CROPLANDS

USER MANUAL
ISOBUS FOR WEED-IT QUADRO

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FOR WEED-IT DISTRIBUTORS V1.16

WEED·IT
precision spraying

BT-OMWEED-ISO-B

Table of contents

1.   Introduction

This document provides information on the user interface of WEED-IT Quadro systems with ISOBUS. Instead of the WEED-IT Quadro user console, your own ISOBUS compatible terminal/display in the cabin can be used to operate the WEED-IT. The user interface is very similar to the WEED-IT Quadro user console and supports touch screen functionalities. The ISOBUS application consists of a Universal Terminal (UT) and Task Controller (TC). The UT enables the operation of the WEED-IT via the terminal in the cab of the tractor or Self-Propelled Sprayer (SP). Task Control (TC) is the function of ISOBUS where data is shared between the terminal in the cab and the WEED-IT to automate tasks, like section control and rate logging.

This 'ISOBUS user manual' is a compact manual in which only the functionalities and control of the WEED-IT via ISOBUS are explained. Please refer to the 'WEED-IT Quadro User Manual' for a detailed description about all parts of the WEED-IT system!

2.   Requirements

The minimum firmware requirements to be able to use the WEED-IT in combination with ISOBUS are stated in the following table:

Device	Firmware version	Date version
BodoQuadro detection sensor	V3.46	07-10-2021
GreedoX user console	V4.16	07-10-2021
Orbus power converter	V1.06	07-10-2021

The ISOBUS firmware works also very well with the following firmware versions:

Device	Firmware version	Date version
BodoQuadro detection sensor	V3.50	06-12-2022
GreedoX user console	V4.20	06-12-2022
Orbus power converter	V1.06	07-10-2021

Updating the devices to the described firmware versions need to be done using special updating tools. Please refer to the 'WEED-IT Quadro Update Manual' for more information about the tools and information on the updates!

Besides the firmware, new hardware components are required to enable ISOBUS compatibility with WEED-IT.

Partnumber	Description
Wi47006000	EPEC 3610 Control Unit
Wi47002286	OR10.1, External power switch kit, incl. relay
Wi47006100	IB1, ISOBUS in-cab cable, standard
OR	
Wi47006125	IB2, ISOBUS out-cab cable, standard

Your WEED-IT distributor or dealer should have installed the required firmware and hardware to enable the ISOBUS functionality.

3. Universal Terminal

All user menu functionalities of the WEED-IT can be controlled via the *Universal Terminal* (UT). The UT needs to be activated on your connected terminal. It differs between terminal brands how the UT is implemented. Some brands made the option to split the screen on the terminal in half for the UT and half for the standard interface.

To open the UT, click on the UT button on the ISO terminal. The design and position of this button is different between brands. Examples:

 or

4. Switching the WEED-IT On / Off via ISOBUS

4.1 Start the WEED-IT via ISOBUS

The WEED-IT can be switched on using the Universal Terminal. By clicking on the *START* button, the ECU (Electronic Control Unit) will start sending a 12V power signal to the I/O relay in the Power Converter. On his turn, the relay switches on the power to the power converter and thereby the complete WEED-IT system starts.

It takes approximately 10 seconds before the WEED-IT console is started. During this time, the WEED-IT ECU and the WEED-IT console exchange data, like the number of connected sensors, the selected spray mode and nozzle, the selected preset and the selected margin.

After the data is exchanged, the main menu of ISOBUS opens:
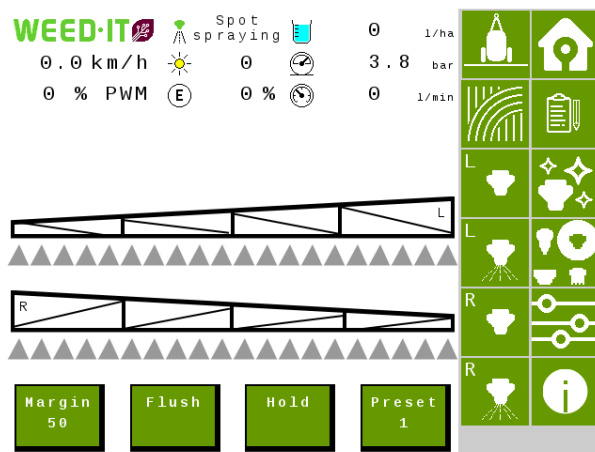
4.2 Shut down the WEED-IT via ISOBUS

To switch the WEED-IT off, open the *Information* menu by pressing the softkey along the side of the screen and then press the *Shut down* button to switch the WEED-IT off. The *Shut down* button stops the 12V power signal between the ECU and the I/O relay and thereby the WEED-IT turns off.
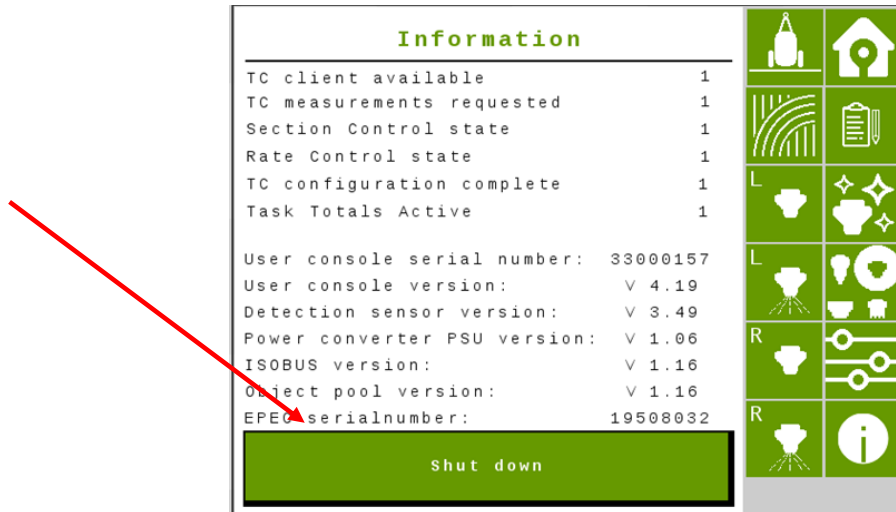
5. Softkeys

Softkeys are on-screen buttons which are visible at the sides of the UT by default, but the positioning can be configured in the settings of the terminal. They are divided in two groups: one column for the navigation between menu's and one column for the operation of the TC. The softkeys are visible in all menu's, except for the *Start menu*.

