

CONTROLLER HC5500



Original

Instruction book - SW 4.XX

67000400-201 - Version 2.01

GB - 10.2008





We congratulate you for choosing a HARDI plant protection product. The reliability and efficiency of this product depend upon your care. The first step is to carefully read and pay attention to this instruction book. It contains essential information for the efficient use and long life of this quality product.

The original instruction book is approved and published in English. All other languages are translations of the original. In the event of any conflicts, inaccuracies or deviations between the English original and other languages the English version shall prevail.

Illustrations, technical information and data in this book are to the best of our belief correct at the time of printing. As it is HARDI INTERNATIONAL A/S policy permanently to improve our products, we reserve the right to make changes in design, features, accessories, specifications and maintenance instructions at any time and without notice.

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.As this instruction book covers more models and features or equipment, which are available in certain countries only, please pay attention to paragraphs dealing with precisely your model.

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1 - CE Declaration	
Declaration of conformity	7
2 - Safety notes	
Operator safety	9
General info	9
3 - Description	
General info	11
General info	11
Glossary and pictorial symbols	12
HARDI LookAhead	12
Pressure based regulation (optional equipment)	13
SafeTrack and IntelliTrack	13
System description	14
Overall description	14
Keys	15
General key description	15
General keystrokes, Example: Tank contents	17
Keystroke menu tree	18
4 - System setup	
Tractor installation	19
Control units	19
Installation of control unit brackets	19
Power supply	20
Printer	20
Speed transducer for sprayer	20
Speed transducer for tractor	21
Foot pedal remote ON/OFF (optional)	21
Initial system start-up	21
Screen contrast adjustment	22
Daily settings	23
System start-up	23
LookAhead nozzle choice	23
Check LookAhead pressure regulation at speed change	24
Check LookAhead pressure regulation at section change	25
Pressure based regulation (optional equipment)	25
Menu 1.1 Volume rate	27
How to change the volume rate	27
5 - Menu 1 Daily settings	
Menu 1.2 Tank contents	28
To change the displayed Tank contents	28
Menu 1.3 Select register	29
Menu 1.3.1 Register readout and selection	29
6 - Menu 2 Setup	
Menu 2.1 Display readout	31
General info	31
Menu 2.1.5 Work rate	31
Menu 2.2 Auto functions	32
Menu 2.2.1 Main ON/OFF	32
Menu 2.2.2 Foam Marker (optional)	32
Menu 2.2.3 Dual line (optional)	32
Menu 2.3 VRA/Remote control	33
Variable Rate Application (VRA) / Remote / HARDI AutoSectionControl	33
Menu 2.4 Set clock	34
How to set clock	34

Table of Contents

Menu 2.5 Alarms	35
How to set up alarms	35
Menu 2.5.6 Audio level	35
Menu 2.6 Register names	36
How to name the registers	36
Menu 2.6.XX Copy name	36
7 - Menu 3 Calibration	
Menu 3.1 Speed calibration	37
Menu 3.1.1 Sprayer	37
Menu 3.1.1.1 Constant	38
Menu 3.1.1.2.1 Practical	38
Menu 3.2 Flow calibration	39
Which method to use	39
Menu 3.2.2 Nozzle method	40
Menu 3.2.3 Tank method	40
Menu 3.2.4 Circulation	41
Menu 3.3 Boom	42
Menu 3.3.1 Width	42
Menu 3.3.2 Number of sections	42
Menu 3.3.3 Nozzles/section	42
Menu 3.3.4 End nozzles (optional)	42
Menu 3.4 Regulation constant	43
Regulation constant	43
Menu 3.5 Tank gauge	44
General info	44
Menu 3.5.1 Adjustment	44
Menu 3.5.2 Total	45
Menu 3.6 Track	47
General info	47
Track	47
Reversing the sprayer	47
Menu 3.6.1 Track width	48
Menu 3.6.2 Tractor drawbar	48
Menu 3.6.3 Dead zone	48
Menu 3.6.4 Damping	48
Menu 3.6.5 Alignment offset	49
Menu 3.6.6 Sensitivity	49
Emergency Track	50
Menu 3.7 LookAhead	51
Menu 3.7.X LookAhead calibration	51
8 - Menu 4 Toolbox	
Menu 4.1 Measure	53
Trip meter	53
Menu 4.2 Service intervals	54
Menu and intervals	54
Service interval reset	54
Menu 4.3 Stop watch	55
Use as timer	55
Menu 4.4 Alarm clock	56
How to use alarm	56
Menu 4.5 Test	57
How to test	57
Menu 4.6 Speed simulation	58
How to use speed simulation	58
Menu 4.7 Emergency Track	59
Menu 4.7 Emergency Track	59

