TRACK-Leader

Operating Instructions

Trimble Agriculture

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For your safety

Basic safety instructions

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

- Read the operating instructions for the agricultural device which you want to control by using the application.

Intended use

The software may be only used in connection with implements and machines. The software may only be used away from public roads, during field operations.

Layout and meaning of warnings

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

WARNING

This signal word identifies medium-risk hazards, which could potentially cause death or serious physical injury, if not avoided.

CAUTION

This signal word identifies hazards that could potentially cause minor or moderate physical injury or damage to property, if not avoided.

NOTICE

This signal word identifies hazards that could potentially cause damage to property, if not avoided.

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 appears 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.

User requirements

- Learn how to operate the display correctly. The display may 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 vehicles and farm equipment.

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About these Operating Instructions

- Target group of these Operating Instructions [▶ 5]
- Layout of operating instructions [▶ 5]
- Layout of references [▶ 5]

Target group of these Operating Instructions

These Operating Instructions apply to all users of the TRACK-Leader software and related additional modules.

Layout of operating instructions

The operating instructions explain step by step how you can perform certain operations with the product.

In these instructions, the following symbols are used to identify different operating instructions:

Type of depiction	Meaning
1. **2.**	Actions that must be performed in succession.
⇨	Result of the action. This will happen when you perform an action.
⇨	Result of an operating instruction. This will happen when you have completed all steps.
☑	Requirements. In the event that any requirements have been specified, these must be met before an action can be performed.

Layout of references

If any references are given in these Operating Instructions, they appear as:

Example of a reference: [▶ 5]

References can be identified by their square brackets and an arrow. The number following the arrow shows you the page on which the section where you can find further information starts.

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Product description

Overview

The following functions are integrated in TRACK-Leader:

- Display of parallel guidance lines.

- Display of parallel guidance lines in headland.

- Marking of obstacles located in the field.

- Warning of obstacles marked.

- Warning of reaching a field boundary.

- SECTION-View – display of sections which the operator must switch on and off by hand to avoid overlaps.

- Communication between TRACK-Leader and the automatic steering system.

Start screen layout

The start screen appears when you open the TRACK-Leader application and no navigation has been started.
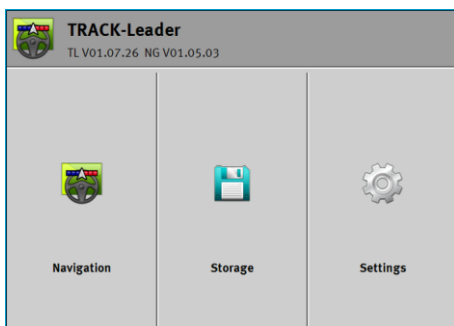
TRACK-Leader Start screen

The Start screen allows you to:

- Switch to further screens.

- View the software version (numbers beside "TL" and "NG")

Controls

Function icon	Function
	Starts the navigation. [▶ 17]
	Appears instead of the "Navigation" function icon if it is not possible to start a navigation. If you press this icon, a message [▶ 77] explaining the cause appears.

Function icon	Function
	Opens the "Storage" screen. [▶ 66]
	Opens the "Settings" screen. [▶ 71]

Information on the work screen

As soon as you start the navigation, the work screen appears. From here you can perform all other tasks which you will need during the field work.

The next illustration shows you the other information on the work screen which can appear during work.
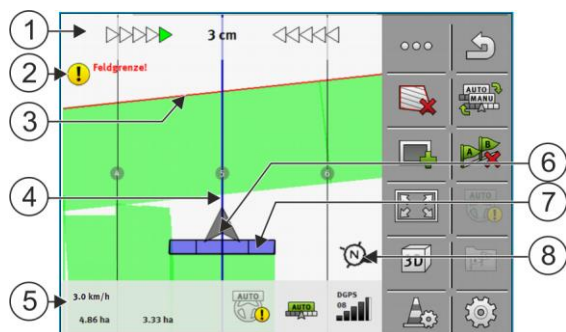
Work screen while working

①	Screen lightbar	⑤	Counter and status information
②	Notification of reaching the field boundary	⑥	Arrow showing the position of the GPS receiver
③	Field boundary	⑦	Working bar
④	Guidance line	⑧	Compass

To enlarge or reduce the view on the work screen, you can use the two-finger zoom function. If you only want to move the view, tap on any position on the screen and drag the view in the desired direction.

Moreover, you can centre the view on the work screen by tapping the compass.
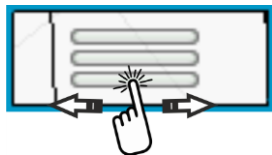
If you see lines in the upper area of the screen, you can switch between the different views by swiping with your finger.

Guidance lines

Guidance lines are lines that help the driver keep parallel tracks.

There are three types of guidance line:

- AB line - This is the first guidance line. It is always marked on the display screen with the letters A and B.
- Activated guidance line – This is the guidance line that is currently being followed by the vehicle. It is marked in blue.
- Not activated guidance lines – Guidance lines that are not activated.

When you have selected a guidance line set, you always see the currently selected set and the respective guidance line distance in the top area of the work screen.

Position of GPS receiver

The center of the gray arrow above the working bar corresponds to the position of the GPS receiver.

Working bar

The working bar symbolizes the agricultural implement. This consists of multiple rectangles. Each rectangle corresponds to a section. The color of the rectangle can change while working.
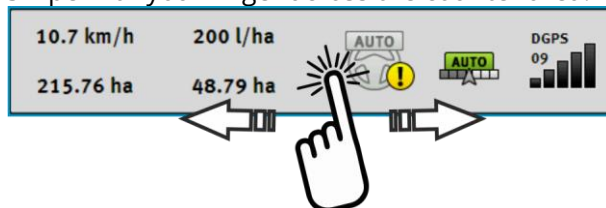
See also: Using SECTION-View [▶ 47]

Counter and status information

In this area, you can see various information.

The circles in the bottom area of the screen show that you can switch between several displays:

1. Swipe with your finger across the counter area:

⇨ The next display appears.

Counters

①	Speed	⑤	Quality of the GPS signal
②	Target rate from the prescription map	⑥	Area: - For a field with no field boundary: Already applied area. - For a field with field boundary: Total area of the field.
③	Status of the auto steer system	⑦	Only appears when you have marked the field boundary: - Area where the product still need to be applied.
④	Status of SECTION-Control: - AUTO - SECTION-Control regulates the section control of the ISOBUS ECU. - MANU - The ISOBUS ECU is operated manually.		
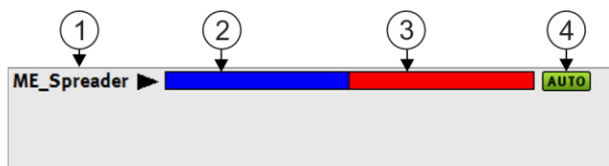
Display of the working width with the status of the sections, with connected ISOBUS ECUs

①	Identification of the implement and its sections.	③	Deactivated section
②	Spreading section	④	Working mode of SECTION-Control on this implement

	l/ha			
	< 0	< 115	< 269	< 423
	< 38	< 154	< 308	< 462
	< 77	< 192	< 346	< 500
		< 231	< 385	>= 500
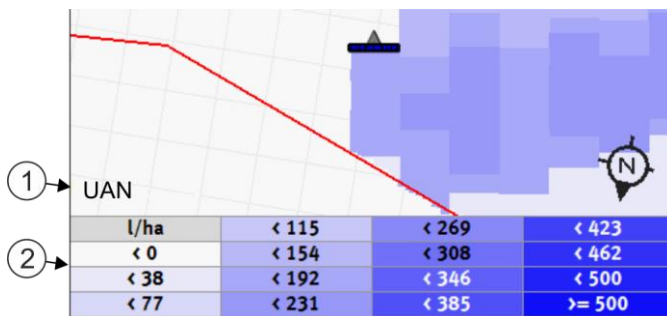
Legend for the visualised target rates or prescription maps

①	Name of the legend The name is given by the ECU or by an ISO-XML task.	②	Legend:

Field boundary

The Field boundary [▶ 25] tells the software the exact position of the field and is the base for calculating the total size of a field.

Traveled areas and areas where the product has been applied

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

- Traveled areas

  If you are only using TRACK-Leader, the traveled area is marked. This is marked regardless of whether or not the vehicle applied product during this travel.

If you want the software only to mark areas where the product has been applied in green, proceed as follows:

- Mount and activate the tool work position sensor

  The work position sensor detects if an agricultural device is in work position, and transmits this information to the display.

GPS connection status

Shows the status of the DGPS connection.

See also: Checking the DGPS signal quality [▶ 24]

Controls on the work screen

This section will provide you with an overview of most of the function icons that can appear on the application work screen, as well as their function.

Function icon	Function / Section with more information
∘∘∘	Shows the second page with function icons.
	Exits the work screen and terminates the navigation or shows the first page with the function icons.
	Show function icons for field boundary settings Additional function icons appear.
	Marking the field boundary [▸ 25] A red line drawn around the field is now shown on the navigation screen. This is the field boundary.
	Deleting the field boundary [▸ 29] The field boundary will be deleted.
	Open the selection of the boom position for recording field boundaries Opens a selection in which you can decide which position of the boom should record the field boundary.
	Start the field boundary recording Starts recording the field boundary with the selected boom position.
	Stop the field boundary recording Stops recording the field boundary with the selected boom position.
	Pause the field boundary recording Pauses recording the field boundary with the selected boom position.
	Resume the field boundary recording Resumes recording the field boundary with the selected boom position and draws a straight line to the point at which the recording was paused.
	Finish the field boundary recording Finishes the recording of the field boundary with the selected boom position and draws a straight line to the starting point of the recording.

Function icon	Function / Section with more information
	Open the selection of the boom position for recording restricted areas
	Opens a selection in which you can decide which position of the boom should record the restricted area.
	Start the restricted area recording
	Starts recording the restricted area with the selected boom position.
	Stop the restricted area recording
	Stops recording the restricted area with the selected boom position.
	Pause the restricted area recording
	Pauses recording the restricted area with the selected boom position.
	Resume the restricted area recording
	Resumes recording the restricted area with the selected boom position and draws a straight line to the point at which the recording was paused.
	Finish the restricted area recording
	Finishes the recording of the restricted area with the selected boom position and draws a straight line to the starting point of the recording.
	Starting track recording [▶ 48]
	Cancel the marking of the applied area
	Working on headlands [▶ 49]
	Icon is deactivated because a field boundary is missing.
	Working on headlands [▶ 49]
	Calls up a screen where the guidance lines can be defined on the headlands.
	Creating an AB line [▶ 32]
	The exact appearance of the flags will depend on the guidance mode that has been activated.
	Point A of the AB line will be set.
	Deleting guidance lines [▶ 39]
	Press the function button for three seconds.

Function icon	Function / Section with more information
	Guidance lines will be deleted.
	Changing the display of the work screen The whole field will be displayed.
	Vehicle surroundings will be displayed.
	Two displays will alternate on the screen: "As applied map" and "Applied areas"
	Selecting a guidance mode [▶ 42] The screen for the configuration of the guidance lines appears.
	Creating an alternative AB line [▶ 45] The exact appearance will depend on the guidance mode that has been activated.
	Detecting the direction [▶ 20] The assumed driving direction is being changed.
	Several functions: • Setting the distance between the guidance lines [▶ 39] • Setting the interval of the guidance lines [▶ 40] • Setting the pattern mode [▶ 40] • Configuring TRACK-Leader AUTO [▶ 75]
	3D view will be activated
	2D view will be activated
	Marking obstacles [▶ 53] Screen with obstacle marking appears.
	When this arrow appears, the system assumes that the vehicle is moving forwards. [▶ 20] When pressed, the assumed direction is changed.