The image below shows the *main* menu on a terminal that uses a layout with two columns of softkeys on the right-hand side on the display.
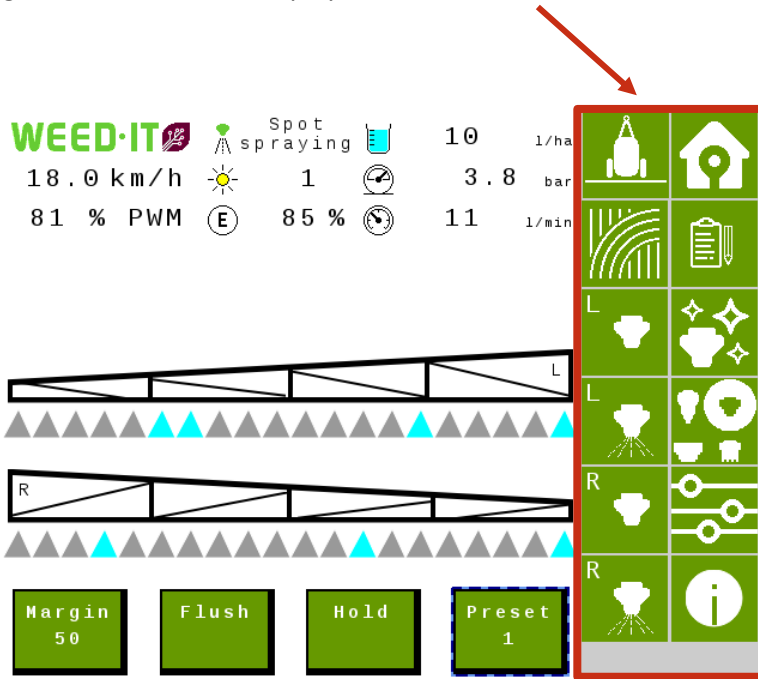
5.1 Navigation softkeys

The first group of softkeys is used to navigate through the different menu's.

	Softkey A1	Navigate to the *main* menu (similar to the main menu of the WEED-IT console).
	Softkey A2	Navigate to the *Field data* menu (similar to menu 103 of the WEED-IT console).
	Softkey A3	Navigate to the *Nozzle cleaning* menu (similar to menu 102 of the WEED-IT console).
	Softkey A4	Navigate to the *Nozzle selection* menu (similar to menu 104 of the WEED-IT console).
	Softkey A5	Navigate to the *Settings* menu (similar to menu's 150-153 of the WEED-IT console).
	Softkey A6	Navigate to the *Information* menu.

5.2 Section control softkeys

The second group of softkeys is used to operate the section control.

	Softkey B1	Navigate to the *Dimensions* menu.
	Softkey B2	Operate the *master switch* of the section control.
	Softkey B3	Disable the leftmost enabled section.
	Softkey B4	Press: Enable the rightmost disabled section, starting from the left-hand side. Press and hold: Enable all sections that were disabled on the left-hand side.
	Softkey B5	Disable the rightmost enabled section.
	Softkey B6	Press: Enable the leftmost disabled section, starting from the right-hand side. Press and hold: Enable all sections that were disabled from the right-hand side.

If the *master switch* is OFF (red), all sections (read: solenoids) remain closed, no matter the circumstances. Sections can manually be disabled/enabled by **softkey B3 – B6**, but the sections remain closed.

If the *master switch* is ON (green), sections can automatically be opened/closed by the Task Controller of the tractor / SP (based on the GPS location of the machine) or by manually disabling/enabling sections with **softkey B3 – B6**. WEED-IT ISOBUS has no influence on the task controller of the tractor/SP to determine which sections should be open and which should be closed. If there is no Task Controller on the tractor/SP, only the manual section control and master switch on the UT have influence on the section control towards the WEED-IT.
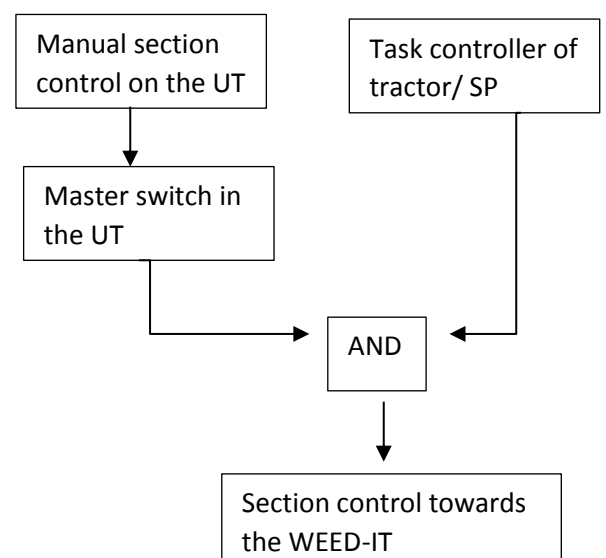
6. Menu's

6.1   Main menu

If the WEED-IT is started on the ISOBUS application on the terminal of the tractor/SP, the following screen will be visible:
(the screen may look different depending on your settings).