Function icon	Function / Section with more information
⬇	When this arrow appears, the system assumes that the vehicle is moving in reverse. [▸ 20] When pressed, the assumed direction is changed.
⇨⇦	Moving guidance lines [▸ 39] (Keep pressed for 3 sec.) Guidance lines will be shifted to the current position of the vehicle.
⦿	Function icons to set the reference point [▸ 22] and for calibrating the GPS signal appear:

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Basic control principles

Initial start-up

Procedure

1. Start the display.

2. Tap the icon in the selection menu:

⇨ The TRACK-Leader application appears in the main window:
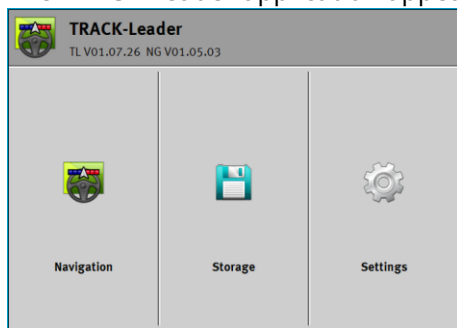
Starting navigation

Starting in TRACK-Leader – Without ISOBUS-TC

Procedure

✓ If you are working with an ISOBUS ECU, it has to be connected to the ISOBUS.

✓ If you want to work without an ISOBUS ECU, you must activate the virtual ECU in the Virtual ECU application. You can find more information on this in the instructions of the display.

✓ You have set the "Operating Mode" parameter to "Standard" in the ISOBUS-TC application.

1. - Open the TRACK-Leader application.

⇨ The following screen appears:
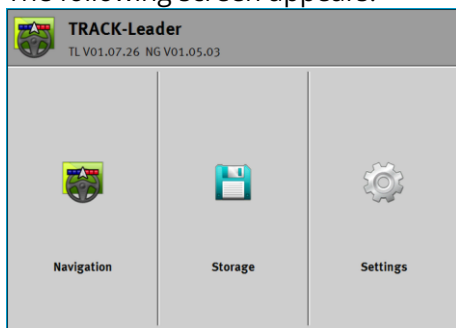
⇨ If the text "..." appears instead of "Navigation", you have not fulfilled one of the preconditions. To find out the precise cause, tap   :

2. Tap "Storage".

⇨ The "Storage" screen appears: [▶ 66]
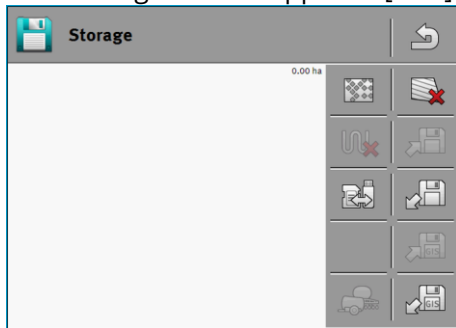
3. You must now decide whether you want to work on a field for the first time, or if you want to work on a field whose field boundaries you have already saved. Decide which of the following options you want to use and continue to read at Step 8.

4. **Option a**: If you want to process a new field, you must ensure that there is no previous recording in the storage. Tap   to discard the opened recording. (The recording will not be deleted from the SD card.)

   ⇨ No field is displayed on the screen.

5. **Option b**: If you want to work on a field with field data you already have on the SD card, tap   to load the field data from the SD card.

   ⇨ The field that you have loaded appears on the screen.

   ⇨ You have two options with the loaded field:

6. **Option b1**: You want to continue working on this field.
   If you want to continue working on this field, but you want to use a different implement to do so, you first have to connect the other implement.
   Continue reading starting at Step 8.

7. **Option b2**: You want to perform a new task on this field, and only need the field boundary. Tap   to delete the tracks.

8.   - Exit the "Storage" screen.

   ⇨ The application start screen appears.

9.   - Start a new navigation.

⇨ The work screen appears. It will only contain the icon for the vehicle or also loaded field boundaries and applied areas - depending on which data was previously loaded.

⇨ If the icon appears at the centre of the display screen, there is no connection to the GPS receiver, and you will not be able to continue work. Install and configure a GPS receiver.

10. To find out more about the information appearing on the work screen, read this section: Information on the work screen [▶ 8]

11. To find out what you should do next, read this section: Operating procedures

With shape files from ISOBUS-TC

Use this method if you are using the "ISOBUS-TC" application in the standard mode.

Procedure

✓ If you are working with an ISOBUS ECU, it has to be connected to the ISOBUS.

✓ If you want to work without an ISOBUS ECU, you must activate the virtual ECU in the Virtual ECU application. You can find more information on this in the instructions of the display.

✓ You have set the "Operating Mode" parameter to "Standard" in the ISOBUS-TC application.

1. Activate a field in the "ISOBUS-TC" application. You can read how to do this in the display operating instructions.

2. ![steering wheel icon] - Open the TRACK-Leader application.

⇨ The work screen with all of the field data saved in ISOBUS-TC appears:
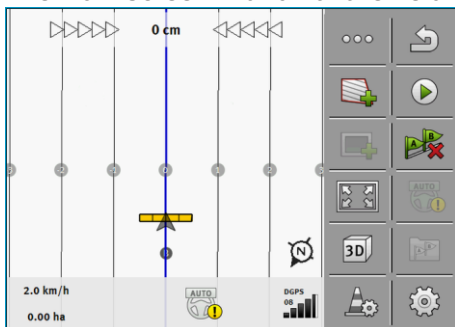
⇨ If the work screen does not appear, this means that you have not fulfilled a number of the preconditions.

⇨ If applied areas marked in green appear on the work screen (from the previous operation), you must delete them on the "Storage" screen with the ![delete icon] button.

⇨ If the icon ![satellite icon] appears at the centre of the display screen, there is no connection to the GPS receiver, and you will not be able to continue work. Install and configure a GPS receiver.

3. To find out more about the information appearing on the work screen, read this section: Information on the work screen [▶ 8]

4. To find out what you should do next, read this section: Operating procedures

Detecting the direction

For the system to be able to function properly when turning and driving in reverse, it is recommended to also take account of the driving direction.

As long as you are moving forwards on the field, the the implement will be properly displayed on the screen and the sections will be properly switched ①, ②. Two behaviours are possible when driving in reverse ③:

- When the driving direction is not taken into account, the display assumes that the vehicle is driving forwards even if the direction has changed. In this case, the vehicle is rotated by 180° on the screen. As a result, the location of the sections is wrong and there may be switching errors. ④

- When the driving direction is taken into account, the colour and direction of the GPS arrow change. ⑤
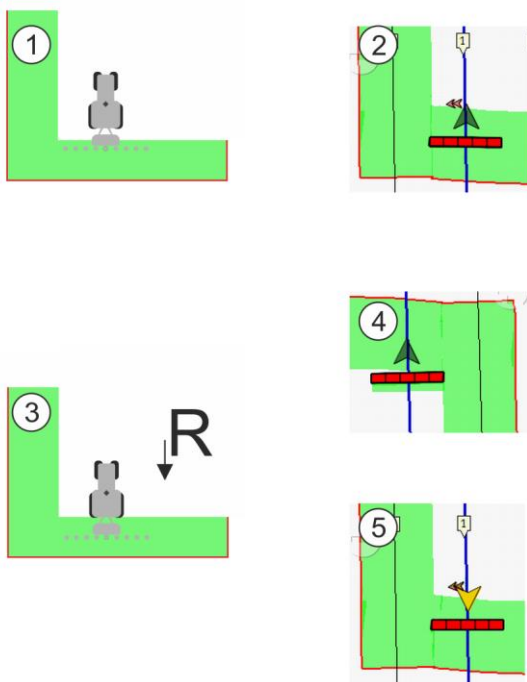
Advantages with the change in direction

The following options are available for taking account of the driving direction.

- Direction sensor in the tractor. The direction signal is transmitted through the ISOBUS and is detected by the display.

- Driving direction signal from the steering system.

- Semi-automatic driving direction detection using the GPS signal.

Semi-automatic driving direction detection

If the "Detect Driving Direction" [▶ 72] parameter is activated, you must check if the assumed driving direction is correct after switching on the display.

With the first vehicle movement, the system assumes that the vehicle is driving forwards. Every subsequent change in direction will be adjusted according to this information.

For this reason, it is very important to check if the system has correctly detected the driving direction directly after starting the navigation. Especially if the vehicle was driving in reverse before or during the start of navigation, or does not yet have proper GPS reception.

The driving direction must be checked again at the latest when the system has been rebooted.

Procedure

1. Start a new navigation.
   ⇨ The arrow above the vehicle icon shows the currently assumed driving direction.

   ![icon] - The vehicle is driving forwards; ![icon] - The vehicle is driving in reverse.

2. Tap ![icon] to change the assumed driving direction.

3. Every time the display detects a change in direction using the GPS signal, the displayed driving direction is changed.

Creating a reference point

If you are using a high accuracy correction signal, such as RTK or CenterPoint RTX, you do not need to create a reference point.

What do you need a reference point for?

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

To calibrate the GPS position you need a fixed point on the ground, the so-called reference point. When the GPS position is calibrated, the stored coordinates of the Reference point are compared with the current coordinates.
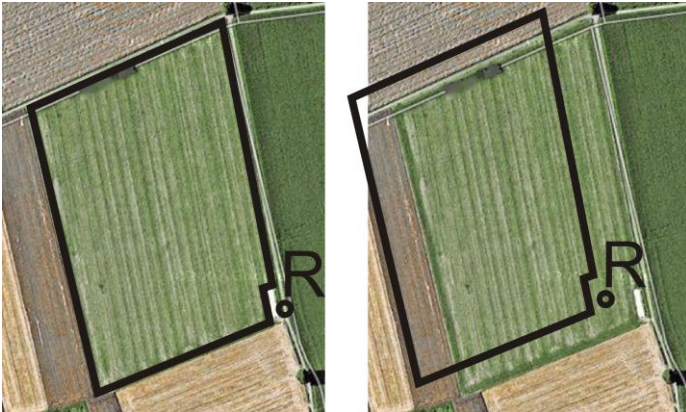
Left – field with calibrated GPS position; Right – field with no calibrated GPS position

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

The saved GPS coordinates for the field boundary, guidance lines, etc. will differ from the actual values. As a result, you may miss applying parts of the field because the saved position of the field is outside the field boundary.

In order to ensure maximum precision:

1. Set a reference point the first time you drive over each field.

2. Calibrate the GPS position of a field for which you have already set a reference point before you edit the field.

3. Calibrate the GPS position occasionally during long periods of work.

Setting a reference point

The coordinates of the GPS receiver are crucial when setting the reference point. If you do not want to dismantle the GPS receiver each time, you must always set the vehicle in the same position. This means that the GPS receiver is also in the same position.