Each cone on the main screen represents one detection sensor. There are different colours that show the status of each detection sensor, spraying, enabled, disabled, etc.
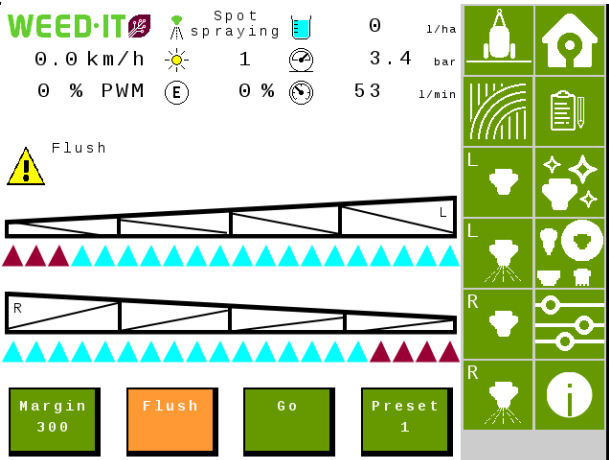
The WEED-IT ISOBUS can handle up to <u>48 detection sensors</u> and 40 sections. When there are more than 40 detection sensors connected to the system, the outer sensor will not have a cone on the main screen. Therefore the old user console of the WEED-IT system needs to be visible in the cab for the user, so the status of those sensors can be monitored. The outer detection sensors will be controlled by automatic section control from the terminal and manual section control from the UT, as described above with softkeys B3 to B6.
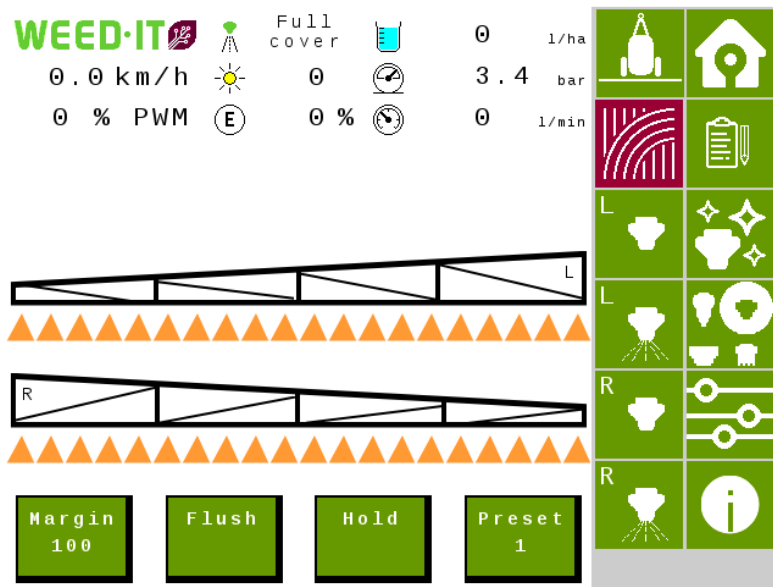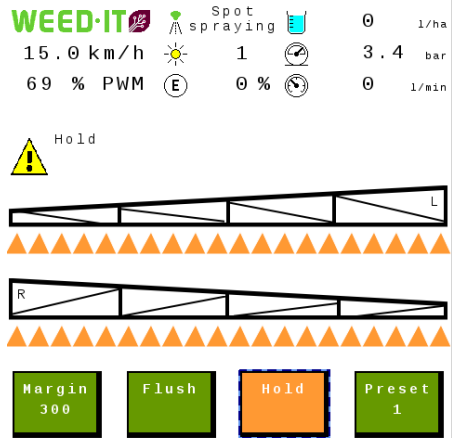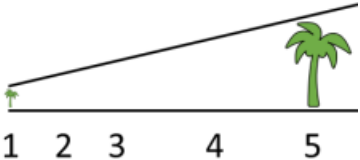
6.1.1   Main menu options

The main menu offers the options for regular use of the WEED-IT system.

`Margin`
`100`
 	
`Margin`
`7.8"`
	Margin: WEED-IT uses a certain margin when spraying a target. This margin varies from 200 to 300 mm and specifies the distance <u>before</u> and <u>after</u> the weed to be sprayed.
	
	One of four predefined margins can be selected while driving the vehicle, by pressing the 'Margin' button. The current margin in mm is displayed in the button. The margin-setting is often used to compensate for the spray displacement caused by heavy winds, or uneven terrain / strong variation in terrain.
	
	By default, the margin presets are defined as follows:
	
	1. 200 mm
	2. 235 mm
	3. 270 mm
	4. 300 mm
	
	When your *distance unit* is set to **miles** in the settings menu, the margin in the main menu will be shown in inches. The margin in inches will be shown with one decimal and with the inches sign behind it.

`Flush`	**Flush:** Use this button to flush the system. During flushing, all nozzles are opened simultaneously. Use this option for cleaning the system, or for checking that all nozzles are functioning. The flush button will turn orange when it is activated. The sections that are manually disabled (red cones) are not flushing. ⚠️ The *master switch* (softkey B2) should be turned ON (green) to use the flush function. The flush function overrules the section control by the terminal. This means that even though the terminal turned sections off, the WEED-IT will still spray. The only way to turn sections off is by using the softkeys, then the cones will turn red. This function is helpful if you want to spray extra on a part of the field where you already sprayed before, or if you temporary want to give an extra burst of 100% open solenoids.