When setting the reference point, you will require a fixed point whose position will not alter over time. For example, this can 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 remember 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:
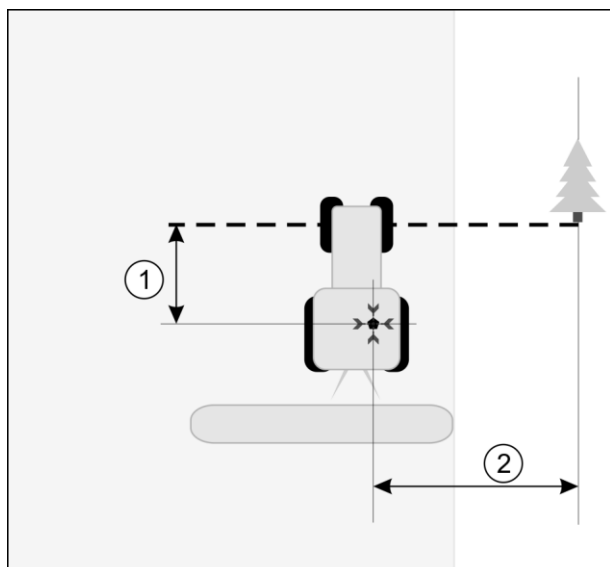
Tractor when setting the reference point

	GPS receiver on the roof of the tractor cab		Position of the reference point
①	Distance between the GPS receiver and the X-axis point on the roadside	②	Distance between the GPS receiver and the Y-axis point on the roadside
– – –	Line from a fixed permanent point over the road		

Procedure

✓ When you are working the field for the first time.

1. Find a fixed point at the entrance to the field. For example, this can be a tree, a landmark or a manhole cover.

2. Draw a line from this point over the path, on which the vehicle is standing.

3. Position the vehicle with its two front wheels on the line.

4. Write down the distance between the fixed point and the vehicle. You must also adhere to this distance when calibrating the GPS signal.

5. Start a new navigation.

6. Tap the following icons consecutively:

   ○○○ > ◉ > ◉

   ⇨ An "R" and a point appears on the display screen, marking the reference point on the field. The point is located beneath the arrow.

⇨ You have now set the reference point.

Checking the quality of the GPS signal

The better the GPS signal, the more TRACK-Leader can work precisely and reliably. The quality of the GPS signal depends on several factors:

- On the model of the GPS receiver;

- On the geographical location (correction satellites are not available in some areas of the world);

- On local shadowing in the field (trees, mountains).
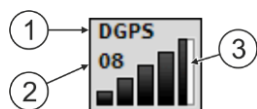
Information on the work screen

①	Current quality of the GPS signal	③	Bar chart Indicates the quality of the connection. The higher the number of blue bars, the better the connection.
②	Number of connected satellites		

Quality	Description
RTK fix	Highest precision.
RTK float	Ca. 10 to 15 cm pass to pass accuracy, TerraStar-C.
DGPS	GPS with correction signal. Depending on the GPS receiver and configuration: WAAS, EGNOS, GLIDE or other.
GPS	Weak and imprecise signal.
INV	No GPS signal. Working is not possible.
RTX conv	Only if a Trimble RTX correction service is used. The correction signal is not yet completely converged. The maximum accuracy has not yet been reached.
RTX	Only if a Trimble RTX correction service is used. The maximum accuracy has been reached.
xFill	If xFill is shown as the GPS quality, a timer is shown instead of the number of satellites. The timer starts at 20 minutes and shows how long xFill can still be used.

Quality of the GPS signal

Field boundary

You can mark the field boundary so that the system knows the outline of a field. The field boundary appears on the screen as a red line that is drawn around the field.

It is not mandatory to mark the field boundary. However, their use offers several advantages:

- The total field area and applied area can be determined.

- The display warns you when you are approaching the field boundary.

- The headlands can only be shown on the screen if the field boundary is entered.

- With marked field boundaries, the sections can be automatically switched off when they leave the field. This is particularly practical for field sprayers with large working widths.

There are several options for marking the field boundary.

- Directly on the display: [▶ 26]
    - While working with an implement.
    - Retroactive calculation from a field perimeter.
    - When driving around the field with the tractor or another vehicle (quad bike).

- Importing the field boundary: [▶ 28]
    - Import of survey data in shp format.
    - Import of older TRACK-Leader records.
    - Import of field boundaries drawn on the PC.

Recording the field boundary during operation

To record the field boundary during operation, you must proceed as follows. The more precisely you record the field boundary, the more precisely the sections can be switched afterwards in the boundary area.

Procedure

✓ A ECU is connected and the list of connections is correctly set.

1. Start a new navigation.

2. - Select the boom position that you want to use for recording the field boundary, depending on the driving direction and side of the field.

3. - Confirm.

4. - Start recording the field boundary.

5. Drive around the field.

6. - Interrupt the recording, e.g. if special driving manoeuvres are required.

⇨ When driving with the recording interrupted, the display will show a dashed line.

7. - Resume the recording.

⇨ The display draws a straight line between the position at which you paused the recording and the position at which you want to resume recording.

8. Resume the recording.

⇨ Please note that when finishing the recording, the display will draw a straight line from the current position to the starting point of the recording.

9. - Finish recording the field boundary.

⇨ The display draws a straight line from the current position to the starting point of the recording.

⇨ You have recorded the field boundary.

⇨ The total area of the field will be shown on the navigation screen.

Marking the field boundary by driving around the field

To be able to mark the field boundary directly on the display, you must drive around the field. The more precisely you drive around the field, the more precisely the sections can be switched afterwards in the boundary area.

The precision of the GPS signal is very important:

- If you can, use the most precise GPS signal possible, for example, RTK.

- If you are working with DGPS, calibrate the GPS signal every 15 minutes. To do this, interrupt the recording (icon) and drive to the reference point. After calibration, drive back to the spot where you interrupted driving around the field.

Basic procedure - without ISOBUS ECU and without SECTION-Control

Procedure

If you are working without an ISOBUS ECU and without SECTION-Control, here is how to drive around the field:

✓ In the "Virtual ECU" app, you have activated the virtual ECU for the implement to be used.

1. Start a new navigation.

2. If you are working without RTK, set the reference point or calibrate the GPS signal.

⇨ You will see the following image:
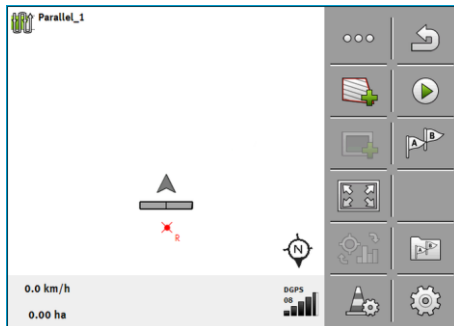
3. ⊙ - Press on this function icon to tell the display that the implement is working. If a work position sensor is installed on the implement (or tractor) and it is configured in the machine profile, this icon does not appear. In this case, the display automatically detects that the implement is working.

4. Switch on the implement and put it into work position.

5. Drive around the field. In doing so, try to drive directly at the field edge with the outer part of the implement. If you notice that the working width is different than the implement width, stop and correct the "Working width" parameter in the Virtual ECU. While driving around the field, you can even set this parameter a little higher and then drive with a constant distance to the field edge.

⇨ After the first few centimetres, you will see on the screen that the area behind the vehicle icon is marked in green. The green colour marks the applied area:
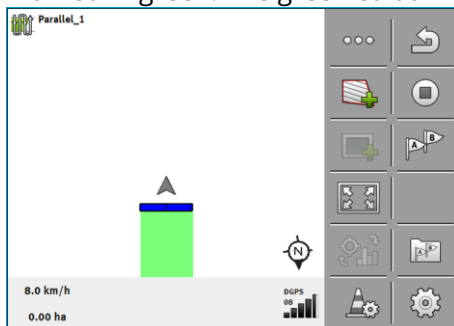
6. Drive around the entire field.

7. Stop when you have completed the route around the field.

⇨ The driving route must be a closed circuit:
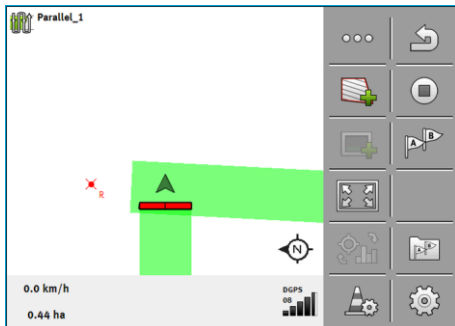
8. - Press this function icon to mark the field boundary surrounding the area marked in green.

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

⇨ The calculated field area now appears in the counter area.

⇨ Because you are positioned near the field boundary, the display starts to beep and the warning "Field boundary" appears on the screen.

You can save the marked field boundary.

Driving around the field perimeter with ISOBUS-TC

If you are using ISOBUS-TC in standard mode, you always have to create a field in ISOBUS-TC and activate it before you follow the basic procedure described here.

Driving around the field with a tractor, quad bike or a different vehicle without implement

In many cases, it is better to drive around the field with a vehicle that is not pulling an implement.

Important:

- You have to install the display and the GPS receiver on the vehicle.

- You must create a virtual ECU for the vehicle in the Virtual ECU application. In doing so, enter the position of the GPS receiver and the working width very precisely.

- Half of the working width corresponds to the distance from the centre of the vehicle to the field boundary. Maintain this constant distance while driving around the entire field.

Importing a field boundary

You can import the field boundary from an external program. This can be older field boundaries that you have created with a different display, or data from a survey company. The source is not important. It is only important that the boundary was drawn very accurately.

The file must have the following properties:

• File format: shp

• Standard: WGS84

You can find out how to work with shape files in section: If you are using ISOBUS-TC in standard mode

Deleting the field boundary

Procedure

1. Touch the following function icon for approx. 3 seconds:

   ⇨ The following message appears: "Do you want to delete the field boundary?"

2. "Yes" - to confirm.

⇨ The field boundary will be deleted.

Recording restricted areas

If there is an obstacle on your field that you always want to drive a detour around, you can record a restricted area.

When recording restricted areas, you have to proceed in a similar way to recording field boundaries.

Procedure

✓ You have recorded the field boundary of the field for which you want to record a restricted area.

✓ You are inside the field.

1. - Select the boom position that you want to use for recording the restricted area, depending on the driving direction and side of the field.

2. - Confirm.

3. - Start recording the restricted area.

4. Drive around the area that you want to record.

5. - Interrupt the recording, e.g. if special driving manoeuvres are required.

   ⇨ When driving with the recording interrupted, the display will show a dashed line.

6. - Resume the recording.

   ⇨ The display draws a straight line between the position at which you paused the recording and the position at which you want to resume recording.

7. Resume the recording.

  ⇨ Please note that when finishing the recording, the display will draw a straight line from the current position to the starting point of the recording.

8. - Finish recording the restricted area.

  ⇨ The display draws a straight line from the current position to the starting point of the recording.

⇨ You have recorded the restricted area.

⇨ The area of the restricted area will be subtracted from the total area of the field. Only the area to be applied will be shown.

5

Parallel guidance TRACK-Leader

- Using guidance lines for parallel guidance [▶ 32]
- Parallel driving with the help of the lightbar and the guidance line [▶ 46]
- Using SECTION-View [▶ 47]
- Starting track recording [▶ 48]
- Working on headlands [▶ 49]
- Marking obstacles [▶ 53]
- Changing tractors [▶ 55]

Using guidance lines for parallel guidance

Guidance lines are parallel lines which are displayed on the display screen. These help you to treat the field in parallel lines.

The first guidance line which you lay out on the display is called the AB line. On the display screen, these are usually marked with the letters A and B. All further guidance lines will be calculated and designated on the basis of the AB line.

The path of the AB line will be saved after the first drive-over, which you must perform manually. The operation of the display will depend on the guidance mode that you have chosen.

To be able to change the working direction on every field, you can create several guidance line sets. [▶ 42] For each guidance line set, you can create the guidance lines in a different direction and in a different mode.