Hold	**Hold**: Use this button to temporarily put the machine on hold, for example when you cross a street, or when turning on the headlands. The hold button turns orange when it is activated. The text in the button will change from 'hold' to 'go'. When using the hold button on the user console of the WEED-IT system, the hold button on the VT will also change colour. ⚠️ When the WEED-IT system is put in hold via the user console, it can only go in 'go -mode' by pressing the hold button on the user console.	
Preset 1	**Sensitivity**: The WEED-IT will automatically adjust to changes in circumstances, e.g. the size of the plants, the color of the soil, ambient light and the weather situation (sun, rain, fog, etc.). You may have to manually adjust the sensitivity of the sensors in some circumstances. Several pre-programmed sensitivity presets are available for that purpose. Presets are numbered; preset number 1 is the most sensitive: 	

Main screen content:

i	Please note that Main screen content depends on the number of connected detection sensors and your settings. See chapter 6.5 for all your settings.

WEED·IT 18.0 km/h	The current **Speed** of the vehicle. Depending on settings, the speed is shown in: • m/s (meters per second) • km/h (kilometers per hour) • mph (miles per hour)

`81 % PWM`	The current **PWM%** shows the average PWM% currently applied by the system. The PWM% is not shown when the mode is 'Spot plain'.
	The current **Spray mode** of the system. Possible modes are: • Spot plain (Spot spraying without PWM) • Spot spraying (Spot spraying using PWM to control the rate) • Dual mode (A base rate and targeting weeds with a higher rate) • Full cover (Broadacre spraying using PWM to control the rate) • GoG Plain* (Green on Green spraying without PWM) • GoG Spraying* (Green on Green spraying using PWM to control the rate) * Only available on selected systems. Ask your dealer for more information!
	Pressure: This number shows the current pressure of the liquid in psi or bar. The pressure should be approximately 3 bar (43.5 psi). A warning appears if the pressure is too high or too low.
	Savings: This number shows the savings percentage: the rate (l/ha) that was sprayed compared to the entered rate (l/ha) in the nozzle selection menu.
	Usage: This number shows the current application rate in l/ha or ga/ac.
	Flow: The current liquid flow in litres per minute.
	Sun: The strength of the sunlight on a scale of 1 to 10. Extremely bright sunshine (9-10) causes noise and reduces system accuracy.

Sensors	All **Sensors** are shown in the centre of the display, each cone represents one sensor. * Example: 40 sensors, 20 on each side: • Orange: disabled by the master switch on the VT or by the terminal (overlap control or outside boundaries). • Gray: enabled, but not spraying • Cyan: enabled and spraying (The cone turns cyan if one of the four nozzles of that sensor is spraying) Red: manually disabled by the driver (using the softkeys, see chapter 5.2) ⚠ * The maximum number of sensors on the main screen = 40. When more sensors are connected, the outer sensors will not be shown on the main screen, but the section control from the terminal and the manual section control will still work. Check the user console of WEED-IT for more information of those outer sensors. The maximum number of sensors that can be connected to the WEED-IT system is 48!
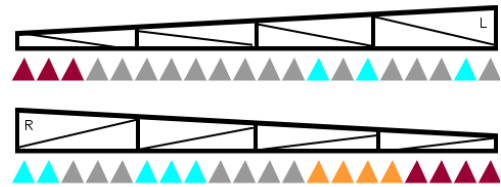
Solenoid status	When a solenoid of the WEED-IT system is failing, either because the connection is broken or because of a PSU error, a red cross is shown under the corresponding sensor. Example: sensor 4 on the left side is missing a solenoid and sensor 14 on the right side has an nozzle PSU error: The red cross only disappears when the solenoid is fixed and the system is restarted.
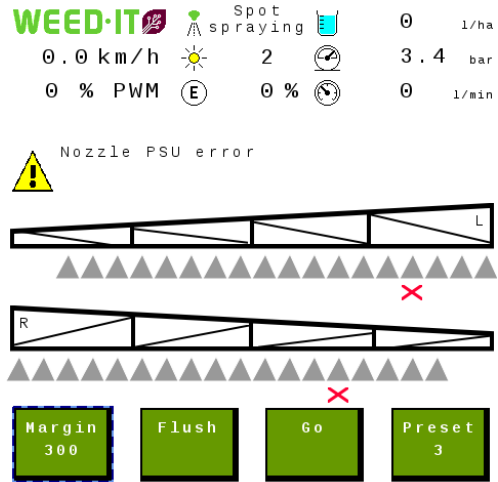
6.2   Field data menu

The field data menu is like menu 103 of the WEED-IT user console. It shows usage totals of several parameters. The preferred units can be set in the *Settings* menu. When the option 'flow meter' is disabled in the settings menu, the liquid, usage and savings are not shown in this menu. By pressing the *New job* button, and pressing *Yes* all values are reset to zero.

Field data

Time	10.0	hrs
Distance	28.34	km
Area	634.50	ha
Liquid	4873	L
Usage	8	L/ha
Savings	83	%

New job

Field data

| Time | 1.1 | hrs |
| Distance | 18.90 | km |

Current job data will be cleared. Continue?

Yes   No

New job

6.3. Nozzle cleaning menu

Only use the Nozzle cleaning functions when the vehicle is **not** moving! When the machine starts moving during the nozzle cleaning, the cleaning action is automatically stopped.

The *master switch* (softkey B2) must be **ON** to use the nozzle cleaning functions!

Use the Nozzle cleaning menu to:

- flush nozzles
- test detection
- test solenoid valves
- check nozzles

Nozzle cleaning

Select the desired cleaning function. Use the second button to test the sensors, and use a green leaf to activate a nozzle.
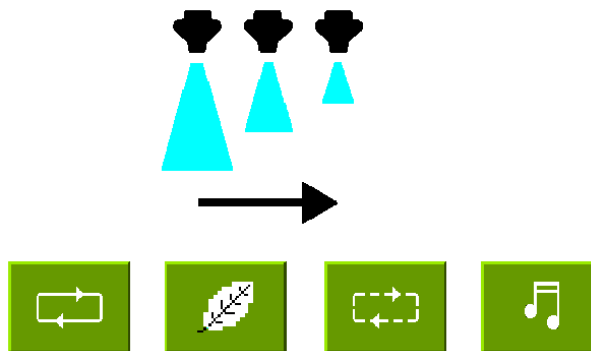
	Press the **Chase** button to activate nozzles one by one with a short burst.
	Press the **Detection** button to test nozzles. Holding a leaf under a sensor should activate the corresponding nozzle.
	Press the **Sequencing** button to activate nozzles one by one with a long burst.
	Press the **Melody** button to activate nozzle cleaning at a variety of frequencies, applied by PWM control.

If the spray mode is *Spot Plain* or *GoG Plain*, all the four buttons will activate the **flush** function, as PWM functionality is not available in these spray modes.

6.4   Nozzle selection menu

The *Nozzle selection* menu is similar to menu 104 of the user console, but the usage is somewhat different. When you enter the menu, the currently set parameters are displayed. The process of setting new parameters has changed, as it is split in two parts.

6.4.1   Set the preferred mode and nozzle

Select the preferred *Mode* and *Nozzle* by pressing the arrow buttons until your mode and nozzle are reached. Then press the button *Confirm nozzle settings,* the WEED-IT will now activate this mode and nozzle and restarts itself. Wait for approximately 10 seconds to start the second part.
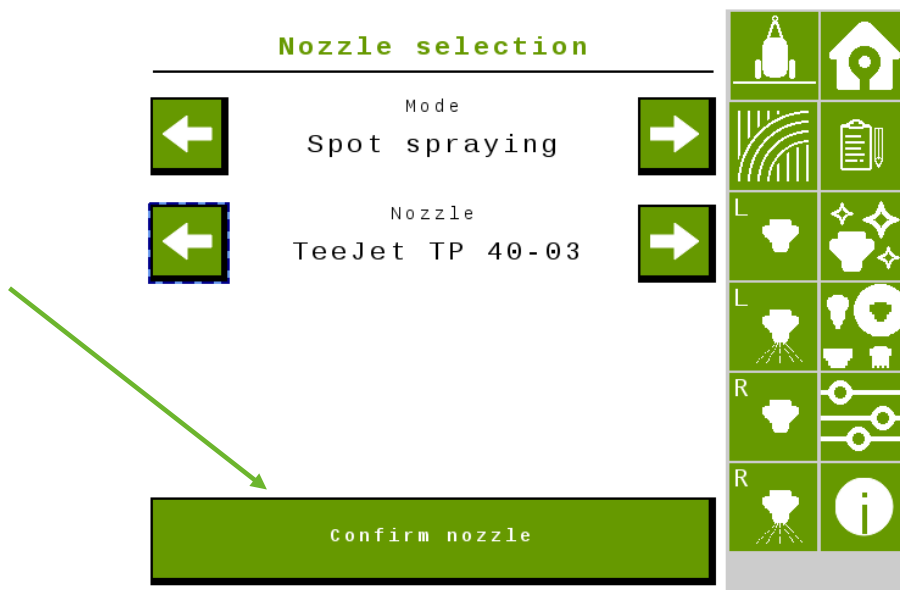
6.4.2   Set the preferred rate, pressure and ideal speed

Now you can set your preferred rate, pressure, and speed. You can change those numbers by pressing on the number: an input window will open (this layout differs per terminal brand). When finished, press the button *Confirm spray settings* and wait until the VT shows that the process is completed. The WEED-IT is ready to spray!
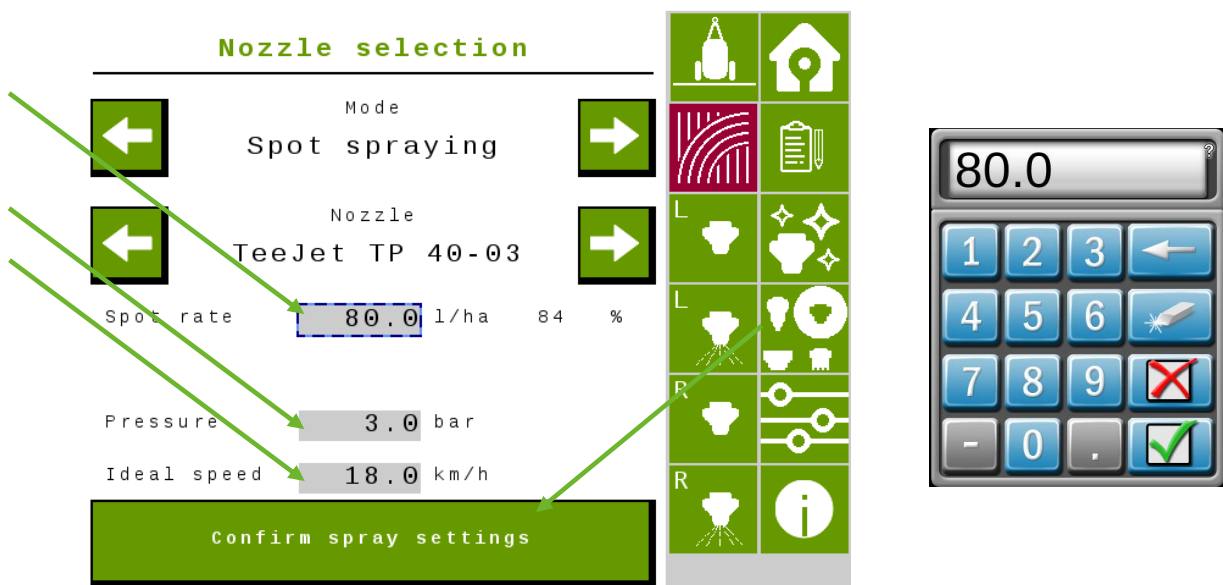
6.5   Settings menu

The *Settings* menu comprises menu's 150-153 of the console. When a specific unit is changed in this menu, it will adjust this unit throughout all other menu's.