Moreover, while working with a guidance line set, you can create a guidance line set for later operations [▶ 45] on the field.
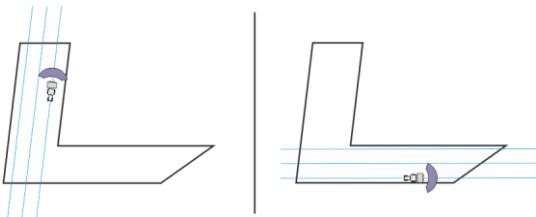
You can select a guidance line set for each direction.

Straight guidance lines

Procedure

  ✓ "Parallel" guidance mode is activated. [▶ 42]

  1. Position the vehicle at the starting point of the desired AB line.

  2.   - Set the first point.

    ⇨ Point A appears on the display screen.

    ⇨ The first flag is colored green on the function icon.

  ⇨
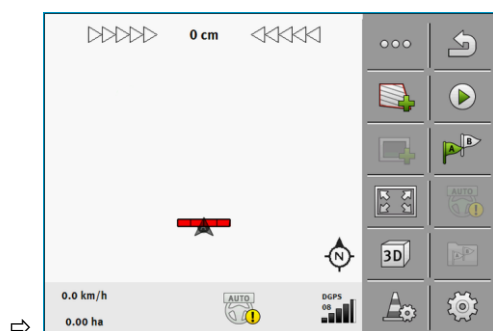
3. Drive to the other side of the field.

4. ⚑ - Set the second point.

⇨ Point B appears on the display screen.

⇨ The second flag is colored green on the function icon.

⇨ Points A and B are connected with a line. This is the AB line.

⇨ Further guidance lines are displayed to the left and right of the AB line.

⇨

Guidance lines as a curve

Procedure

✓ Selecting a guidance mode [▶ 42]

1. Position the vehicle at the starting point of the desired AB line.

2. ⚑ - Set the first point.

⇨ Point A appears on the display screen.

3. Drive to the other side of the field. You do not need to drive in a straight line when you do this.

⇨ While driving, a line will be drawn behind the vehicle on the display screen.

4. ⚑ - Set the second point.

⇨ Point B appears on the display screen.

⇨ Points A and B are connected with a line.

5. Further guidance lines are displayed to the left and right of the AB line.

Guidance lines using a compass

Procedure

✓ Guidance mode "A+" is activated. [▶ 42]

1. Position the vehicle at the starting point of the desired AB line.

2. Tap the icon: ⚑A+

   ⇨ A keyboard appears.

3. Input the direction of the compass towards which you want the guidance lines to lead. You can input a value between 0° and 360°.

4. ✔ - Confirm.

   ⇨ Multiple parallel guidance lines are drawn on the display screen, and these all run in the direction which you have entered.

Combined guidance line

In the "AB and contour" guidance mode, you can draw a guidance line consisting both of parallel straight lines and curves.

Function icon	Function	Result
⚑	Sets point A.	
⚑	Starts the recording of a contour line.	Sets a red point, which is connected to the last point with a straight line.
⚑	Pauses the recording of the contour line.	Sets a red point, starting at which a straight line will be recorded.
⚑	Sets the last point and terminates the recording of the AB line.	

Procedure

✓ "A-B and contour" guidance mode is activated. [▶ 42]

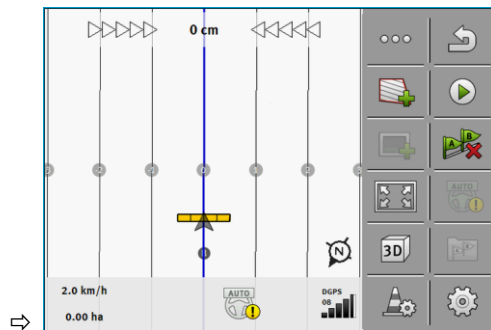1. Position the vehicle at the starting point of the desired AB line.

2. ⚑ - Set the first point.

   ⇨ Point A appears on the display screen.

3. Keep driving straight ahead as long as you need a straight guidance line.

   ⇨ While driving, a line will be drawn behind the vehicle on the display screen.

   ⇨ The line is dashed and straight.

4. - Terminate the recording of the straight AB line.

   ⇨ The icon is replaced by the icon.

   ⇨ A small red point will be set on the screen.

   ⇨ Now you can record a curve as a guidance line.

   ⇨ While driving, a line will be drawn behind the vehicle on the display screen.

5. If you want to draw a new straight line again, you can tap the icon again, and continue like in step 3.

6. - Set the second point to terminate the recording.

   ⇨ Point B appears on the display screen.

⇨ Points A and B are connected with a line.

Using automatically created guidance lines

The system is capable of automatically creating guidance lines.

- On the headlands. [▶ 49]

- On the inside of the field. This case is not described here.

By using this function, you can often omit creating the first AB line with manual steering. You can use your steering system right from the beginning instead.

Mode of operation

If a field boundary appears on the screen in TRACK-Leader, the system can automatically create the guidance lines. These guidance lines are always straight and run parallel to each other. The first AB line is created as a connecting line between two points that are set beside the field boundary. The distance from the field boundary is half the working width.

Multiple guidance line sets are created at once. You can choose which lines you want to use. You should then delete the guidance line sets that are not required

In general terms, operation consists of the following phases:

1. Providing the field boundary: Drive around the field, load a shape field boundary in ISOBUS-TC, or load an old field boundary in TRACK-Leader.

2. Adding the headlands: [▶ 49] To do so, mark the "Automatically create guidance lines" parameter.

3. Delete unnecessary guidance line sets.

4. Select the guidance line for the job.

Procedure

To use automatically created guidance lines:

  ✓ You a positioned on the field that you want to work on.

  ✓ You have started a navigation.

  ✓ The field boundary appears on the screen:

  ✓ There are no guidance lines.

1. ⬚➕ - Create the headland.

2. Set the "Minimum turning radius" parameter.

3. Set a check mark for the "Automatically create guidance lines" parameter.

4. ↩ - Exit the screen.

5. Confirm that you want to create the headland. You can still delete it later.

6. 🏳 - Open the list with available guidance line sets.

  ⇨ Automatically created guidance line sets have the designation "Headland_(no.)".
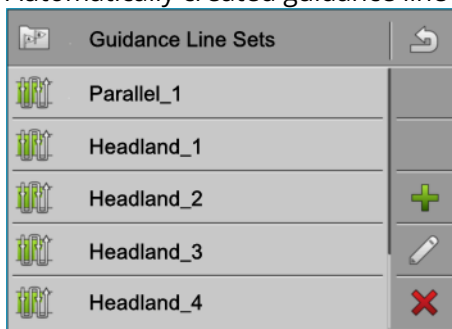
7. You must now decide which guidance line sets you want to keep and which you want to delete.

8. Tap twice on one of the guidance line sets.

  ⇨ The work screen appears.

9. ⛶ - Maximise the screen.

⇨ The overview appears:
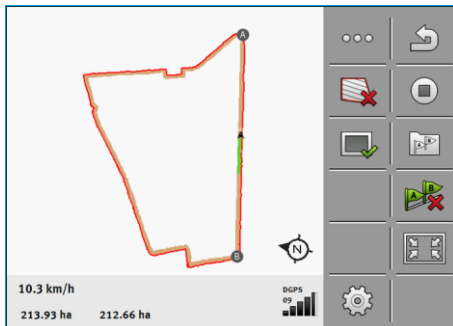
⇨ You will see two points in the overview: A and B

10. Check if a line drawn between points A and B is suitable as an AB line.

11. You now have two options:

12. **Option a**: If the guidance line is not suitable for working the field, delete the guidance line set.

13. - Open the list with available guidance line sets.

14. - Delete the guidance line set. The marked line set is always the one that is deleted. You can mark a guidance line set by tapping it once.

15. **Option b**: If you want to keep the guidance line set, rename it.

16. - Open the list with available guidance line sets.

17. - Rename the marked guidance line set.

18. Tap twice on the next guidance line set.

19. - Maximise the screen.

⇨ The overview appears:
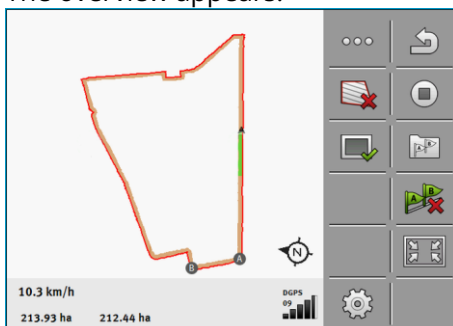
20. Check if a line drawn between points A and B is suitable as an AB line.

21. - Open the list with available guidance line sets.

22. - Here, you can delete the guidance line set. The marked line set is always the one that is deleted. You can mark a guidance line set by tapping it once.

23. Repeat these steps for all automatically created guidance line sets.

Guidance lines as circles

Procedure

✓ "Circle" guidance mode is activated.

1. Position the vehicle at the outer edge of the field, next to the circular irrigation equipment.

2. - Set the first point.

3. Drive at least halfway around the circumference of the field.

4. - Set the second point.

⇨ Circular guidance lines appear on the display screen.

Adaptive guidance lines

Procedure

✓ "Adaptive contour(s) manual" or "Adaptive contour(s) auto" guidance mode is activated.

1. Position the vehicle at the starting point of the desired AB line.

2. - Set the first point.

3. Drive to the other side of the field.

⇨ A line is drawn behind the arrow icon.

4. - Mark the turn maneuver in "Adaptive contour(s) manual" guidance mode.

5. Make a turn in "Adaptive contour(s) auto" guidance mode. The system will automatically notice that you are turning.

⇨ New guidance lines appear to the left and right of the drawn line.

6. Follow the new guidance line.

Deleting guidance lines

You can delete guidance lines and create new ones at any time.

Procedure

1. Touch one of the following functions icon for approx. 3 seconds: . The icons can appear different depending on the guidance mode.

   ⇨ The following message appears: "Do you want to delete the guidance lines?"

2. "Yes" - to confirm.

   ⇨ The guidance lines will be deleted.

Moving guidance lines

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

This function only operates in the following guidance modes:

- Parallel
- Contour

Procedure

✓ Navigation is started.

1. - Move the guidance lines to the position of the GPS receiver.

⇨ The guidance lines, field boundaries and routes will be moved.

Setting the distance between the guidance lines

As standard, the distance between the guidance lines corresponds to the working width, but you can change this distance.

Example

Sprayer working width = 18 m

You will want to ensure that nothing is left out during product application onto the field.

Set the "Line spacing" parameter to 58.38 ft (17.80 m), for example. You will then work with a 0.67 ft (20 cm) overlap (0.33 ft (10 cm) on the left and 0.33 ft on the right).

Procedure

✓ Navigation is started.

1. ⚙️ - Switch to the "Navigation Settings" screen.

    ⇨ The "Navigation Settings" screen appears.

2. Tap "Line spacing".

    ⇨ The keyboard appears.

3. Enter how many meters there should be between two guidance lines.

4. ✅ - Confirm.

    ⇨ The "Navigation Settings" screen appears.

5. Exit the screen.

Setting the interval of the guidance lines

When you want to drive in parallel and thus use every second or third guidance line, you can set these guidance lines to be marked more boldly than the others.

Example

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

Procedure

✓ Navigation is started.

1. ⚙️ - Switch to the "Navigation Settings" screen.

    ⇨ The "Navigation Settings" screen appears.

2. Tap "Pattern interval".

    ⇨ The keyboard appears.

3. Input the interval at which the guidance lines should be marked in bold.

4. ✅ - Confirm.

    ⇨ The "Navigation Settings" screen appears.

5. Exit the screen.

Setting the pattern mode

If you are using the "Pattern interval" function, you can set whether the marking of the guidance lines to be applied should change during work.