Flow meter: This setting only has effect when the mode of the WEED-IT is set to full cover spraying or dual spraying. When spraying with spot plain or spot spraying, the rate reported to the terminal is the set spot rate in the nozzle selection menu.

When the mode is Full cover or Dual and the option 'flow meter' is enabled, the rate from the flow meter is reported directly to the terminal. When the option 'flow meter' is disabled, the selected cover rate from the nozzle selection menu is reported to the terminal.

Mapping: With this setting the user can choose between making a weed-map or a coverage map. When the option 'as detected' is selected, the sections where a weed was detected are reported as true to the terminal and will be drawn on the screen. When the option 'as covered' is selected, the places where a section has been enabled are reported back to the terminal and will be drawn on the screen. With the latter option, the reported value is not depending on whether the WEED-IT detected a weed on that place or not.

Auxiliary output: This setting controls a digital output of 10V (max 3 Amp) on pin 9. The returning wire should be connected to pin 8. The auxiliary output can be used to control for example an electric valve, lamp, or relay.
Note: the value of this output is independent of the WEED-IT. This means that ones enabled in this menu, the output will stay on while the WEED-IT can be off in the meantime.

		The ISOBUS UT of WEED-IT is only available in English.

6.6 Information menu

The *Information* menu shows in the top of the screen the status of the Task Control. You can see per line if the status is OK: 1 or not connected / not OK: 0. (TC client should be > 0).

In the bottom part of the screen, the serial numbers of the user console and Control Unit, as well as the firmware versions of the user console, detection sensor, power converter, and Control Unit are shown.

In this menu you can also shut the WEED-IT down, by pressing the button: 'Shut down'.

6.7 Dimensions

The *Dimensions* menu is used to configure the implement geometry and controller setup for the Task Controller, if this is supported by the terminal. The Control Unit contains default values, which are loaded when the implement is connected for the first time. The dimensions should be adjusted to suit your WEED-IT system. Once these are correctly set, there is no need to adjust them anymore, unless the geometry changes. Not even if you attach the sprayer to a different tractor, because these settings belong to the geometry of the implement. For more details, refer to the ISOBUS installation manual.

The dimensions menu consists of 2 pages. At page 1 the implement dimensions, like the rear offset axle and rear offset boom can be entered. At page 2, the section dimensions, like the rear offset section and disabled solenoids can be entered.

> **i** After entering the correct dimensions of your connected machine, press **'Confirm dimensions'.** The EPEC control unit will restart and the right dimensions of your machine are communicated with the Task Controller of the tractor/SP.

6.7.1 Implement dimensions

Implement dimensions

Rear offset axle	5000	mm
Right offset axle	0	mm
Rear offset boom	1000	mm
Right offset boom	0	mm
On latency	100	ms
Off latency	100	ms
Implement	Self Propelled	
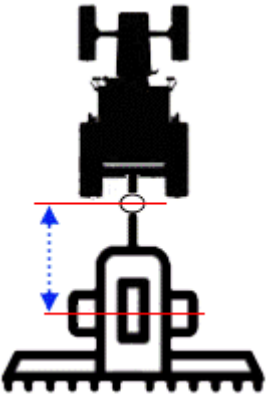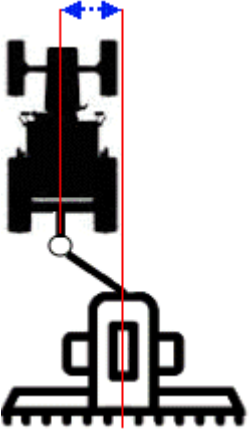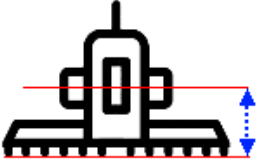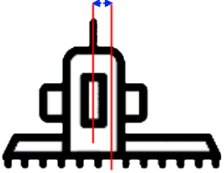
Page 1/2

Confirm dimensions

	The **rear offset axle** is the in-line distance (driving direction) between the connection point (drawbar, ball, clevis) and the axle of the sprayer. In case of a self-propelled sprayer or 3 point linkage sprayer, this distance will not be used. The range for the rear offset axle is: 0 to 15m.
	The **right offset axle** is the lateral (sideways) distance between the center of the connection point (drawbar, ball, clevis) and the center of the sprayer. In case of a self-propelled sprayer or 3 point linkage sprayer, this distance will not be used. The range for the right offset axle is: -5m to +5m.
	The **rear offset boom** is the distance between the axle of the sprayer and the center of the spray boom. In case of a self-propelled sprayer, the **rear offset boom** is the distance between the rear-axle of the sprayer and the center of the spray boom. In case of a 3 point linkage sprayer, the **rear offset boom** is the distance between the linkage and the spray boom. The range for the rear offset boom is: -10m to +10m.
	The **right offset boom** is the lateral distance between the center of the sprayer and the center of the boom. This holds for both a self-propelled, 3 point linkage and pull type sprayer. The range for the right offset boom is: -5m to +5m.
	The **on latency** is the time between the moment that an ON command is sent by the Task Controller and the moment that the spray liquid hits the ground/crop. This time is used by the Task Controller to compensate for the mechanical delay; the compensation is achieved by sending the ON command earlier.