Possible settings

- "Absolute" – the initially marked guidance lines always remain marked, even if you are following a different guidance line that is not marked:
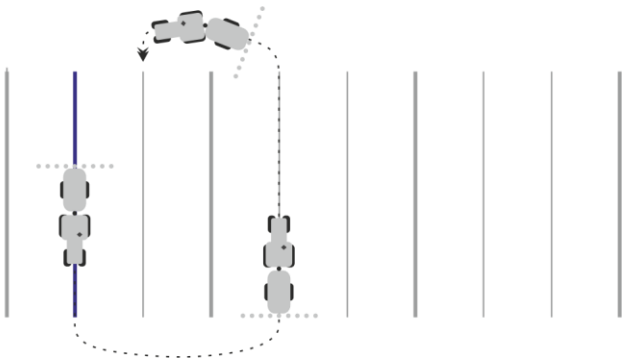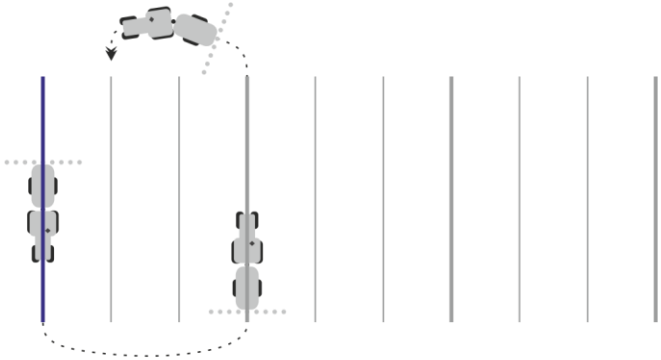
- "Relative" – with this setting, all of the markings are shifted as soon as you follow a line that was not previously marked:
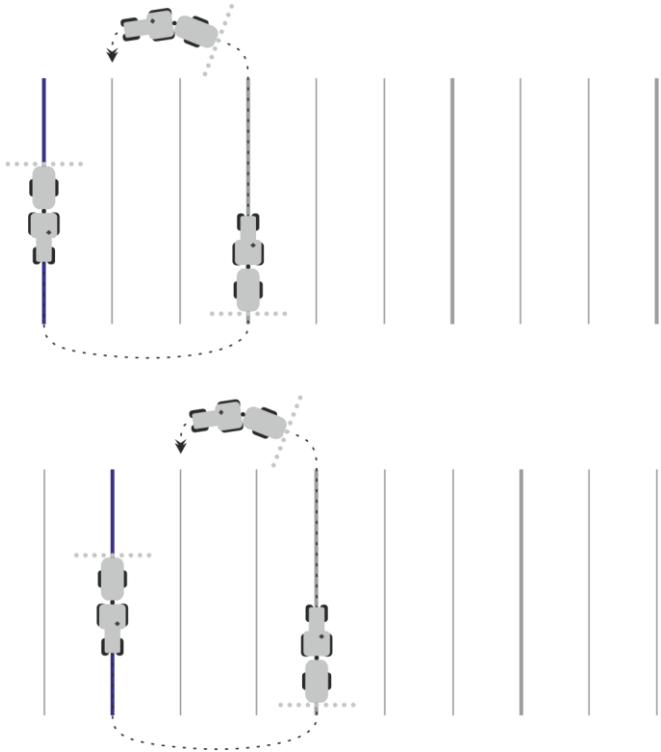
Selecting a guidance mode

The guidance mode determines how the guidance lines are applied and how these run over the field.

Function icon	Function
	Switch to the screen with the guidance line sets for the headlands.
	Switch to the screen with the guidance line sets:
	Exits the "Guidance line sets" screen without adopting a new guidance line set.
	Creates an alternative guidance line set while a different set is activated.
	Creates a new guidance line set.
	Enables the modification of a guidance line set.
	Deletes the marked guidance line set.

Procedure

✓ A navigation is started.

1. ⊞ - Switch to the "Guidance line sets" screen.

   ⇨ The "Guidance line sets" screen appears.

2. ✚ - Create a new guidance line set.

   ⇨ The "Guidance line set" screen appears, with the lines: "Guidance mode" and "Name".

3. Tap the "Guidance mode" line.

   ⇨ A list appears.

4. Select the desired guidance mode.

5. ✔ - Confirm your selection.

   ⇨ The "Guidance line set" screen appears.

6. ↩ - Exit the screen.

   ⇨ The "Guidance line sets" screen appears.

7. Double-tap the desired guidance set to activate it on the navigation screen.

   ⇨ The guidance lines of the guidance line set used until now will be hidden.

   ⇨ You have changed the guidance mode and can now create a new guidance line.

   ⇨ You can change the guidance line set at any time.

The following guidance modes are available:

• **"Parallel" guidance mode**
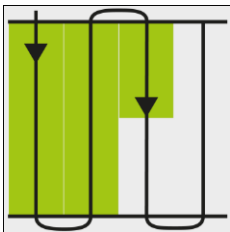
This guidance mode allows you to work the field in parallel, straight lines.

- **"A-B and contour" guidance mode**
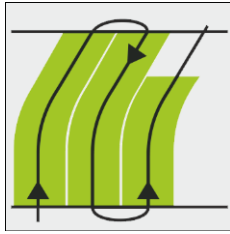
In this guidance mode, you can create a guidance line that first consists of a contour and then of a straight AB line.

- **"Contour" guidance mode**
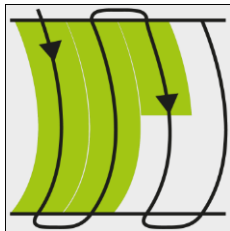
Use this guidance mode if your field has a field boundary that is continuously uneven.

- **"A+" guidance mode**
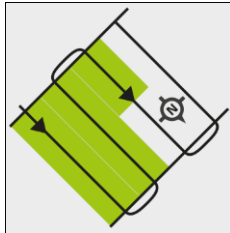
This guidance mode allows you to manually input the geographical direction in which the guidance lines should be laid. To do this, simply input the direction in degrees (between 0° and 360°), and the guidance lines are automatically laid, parallel to each other.

- **"Adaptive contour(s) manual" guidance mode**
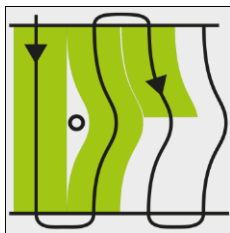
In this guidance mode, the path of the vehicle is recorded during each crossing. The next guidance line is only laid out after a turn. This will be an exact copy of the last crossing.

You must press a button before each turn.

・**"Adaptive contour(s) auto" guidance mode**

This mode functions in the same way as "Adaptive contour(s) manual", but the display automatically recognizes that you are turning.

・**"Circle" guidance mode**

This guidance mode allows you to lay out circular guidance lines in order to treat fields which are equipped with circular irrigation equipment.

・**Automatic guidance lines**

There is an alternative to the guidance modes: Automatic creation of the guidance lines when working with the headland. More about this in section: Working on headlands [▶ 49]

Creating an alternative guidance line set during operation

While you are working on the field with a guidance mode, you can create an alternative guidance mode with different guidance lines, e.g. for later operations.

Procedure

✓ A navigation is started.

1. - Switch to the "Guidance line sets" screen.

   ⇨ The "Guidance line sets" screen appears.

2. - Activate the function to create a guidance line set during operation.

   ⇨ The "Guidance line set" screen appears, with the lines: "Guidance mode" and "Name".

3. Tap the "Guidance mode" line.

   ⇨ A list appears.

4. Select the desired guidance mode.

5. - Confirm your selection.

   ⇨ The "Guidance line set" screen appears.

6. - Exit the screen.

⇨ The "Guidance line sets" screen appears.

7. ⟲ - Switch back to the navigation.

8. 🏴 - Set the first point for the alternative guidance mode. The exact appearance of the flags will depend on the guidance mode that has been activated.

⇨ Point A appears on the display screen.

9. The first flag is coloured green on the function icon.

10. Drive to the other side of the field.

11. 🏴 - Set the second point.

⇨ Point B appears on the display screen.

⇨ The second flag is also coloured green on the screen.

⇨ The alternative guidance mode will be saved.

⇨ You can now select the alternative guidance mode on the "Guidance Line Sets" screen.

Parallel driving with the help of the lightbar and the guidance line

The display screen lightbar helps you to follow the guidance line. This shows you when you have moved off the track and also once you have returned to the track.

The following types of screen lightbars are available:

- The screen lightbar in graphic mode
- The screen lightbar in text mode

In addition to the screen lightbar, a direction arrow appears on the screen, which indicates the correct steering direction.
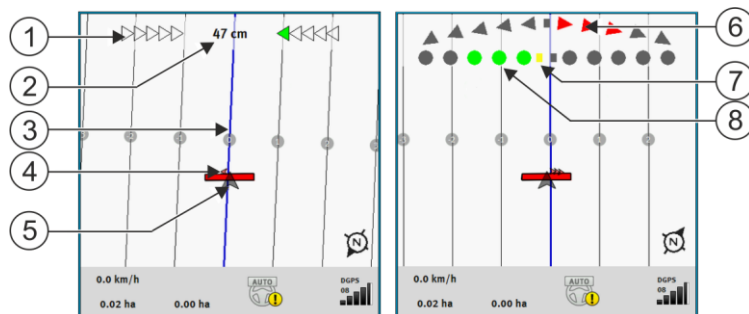
Screen lightbar. left: Text mode; right: Graphic mode

①	Direction display of the lightbar in text mode.	⑥	Triangle This shows you how sharply and the direction in which you must turn in order to reach the ideal position at a certain distance. See also the "Preview" parameter [▶ 73].
②	Current deviation from the guidance line.	⑦	Marking of the optimal position
③	Guidance line This shows the optimal position of the vehicle.	⑧	Current deviation from the guidance line Each point corresponds to a deviation of 30 cm.
④	Direction arrow		
⑤	Position of GPS receiver		

To change the lightbar type while working, tap with your finger on the upper area of the screen.

Using SECTION-View

SECTION-View is a schematic display of the working width and the sections. This displays the vehicle as an icon and can replace the screen lightbar.
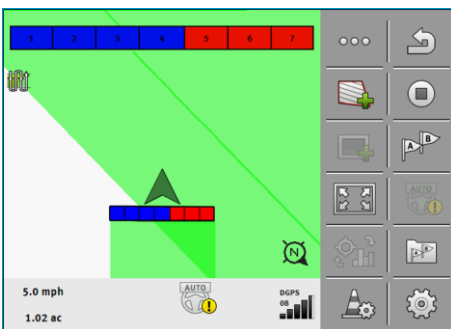
Without ISOBUS ECU: SECTION-View in the header and as a working bar
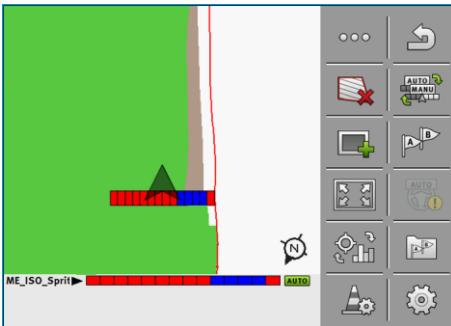
With ISOBUS ECU: SECTION-View in the footer and as a working bar

If you are working without an ISOBUS ECU, you can use the display to help you when switching sections. If you are working with an ISOBUS ECU, the sections are actuated automatically. The colors tell you their current status.

Colour	You have to do:
Gray	The recording is deactivated. Beneath the section, the field has already been processed, or the vehicle is stopped.
Yellow	The recording is deactivated. The ground beneath the section is unprocessed.
Red	Switch off the section. The recording is activated.
Blue	Switch on the section. The recording is activated.