	The **off latency** is the time between the moment that an OFF command is sent by the Task Controller and the moment that the solenoid valves close. Again, this time is used in the Task Controller to compensate for the delay. The on latency and off latency will be in the order of 500 – 800 milliseconds.
	The **implement type** is the type of sprayer (pull type, 3 point linkage or self-propelled) that is being used.
Page 1/2	Page button. By pressing this button, the 2nd page of the dimensions menu will open. In the second menu, the section dimensions can be entered.
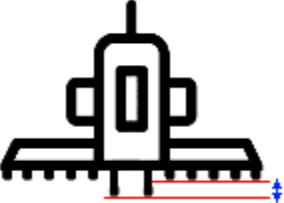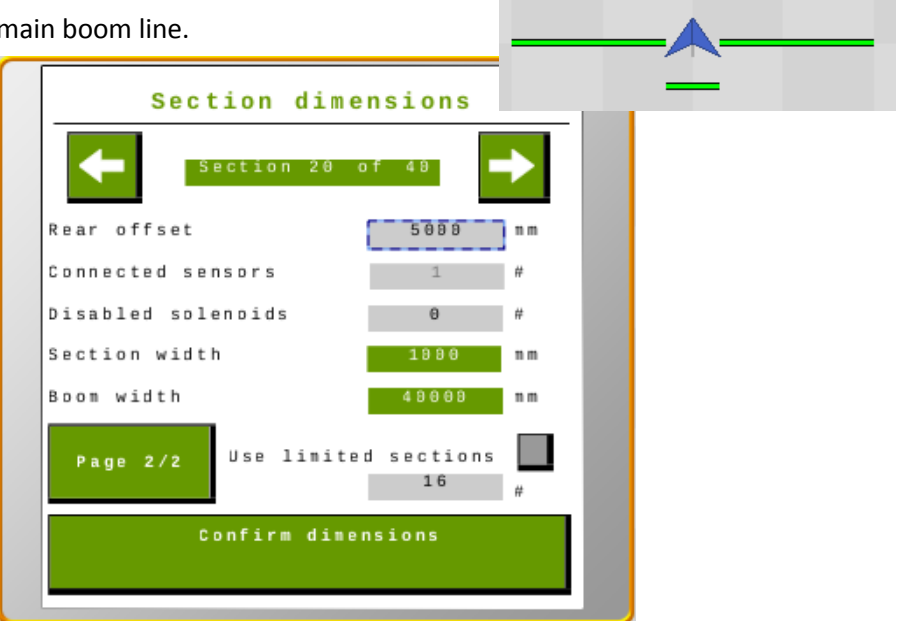
6.7.2   Section dimensions

In this menu, the values can be set for each section independently. The sections can be selected by using the arrow keys to scroll through the sections. The number of sections depend on three things:

- Number of detection sensors in the system.
- Number of sections the terminal can control.
- Number of sections entered underneath 'use limited sections' and whether this option is enabled.

See the images attached to each of the parts below for more clarification:

Section 1 of 24	In the top of the page, between the arrows, the current section and maximum nr of sections is shown. The maximum number of sections depends on the number of connected sensors (1 sensor is 1 section) and on the capabilities of the terminal. If the terminal has the capacity to control max 16 sections, your maximum number of sections will also be 16 in this menu. The maximum number of sections can also be limited by using the button 'use limited sections'.
← →	Use the arrows to scroll through the sections.
	The **rear offset** of the section is the distance between the section and the rest of the boom in mm. This can be used when the sections are not in one line. The value needs to be set for each section independently. The range for the rear offset section is: -15m to +15m. In the image below an example is given of a system that has its 2 centre sections shifted 5000mm behind the main boom line.

Connected sensors: In case the terminal is able to control all detection sensors connected, this value will be 1 and can't be changed. This means that each section consists of 1 sensor and the section width is 1 meter or 40 inches.

In case the maximum number of sections is limited by the <u>terminal</u>, this value can be changed. See *use limited sections* underneath for more information.

A warning will pop-up when the *page 2/2* or *confirm dimensions* button is pressed, while the total number of connected sensors doesn't match the real number of connected sensors.

!! Please change the number of connected sensor values in this menu, until it corresponds with the real number of connected sensors. !!
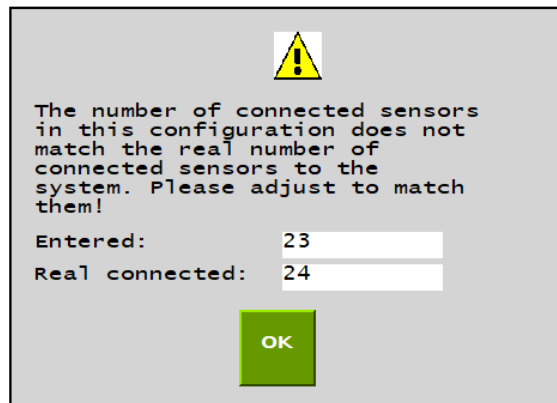
	Disabled solenoids: This value is used for systems that have one or more sensors that don't use all 4 solenoids. When a number larger than 0 is entered, the width of the section and the boom width change. The section width is lowered by 250 mm (or 254 when *miles* is selected in the settings menu) times the number of disabled solenoids.
	E.g. on a 36 meter sprayer, 37 sensors are used because of installation restrictions. The outer left and right sensor control only 2 solenoids. A value of 2 have to be entered for 'disabled solenoids' for section number 1 and section number 37. The width of those two sections will be 500mm, and the boon width will become 36,000 mm.
	Section dimensions Section 1 of 37 Rear offset 0 mm Connected sensors 1 # Disabled solenoids 2 # Section width 500 mm Boom width 36000 mm Page 2/2 Use limited sections 16 # Confirm dimensions
	Section width: This value is a result of the number of connected sensor for this section, minus the disabled solenoids * 250 (or 254).
	When the distance unit is set to *kilometres* in the settings menu, the section width will be the number of connected sensors *1000 – disabled solenoid * 250mm.
	However, when the distance unit is set to *miles* in the settings menu, the section width will be the number of connected sensors * 1016 – disabled solenoids * 254.
	Distance unit: Kilometers Miles
	Boom width: This value is the cumulative width from all sections.