Starting track recording

You do not need to read this section if:

- SECTION-Control is activated.

- You have a work position sensor

If you neither use SECTION-Control nor have a working position sensor fitted, the software does not know when your device (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 tracks enables you to see the parts of the field which you have already traveled through on the screen.

Procedure

✓ You have started a navigation.

1. ![play button icon] - Start the recording as soon as you start working.

⇨ The function icon changes its appearance: ◼

⇨ The applied area behind the vehicle icon is marked in green.

Working on headlands

In the headland you can lay out guidance lines which will guide you around the field.

Advantages:

• You can apply product in the headland after applying the product in the center of the field. In this way, no spray residue remains on the tyres after product application in the headland.

• SECTION-Control switches off the boom sections which are in the headland area when the product is being applied onto the field.

Function icon	The software is in this state when the icon appears	This happens when you press the function key next to the icon
	Headland is deactivated and has never been activated for this field before. The field boundary has not been recorded.	Cannot be pressed.
	Headland is not activated. First appears when the field boundary has been marked.	Calls up a screen where the guidance lines can be defined on the headlands.
	You can now apply the product inside the field. SECTION-Control only applies product in the interior of the field. Sections will be switched off when passing over to a headland. Parallel guidance within the field is activated.	Parallel guidance in headlands will be activated.
	Now you can apply the product to the headland.	Parallel guidance within the field will be activated.

Procedure

The parameters only appear once: when creating the headlands. Therefore, if you load a field boundary that also contains headlands, you can only change the headland settings as follows:

1. (press and hold) - Delete the headland.

2. - Create it once again.

Parameters

You can configure the following parameters:

- "**Headland width**"

Input here how wide the headland should be. You can input the working width of the widest machine as a basis, for example the sprayer.

- "**Guidance line distance**"

Here, input how widely separated from each other the guidance lines should be. This normally corresponds to the working width of the used working equipment.

- "**Minimal turning radius**"

To prevent the lines on the headland from crossing at an angle less than 90°, you can enter a radius here that can be driven by your vehicle with the mounted implement.

- "**Automatically create guidance lines**"

If you activate this option, the display automatically creates guidance lines for the inside of the field. The guidance lines will be drawn as straight parallel lines.

In doing so, three guidance line sets will be created in the folder with the guidance line sets, so that you can choose the direction in which you want to work the field. The guidance line sets are names "Headland" 1 to 3.

Here, you can continue reading about how to select a guidance line set:

- "**Half width mode**"

Parameter for seeders only.

Set the parameter to "yes" when you want to lay out guidance lines for the sprayer with the seeder and thus lay out both guidance lines in a single drive-over.

In this mode, the guidance lines are laid out in such a way that the seeder can only work with only half of the working width during the first or second driver.
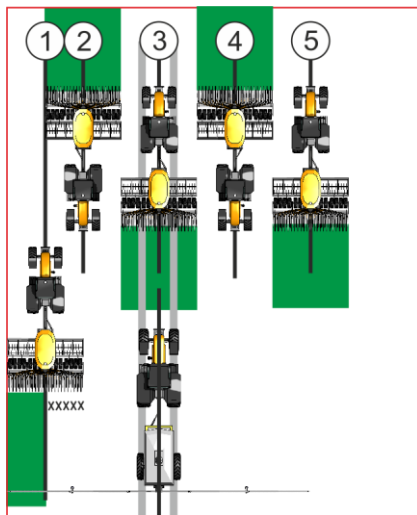
Procedure

✓ A field with field boundaries is loaded.

1. Start a new navigation.

   ⇨ A field with boundary and an unmarked headland is displayed.
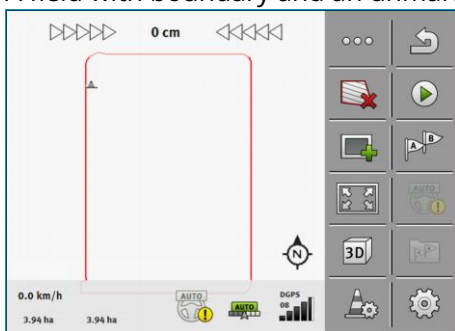
2. ⬛ - Call up the parameters for the headland.

   ⇨ The parameters are displayed.

3. Enter the parameters.

4. ↩ - Exit the screen.

⇨ The headland area is marked in orange on the work screen.
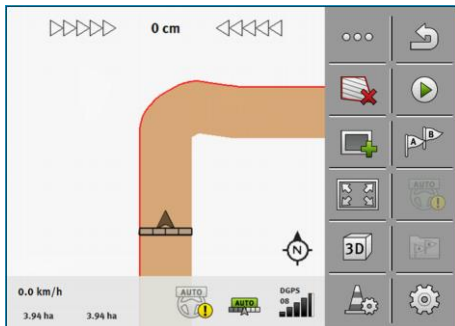
5. Apply product in the interior of the field.

⇨ Once the product has been applied, the interior of the field is green and the headland orange:
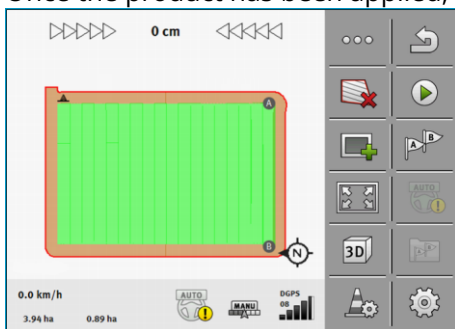
6. - Activate parallel guidance in the headland.

⇨ - is displayed in the work screen.

⇨ The headland is marked in gray.
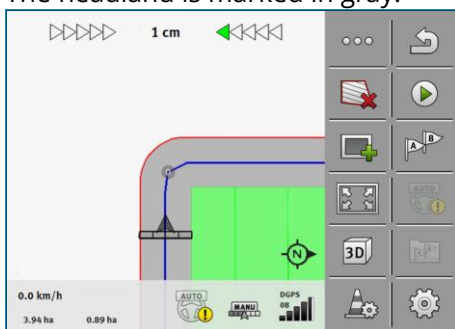
⇨ Guidance lines are displayed in the headland.

7. Apply product on the headland.
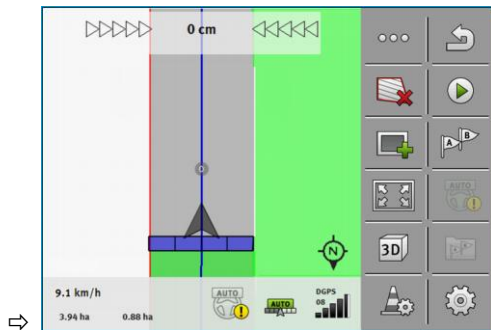
Marking obstacles

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

You can mark obstacles while working in a field.

You will be warned of an obstacle in the following cases:

- If the obstacle will be reached in 20 seconds or earlier.
- If the distance between the obstacle and the vehicle is smaller than the working width of the agricultural device.

The warning always consists of two elements:

- A graphical warning in the upper left-hand corner of the work screen
  - "Field boundary"
  - "Obstacle"
- Acoustic signal

CAUTION **Obstacles**

The software can warn you about obstacles. It cannot brake nor avoid the obstacles.

Function icon	Meaning
	Calls up additional function symbols.
	Creates a new obstacle.
	Deletes all obstacles.

Function icon	Meaning
	Deletes the selected obstacle.
	Moves the obstacle.
	Saves the obstacle.

Procedure

✓ You have started a navigation.

1. - Call up new function icons.

2. - Add an obstacle.

   ⇨ The keyboard appears.

3. Give a name to the obstacle.

4. - Confirm.

   ⇨ A flashing red point appears on the display screen. This marks the point at which the obstacle can be found. The distance between the obstacle and the GPS receiver will then be displayed.

5. Use the arrow to move the point so that the distances on the display screen correspond to those on the field.

6. - Save the position of the obstacles in the field.

⇨ The obstacle now appears on the work screen.

Deleting obstacle markers

Procedure

To delete the marking of one or several obstacles:

1. - Press to call up the screen for deleting the obstacle marking.

   ⇨ The "Delete obstacles" screen appears.

2. Select the desired obstacles. Alternatively, you can also mark or unmark all of the obstacles with .

3. ⟲ - Switch back to the work screen.

⇨ The following message appears: "Do you want to delete the selection?"

4. "Yes" - to confirm.

⇨ The selected obstacles are deleted.

Changing tractors

You have the option of aborting the navigation at any time and to continue working with a different tractor and touch display at a later time.

Procedure

To change the tractor:

✓ A navigation is activated, the inside of the field is partially worked.

✓ A touch display from ME is used in both tractor cabs.

1. Come to a stop with tractor 1.

2. ⟲ - Exit the navigation.

3. Save the field. [▶ 67]

4. Synchronise the data between the SD card and USB memory device. [▶ 68]

5. Remove the USB memory device.

6. Insert the USB memory device into the display of the second tractor.

7. Synchronise the data between the SD card and USB memory device.

8. Load the field.

9. Start a navigation.

6

TRACK-Leader AUTO automatic steering

Basic safety instructions

Always pay attention to the following safety instructions when you are using automatic steering:

- As the driver, you are responsible for the safe use of the steering system. The system is not used to replace the driver. To avoid lethal accidents, or dangerous injuries by rolling vehicles, never leave the driver's seat when the automatic steering system is switched on.

- The steering system cannot drive around obstacles. The driver must always observe the driven route and must manually steer around obstacles.

- The steering system does NOT control the driving speed of the vehicle. The driver must always control the forward speed himself, so that he works at a safe speed and the vehicle does not get out of control or roll over.

- The steering system takes control of the vehicle steering if it is activated when testing, calibrating, and working. If it is activated, the steering parts of the vehicle (wheels, axles, articulation points) can behave unpredictably. Before you activate the steering system, make sure that there are no people or obstacles near the vehicle. This prevents death, injuries or material damage.

- The steering system may not be used on public roads or in other public areas. Make sure that the automatic steering system is switched off before driving onto a road or in a public area.

Preparing the display for work with TRACK-Leader AUTO

Procedure

Before you use TRACK-Leader AUTO for the first time, you must make a few settings in the display:

1. Activate the "TRACK-Leader AUTO" license in the "Service" application of the display. You can read how to activate the licenses in the operating instructions for the display.

2. Activate the GPS driver "AG-200, NAV-900". You can read how to activate the GPS driver in the operating instructions for the display.

3. In TRACK-Leader: In the "Settings" > "General" menu, activate the "TRACK-Leader AUTO" parameter.

4. Connect a ECU or activate a virtual ECU in the Virtual ECU application.

5. Make sure that the proper Vehicle profile is selected in the TRACK-Leader AUTO settings.

6. If you are using TRACK-Leader AUTO eSteer, you must also import the initial value for the "Manual Steering Override" parameter.

TRACK-Leader AUTO with NAV-900

Please note that to use the NAV-900 as a system for automatic steering, you must always have it approved and registered by an official body according the respective country-specific regulations.

Switching the steering ECU on and off

The steering ECU is directly integrated into the GNSS receiver NAV-900. So there is no need to switch the steering ECU on or off when you start or finish work.

If the receiver is correctly mounted and connected, the integrated steering ECU switches on and off automatically.

Activating and operating the automatic steering

When automatic steering is activated, the steering system takes control of the steering mechanisms as soon as it has detected a guidance line in the TRACK-Leader application.

WARNING   **Ignorance of the dangers**

Death or serious injuries

- ◦ Before installing and using the system, read the entire documentation and familiarise yourself with the possible risks and dangers.

WARNING   **Driving vehicle**

Death or serious injuries

- ◦ Never leave the vehicle when the steering ECU is switched on.
- ◦ Before the initial start-up, calibration, or use of the steering system, make sure that there are no people or objects in the area surrounding the vehicle.

WARNING   **Accidents due to unintentional activation of the system**

Death or serious injuries

◦ Switch the steering ECU off before driving onto a road.

◦ Never switch on the steering ECU on a road.

WARNING   **The system cannot avoid obstacles**

Impact with an obstacle

◦ Observe the field while driving and manually drive around all obstacles. Stop the vehicle if necessary.

Icon	Function
AUTO (⚠)	Automatic steering is not possible. This may be due to the following reasons: • The steering ECU has blocked the function due to an error message. • You have not defined a guidance line. Results: Nothing happens because the icon is deactivated.
AUTO / MANU	Activate and deactivate the steering system. You can see the current status in the status area: AUTO - Automatic steering is activated The vehicle is following a guidance line. MANU - Automatic steering is deactivated.
⬅	Steers the vehicle to the left. Until the next guidance line change, the vehicle will be guided parallel to the guidance line.
➡	Steers the vehicle to the right. Until the next guidance line change, the vehicle will be guided parallel to the guidance line.

Procedure

✓ You have fulfilled all of the requirements. See section: Preparing the display for work with TRACK-Leader AUTO [▶ 57]

✓ You are on the field.

1. Start the vehicle engine.

2. Switch on the display.

3. Open the TRACK-Leader application.

4. Tap "Navigation".

   ⇨ The work screen appears.

5. Wait until the NAV-900 has booted up.

   ⇨ The following message appears:
   "TRACK-Leader AUTO and NAV-900"
   Before initial operation of the system, read and observe the documentation, particularly the safety instructions."

   ⇨ The steering ECU has been booted up.

6. Confirm.

   ⇨ On the right of the work screen, you will see the function icon. The system cannot be activated until you have created an AB line.

7. Select a guidance mode. [▶ 42]

8. Make sure that you have a good GPS signal.

9. Create an AB line. [▶ 32] When creating the AB line, you will need to steer the vehicle manually.

10. As soon as you have created Point B, you can activate the steering system. It is important to drive the vehicle slowly in the direction of work so that the direction is properly detected.

11. There are several ways of activating the steering system:

    Possibility 1: Tap .
    Possibility 2: Actuate the optional external switch.
    Possibility 3: For TRACK-Leader AUTO Iso with some vehicle models, there is also an activation key in the vehicle or activate through headland management. Please observe the operating instructions for the vehicle.

    ⇨ The icon is replaced with the following icon: .

    ⇨ The steering system will be activated. It takes control of the steering.

12. Drive up to the headlands.

13. When you have reached the headlands, deactivate the steering system. The next section describes how to do this.

14. Turn around manually.

15. After turning, steer the vehicle, until the next AB line has been recorded, i.e., marked in blue.

16. Activate the steering system.

⇨ The steering system will be reactivated.

17. Your job now mainly consists of regulating the speed and to stop when required.

Deactivating the automatic steering

When the automatic steering is deactivated, the NAV-900 is switched on but does not steer the vehicle.

Deactivate the automatic steering in the following situations:

• Before you turn around.

• Before you switch off the steering ECU, the display or the vehicle.

• If you want to take control of the vehicle.

Procedure

To deactivate the automatic steering:

1. **Possibility 1:** On the TRACK-Leader work screen, tap the icon.
   Possibility 2: Turn the steering wheel. When you turn the steering wheel sharply, or if you stop its turning, the installed sensor recognises that you are taking control. The automatic steering will be disabled.
   Possibility 3: For TRACK-Leader AUTO Iso with some vehicle models, there is also an activation key in the vehicle or activate through headland management. Please observe the operating instructions for the vehicle.

⇨ In the counter area of the work screen, you see that the icon is replaced by the following: .

Fine adjustment of the steering system

Because the steering system was already calibrated, it works smoothly in almost all situations. However, it may be necessary to adjust the values under special circumstances. For example, for special field conditions, implements, forward speed etc.

Ruling out causes

When the system is not steering satisfactorily:

1. Check the quality of the GNSS signal.

2. Ensure that the receiver is installed at its intended position.

3. Ensure that you have selected the correct vehicle profile in the NAV-900.

Fine adjustment

When you have ruled out other causes, you can perform fine adjustment on the steering system.

After calibration, the optimum value for the selected vehicle without implement appears for each parameter. You can adjust the values for the current field conditions and for the mounted implement by increasing or reducing the parameters incrementally.

NOTICE   **Sudden strong deviation of the vehicle**

All of the parameter changes are immediately adopted without rebooting.

If you increase the value for a parameter too much, the vehicle might react by steering strongly to one side.

   ◦ Increase the values in small increments.

Procedure

To see the parameters:

1. Open the TRACK-Leader application.

2. Ensure that the proper Vehicle profile [▶ 75] is activated for the vehicle.

3. Start a new navigation.

4. On the work screen, tap ⚙ .

Classic line acquisition

If the parameter is activated, only the "Line acquisition" and "Steering response" parameters appear by default.

If the parameter is deactivated, OnSwath mode is activated at the same time. The "Line acquisition", "Steering angle", "Slew rate", "Steering angle", "Approch angle" and "Steering response" parameters appear.

This parameter is only visible if the "Autopilot" or "CAN Based Autopilot" license is activated. If you are using the EZ-Pilot Pro license, OnSwath mode is always activated automatically. The parameter is then also not visible.

Line Acquisition

With this parameter, you can determine how fast the system steers in the direction of a newly created guidance line.

The goal of this setting must be that the vehicle takes the shortest path without having to steer sharply or suddenly.

Steering angle

This parameter specifies the maximum steering angle that can be used for line acquisition.

The respective minimum and maximum values depend on the vehicle profile.´

Slew rate

This parameter specifies the speed at which the steering mechanism is moved.

The respective minimum and maximum values depend on the vehicle profile.´

Approach angle

This parameter specifies the angle to the guidance line from which the steering can be activated.

The respective minimum and maximum values depend on the license used in the NAV-900.

Steering proportional gain

With this parameter you can influence the aggressiveness of the steering behaviour of the steering wheel motor.

This parameter is only relevant if you are using the EZ-Pilot Pro steering wheel motor.

Storage

Overview

Every time you work on a field, a large amount of data is produced. We call it "Field data" here. The field data must be saved so you can use it in the future.

Data type

Field data consists of the following information:

- Field boundaries
- Reference point
- Guidance lines
- Applied areas
- Marked obstacles

Formats

The display saves the field data in two formats simultaneously:

- ngstore format - This is the display's internal data format. It is used as a standard and contains all of the field data.
  - The files are located in the "ngstore" folder.
- shp format or kml format - These are standardised formats that are used by many GIS programs.
  - The files are located in the "SHP" folder.
  - To find out how to open files in shp format, read the ISOBUS-TC section in the display operating instructions.

Memory device

The ngstore data is saved on the SD card. To transfer it to the USB memory device, you have to use the Import/export function [▶ 68]. During export, the shp and kml files are saved to the "SHP" folder on the USB memory device.

"Storage" screen
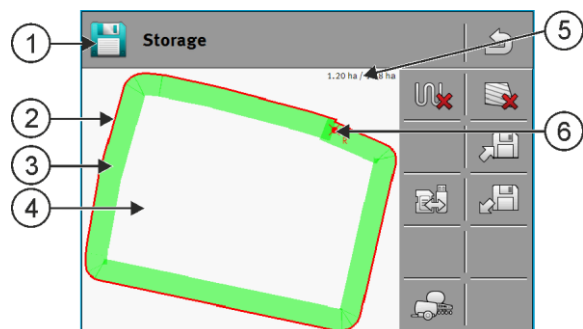
Information on the "Storage" screen

①	Name of the loaded recording	④	Unapplied area
②	Field boundary	⑤	Counters: Unapplied areas / total area
③	Tracks Areas that have been worked.	⑥	Reference point

Function icon	Function
	Deletes the tracks in the opened recording.
	Deletes the opened recording.
	Saves the opened recording in the "ngstore" folder. Storage location: SD card. If a USB memory device is inserted when saving the recording, the field data will also be saved as shape files in the SHP folder.
	Loads a stored recording from the "ngstore" folder. Storage location: SD card
	Synchronises data between the USB memory device and the SD card.
	If the connected ISOBUS ECU works with several working widths, this button serves to switch the display between the work results of both working widths.

Function icons on the "Storage" screen

Saving field data

Procedure

1. On the start screen of the TRACK-Leader application, tap on "Storage".

2. Insert an USB memory device into the display. The files will be saved directly to the USB memory device.

3. Tap .

   ⇨ The keyboard appears.

4. Enter the name under which the field data should be saved.

5. - Confirm.

   ⇨ The data is saved on the SD card.

   ⇨ The field will be deleted from the Overview.

6. If you want to continue to treat the field directly, you will need to load this.

shp files

When saving, the loaded field will be converted to shp format. The files are saved in the "**SHP**" folder on the USB memory device.

When converting into shp format, files with field data are created. The display inserts a corresponding name addition:

- _boundary = File with the field boundary.

- _obstacles = File with the obstacle points.

- _workareas = File with the applied areas. The applied areas can only be converted into shp format. However, they cannot be opened again.

- _condensedworkareas = In this file, the total applied area is divided into zones. If the display was working with an ISOBUS ECU, the used target rate is saved for each zone. This type of data can be used to create an as applied map with the GIS program. This, in turn, can be converted into a prescription map.

- _guidancepath = File with the guidance lines.

- _headland = Area of the headland.

Loading field data

Procedure

1. On the start screen of the TRACK-Leader application, tap on "Storage".

2. Tap .

   ⇨ The "Load record" screen appears.

   ⇨ You will see a list with recordings that you have saved in the "ngstore" folder. Under each name, you will see the distance from your current position.

3. Tap on to sort the files alphabetically, or on to sort them according to the distance from your position.

   ⇨ The list is sorted.

4. Tap on the name of the recording that you want to load.

The loaded field contains all of the field data that was created during the previous task. If you want to continue the task, you can leave all data as is. However, you can also delete some of the displayed data: for example, the applied areas, the field boundary or the guidance lines.

You can find out how to delete field data here:

- Tracks [▶ 69];
- Field boundary [▶ 29];
- Guidance lines [▶ 39]

Synchronising ngstore data

To exchange data saved with the TRACK-Leader between the SD card and a PC or another Müller-Elektronik touch display, you can synchronise the storage media.

During synchronisation, the contents of the ngstore database on both storage media are compared and synchronised. After synchronisation, the data on both storage media is up-to-date.

NOTICE   **Data formats on touch and non-touch displays are not compatible**

You can only exchange files from the "ngstore" folder between displays of the same type.

Procedure

To synchronise the storage media:

1. On the start screen of the TRACK-Leader application, tap on "Storage".

2. Tap .

⇨ The following message appears: "Should the data be synchronised between the USB memory device and the SD card? This can take up to several minutes."

3. Confirm to synchronise the storage media.

Discarding field data

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

You must delete the field data after work is completed to be able to work on a new field.

NOTICE   **Data loss**

Once field data is discarded, it cannot be retrieved.

◦ Save all important field data before discarding this.

Procedure

1. On the start screen of the TRACK-Leader application, tap on "Storage".

⇨ If no field is loaded, you do not need to delete anything.

⇨ If a field is loaded, check if you want to delete the entire field or only the application marks.