|	
	Use limited sections: This option can be used when your terminal doesn't communicate the right number of sections to the WEED-IT ISOBUS. Click on the button to enable the option (turns green) and change the number of sections you prefer. The number can't be higher than the number of connected sensors. Pay attention: the number of 'connected sensors' per section is automatically calculated when this option is enabled or when the number beneath this option is changed while the option is enabled. Please change the numbers according to your own preferences. E.g.: A 24 sensor system is run by a John Deere 2630 terminal. This terminal doesn't share its max number of sections, while its max is 16, so 'use limited sections' must be enabled and set at 16 sections. The system now automatically calculates that the first 8 sections have 2 sensors attached, and the last 8 sections one sensor (in total 24 sensors). You can change this by pressing on the number behind 'connected sensors' and change the value. For example the outer 4 sections on both sides 1 sensor and the middle 8 sections 2 sensors. Don't forget to press the 'confirm dimensions' button. **Section dimensions** Section 1 of 16 Rear offset 0 mm Connected sensors 2 # Disabled solenoids 0 # Section width 2000 mm Boom width 24000 mm Page 2/2 Use limited sections 16 # **Confirm dimensions**
Page 2/2	Page button. By pressing this button, the 1st page of the dimensions menu will open. In the first page, the implement dimensions can be entered.

7. Warnings and errors

In the unlikely case of a warning or error, these messages are shown on the main screen of the WEED-IT ISOBUS VT. When an error occurs, the WEED-IT cannot work in a normal operation and the machine needs to stop! The errors are shown persistently until the WEED-IT and ECU are restarted manually.

A specific error is: **Section control failed**. This happens when a sensor is added or removed from the WEED-IT system. The number of sensors on the system determines the number of sections on the system. When the number of sensors is changed, the section configuration does not match with configuration sent to the terminal during start-up. The ECU needs to be rebooted in order to send the right section configuration to the terminal. Rebooting can be done by turning the ECU off and on again, or by pressing 'confirm dimensions' in the Dimensions menu.
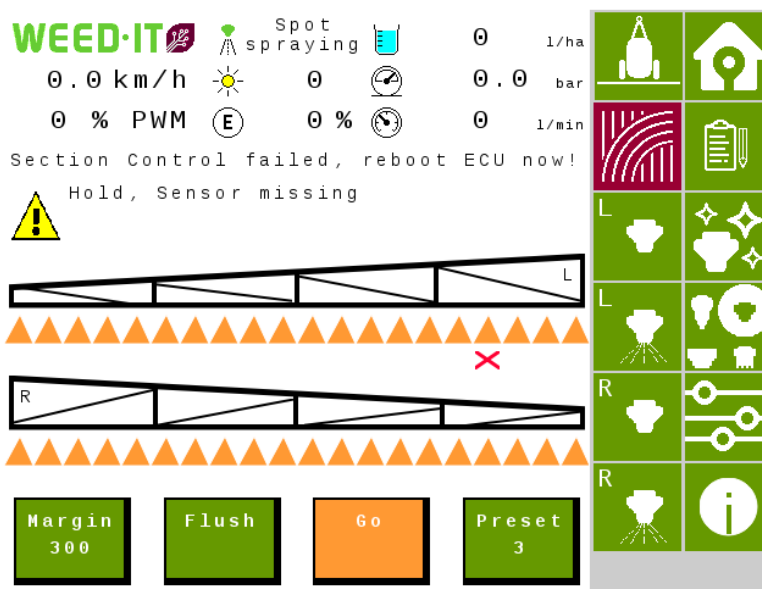
Warnings are self-clearing and are shown next to the yellow exclamation mark.

An example of a warning is 'HOLD'.

See the WEED-IT user manual for all warnings and errors and the corresponding actions to solve them.

8. Demo mode (for distributers only)

In the WEED-IT ISOBUS application a new feature is added: the demo mode.

8.1 Activating the demo mode

This mode can be activated by pressing and holding the start button for 6 seconds. The screen automatically goes to the main menu and fixed numbers are shown in this screen. The relay is not switched when using the demo mode.

8.2 Using the demo mode

The demo mode can be used on farm shows to show how the VT of the WEED-IT looks like. You can change the settings and use the manual section control like in a normal operation.

The demo mode can also be used to check the Task Control functionalities without the need to connect a weed-it system. This can be helpful to test the mapping and section control functionalities on new terminals or terminals with problems.

When in demo mode, a standard set of parameters is shown on the screen. A fixed speed, PWM%, sun factor, savings, rate and pressure are shown. When the terminal has enabled the sections and the master switch is on, the reported detections will be random, resulting in a nice weed-map.

The nozzle and mode cannot be changed in demo mode!

Since demo mode is fixed with 40 sensors, also the dimensions menu has to be confirmed again: press 'confirm dimensions'. As the control unit turns off and on again, you need to activate demo mode again! Hold and press the start button for 6 seconds. Now the dimensions are correctly exchanged with the terminal and a nice demo can be given!

8.3 Deactivating the demo mode

The demo mode can be deactivated in 2 ways:

1. Restart the ECU. By restarting the EPEC, the demo mode is automatically disabled and the WEED-IT ISOBUS will work normal again.
2. Press and hold the start button for 6 seconds again. This will also deactivate the demo mode.

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