2. Tap if you want to delete the green application marks, in order to work on this field again with the field boundary.

⇨ The application marks will be discarded and the field boundary is maintained.

3. Tap if you want to discard the recording in order to work on a new field.

⇨ The field data for the currently loaded field will be discarded.

8

Configuration

Overview

This section clarifies all settings which you have to configure.

All configuration parameters can be found in the "Settings" screen. They are grouped as follows:

- General - Parameters that affect all of the TRACK-Leader modules.
- TRACK-Leader - Parameters that are used to configure the parallel driving and for the light bar. The parameters are therefore required for all modules.
- TRACK-Leader AUTO - Parameters for TRACK-Leader AUTO automatic steering
- Demo - A demonstration video.

The number of appearing parameter groups depends on which module was activated in the "General" menu.

Module	Section
TRACK-Leader	Configuring "General" settings [▶ 72]
	Configuring TRACK-Leader [▶ 73]
TRACK-Leader AUTO	Configuring "General" settings [▶ 72]
	Configuring TRACK-Leader [▶ 73]
	Configuring TRACK-Leader AUTO [▶ 75]

You have to configure the following

Icon	Meaning
☑	Yes
☐	No

Icon for the configuration

Procedure

This is how you open the configuration screens:

1. ⬤ - Open the TRACK-Leader application.
2. Tap "Settings".
   ⇨ The "Settings" screen appears.
3. Tap the buttons to configure the application.

Configuring "General" settings

In this menu you can set the display on the screen and activate some functions.

TRACK-Leader AUTO

With this parameter, you can activate and deactivate the support of all variations of the TRACK-Leader AUTO steering system.

Direction detection

This parameter activates or deactivates the automatic detection of the driving direction. See: Detecting the direction [▶ 20].

In the following cases, the parameter is greyed-out and cannot be changed:

- If a steering system is connected.

- When a direction signal is received from the ISOBUS tractor.

Selective marking

With this parameter, you can define whether the untreated area should be shown in green on the screen and marked as worked when one of the inner sections is deactivated. This function is only applicable in cases where the outer sections are applying while the inner sections are deactivated. If the sections are switched inwards from the outermost sections, this parameter is not taken into account. This makes the display of section control on wedge-shaped areas realistic.
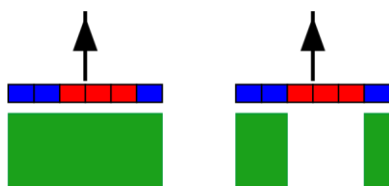
Left: the area behind the deactivated sections is marked in green.

Possible values:

- "Yes"

  If one of the inner sections is deactivated, the area behind it is not marked in green.

- "No"

  The area behind inner sections is marked in green regardless of whether they are applying or not.

  Use this function e.g. for crop protection in crops planted on ridges. In this way, the field sprayer is not needlessly activated when turning at the headlands.

Acoustic warnings

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

Possible values:

- "Yes"
- "No"

Show grid

Displays a grid on the navigation screen.

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

Switch sections off at a standstill

Activate this parameter if the sections should be automatically switched off if a speed of 0.3 km/h or less is reached.

Configuring TRACK-Leader

Sensitivity

Sets the sensitivity of the lightbar.

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

- Default value: 30 cm

This value means a sensitivity of 15 cm to the left and 15 cm to the right.

Preview

This parameter determines the number of meter in front of the vehicle at which the preview display of the screen lightbar will calculate the future position of the vehicle.

- Default value: 8 m

Line acquisition angle

With this parameter, you can determine the angle up to which the system activates a guidance line. If the angle between the vehicle and the guidance line is smaller than the set value, the guidance line will be activated. If the angle is larger, the guidance line will be ignored.
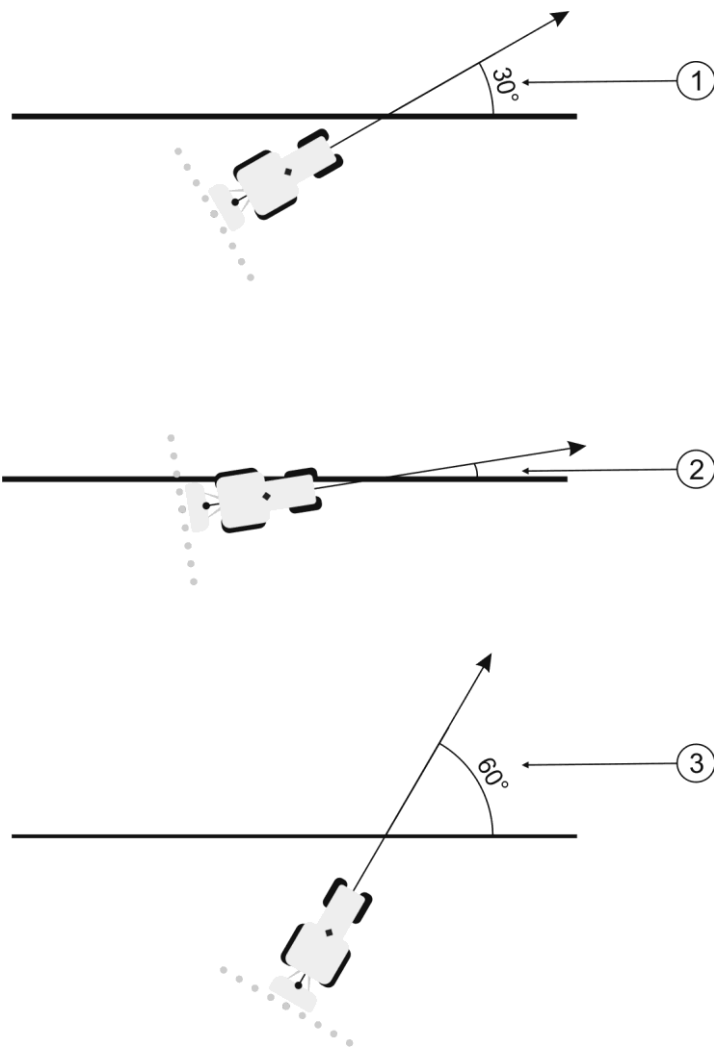
Display response for a set line acquisition angle of 30°

①	Angle between the vehicle and the guidance line = 30°	③	Angle between the vehicle and the guidance line = 60°
	The guidance line will be activated.		The guidance line will not be activated.
②	Angle between the vehicle and the guidance line smaller than 30°		
	The guidance line will be activated.		

- Default value: 30 degrees

- Value for TRACK-Leader AUTO: 65 degrees
  If you use TRACK-Leader AUTO with a NAV-900, the line acquisition angle also depends on the license used.

Configuring TRACK-Leader AUTO

In this menu you can configure parameters for automatic steering.

The parameters you can configure depend on which GNSS receiver you use for auto steering.

In this menu you can configure some basic settings. You can configure further parameters after starting a navigation.

Vehicle profile

The vehicle profiles are configured using a tablet PC in the steering ECU. At this point, you must select the appropriate profile for the vehicle.

Via the function icon you can transfer the corresponding profile from the receiver to the display. The vehicle profile is then available both on the receiver and on the SD card in the display.

If you have inserted a USB memory device, you can also copy profiles from the SD card to the USB memory device or from the USB memory device to the SD card.

If you want to copy a vehicle profile from the USB memory device to the SD card, follow these instructions:

- You can only use vehicle profiles that are adapted for the NAV-900. The profiles must have the file extension .vdb or .cfg.
- You can also transmit several vehicle profiles simultaneously.

Procedure

Proceed as follows if you want to copy vehicle profiles from the USB memory device to the SD card

1. On the USB memory device, create a folder named "NAV900-Profiles".
2. Copy the desired vehicle profiles into the created folder.
3. Insert the USB memory device into the display.
4. - Tap to open the configuration menu for TRACK leader AUTO.
5. - Copy the data.

⇨ You can now select the desired profile in the "Vehicle profile" parameter.

Firmware version receiver

Firmware version of the GNSS receiver.

Error messages

Overview

Error message text	Possible cause	How to fix the problem
Caution! The storage could not be initialized. If the problem still persists after a restart, please contact the service.	The database could not be created on the storage medium.	Restart the display.
Active profile cannot be removed!	An attempt was made to delete the currently selected machine profile.	Select another machine profile and then delete the desired machine profile.
Could not find DGPS configuration file!	The internal file containing the DGPS settings could not be found.	Contact our Service team in order to reinstall the software.
Test phase is expired. Please contact your dealer.	Test phase is expired.	Request a license. Unlock the software.
Error!		Contact Customer service.
GPS signal has been lost!	The connection to the GPS receiver has been interrupted. The position can no longer be determined.	Check and re-connect the cable connections to the GPS receiver.
GPS signal too weak!	The GPS signal quality is too weak, most likely due to shadowing.	Check the mounting of the GPS receiver and your current position. The receiver must be in open view to the sky.
No DGPS available!	No DGPS is available due to receiver shadowing.	Check the mounting of the GPS receiver and your current position. The receiver must be in open view to the sky.
	No DGPS is available due to a failure of the correction data service, e.g. EGNOS.	Check the general availability of the service. For EGNOS/WAAS, check and set the proper correction satellites.
Could not read DGPS	The serial connection to the GPS	Check and re-connect the cable

Error message text	Possible cause	How to fix the problem
configuration from GPS receiver!	receiver has been interrupted.	connections to the GPS receiver.
Could not read e-Dif configuration from GPS receiver!	The serial connection to the GPS receiver has been interrupted.	Check and re-connect the cable connections to the GPS receiver.
Saving failed!	The storage medium was removed before or during saving.	Re-insert the storage medium and re-start the save process.
	Writing is not allowed on the storage medium.	Disable write protection on the storage medium.
	The storage medium is full or damaged.	Delete unnecessary data from the storage medium and try again.
Invalid status!		Contact Customer service.
No sections have been recognized!	No sections are configured in the ISOBUS ECU or the connected ISOBUS ECU does not support SECTION-Control.	If possible, configure the sections on the ECU. If the ECU does not support SECTION-Control, you cannot use it.
The implement does not have a working width!	The working width or geometry have not been configured in the ISOBUS ECU.	Configure the ISOBUS ECU. Correctly set the working width in the ECU; contact the implement manufacturer.
No task started!	The ISOBUS-TC operating mode is configured to "Extended". Therefore, TRACK-Leader expects a task. No task was started in ISOBUS-TC.	Start a task in ISOBUS-TC or set the operating mode to "Standard" in ISOBUS-TC.
No valid device data recognized!	The working width or geometry have not been configured in the ISOBUS ECU.	Configure the ISOBUS ECU.
RTK signal lost!	No RTK signal is available due to signal shadowings.	The GPS receiver and base station must be in open view to the sky.

Error message text	Possible cause	How to fix the problem
	No mobile network reception.	
	You are too far away from the base station (or from a different signal source).	
Device allocation is not set.	The connection between the Tractor-ECU and ISOBUS-TC has been deactivated.	Activate the connection between the Tractor-ECU and ISOBUS-TC in the Tractor-ECU application.
The device data is still loading.	If this message appears for a long time, the display is connected to a ECU that is not responding.	It is possible that you cannot use SECTION-Control with this ECU, because the ECU does not support SECTION-Control. Connect a different ECU to the display.
No connected ECU. Connect the ECU or select a machine profile in the Virtual ECU.	TRACK-Leader has not received any information through the connected ECU or there is no connected ECU.	
Main memory is very low. Suspend your work and restart the display.	Too much working data (e.g. of applied areas) is stored in the main memory.	Restart the display.