9 - Menu 5 Logbook	
Menu 5.1 Print	61
What you can print	61
Menu 5.2 Data dump	62
How to dump data	62
10 - Mistblowers	
Soft keys	63
General info	63
Unit Canopy Row	63
How to control canopy	63
Fixed read out of canopy measures	64
Menu 3.3.2 Number of sections	64
Menu 3.3.3 Section size	64
11 - Maintenance	
Off-season storage	65
Storage	65
12 - Fault finding	
Emergency operation	67
In an emergency situation	67
Operational problems	68
Operational faults	68
Mechanical faults	69
13 - Testing and fine tuning	
Testing and fine tuning	71
Fine tuning the flow constant - PPU	71
Testing flow transducer	72
Testing speed transducer	72
14 - Technical specifications	
Specifications	73
Specifications	73
Flow ranges for the flow transducers	73
Baud rate	73
Materials and recycling	74
Disposal of electronics	74
Packaging information	74
Charts	75
Chart for recording values	75
Index	
Index	77

Table of Contents

Declaration of conformity

**Manufacturer:**

HARDI INTERNATIONAL A/S
Helgeshøj Allé 38
DK 2630 Taastrup
DENMARK

Importer:

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declare that the following product;

Model no.
Serial no.

- A. was manufactured in conformity with the provisions in the COUNCIL DIRECTIVE of 22 June 1998 on mutual approximation of the laws of Member States on the safety of machines (98/37/EEC) with special reference to Annex 1 of the Directive on essential health and safety requirements in relation to the construction and manufacture of machines.
- B. was manufactured in conformity with the provisions in other relevant COUNCIL DIRECTIVES.
- C. was manufactured in conformity with the current standards implementing harmonised standards in accordance with Article 5 (2) and other relevant standards.

Taastrup, 04. 2006

A handwritten signature in black ink, appearing to read 'Lars Bentsen', is written in a cursive style.

Lars Bentsen
Product Development Manager
HARDI INTERNATIONAL A/S

Operator safety



This symbol means DANGER. Be very alert as your safety is involved!



This symbol means WARNING. Be alert as your safety can be involved!



This symbol means ATTENTION. This guides to better, easier and more safe operation of your sprayer!



This symbol means NOTE.

General info



Note the following recommended precautions and safe operating practices.



Read and understand this instruction book before using the equipment. It is equally important that other operators of this equipment read and understand this book.



Keep children away from the equipment.



If any portion of this instruction book remains unclear after reading it, contact your HARDI dealer for further explanation before using the equipment.



Turn electrical power off before connecting and disconnecting the display and transducers, servicing or using a battery charger.



If an arc welder is used on the equipment or anything connected to the equipment, disconnect power leads before welding.



Test with clean water prior to filling with chemicals.



Do not use a high pressure cleaner to clean the electronic components



Press the keys with the underside of your finger. Avoid using your fingernail.

General info

General info

The HARDI Controller 5500 is for use in agricultural and horticultural production. The Controller permits automatic control of application rate.

Main components are:

- Controller
- Spray Box
- Junction box (on sprayer)
- Jobcomputer (for SafeTrack and AutoSectionControl functions)
- Flow transducer (on sprayer)
- Speed transducer (on sprayer or tractor)

The Controller has a four line display permitting much information to be shown at the same time. Display readout includes volume rate, speed, liquid rate per minute, total covered area, total volume sprayed and 99 trip registers. It includes a total register that summarizes data from the 98 trip registers. It is illuminated internally so readout is possible even for night-time work.

If used on a mistblower, volume applied can also be set up as "Unit Canopy Row". Tree width and height can be changed on the go.

Functions include correct area with closure of up to 9 spray boom sections, alarm functions for volume rate, minimum tank contents, speed min./max. and possibility for audio/visual alarm.

The Spray Box has integrated controls for the spray functions, foam marker, end nozzles and optional electric valves.

The transducers utilised are chosen for long service life and good signal quality. The speed and flow transducer has a diode built into the housing to aid servicing. As the wheel or rotor turns, the diode will flash thereby indicating it function correctly.

The Controller is also compatible for Variable Rate Application and is prepared for communication with Precision Farming tools.

Data dump of registers and configuration to a personal computer is possible.

The system has a non-volatile memory with no battery which simplifies storage. All parameters in the menus are saved in the Controllers memory and are not lost when the power is disconnected.

The controller have been developed to last many years under agricultural conditions.

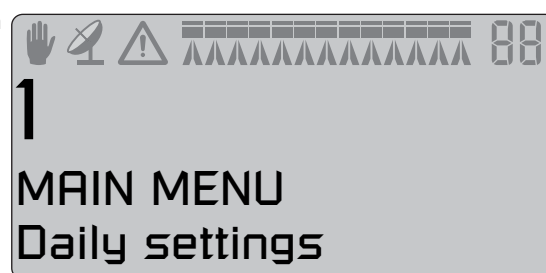
Optional transducers include pressure, revolutions, area meter and tank gauge. Other options include a 12 Volt printer and a foot operated remote ON/OFF for the Main ON/OFF.

3 - Description

Glossary and pictorial symbols

Controller	HARDI Controller 5500 with display.
Spray Box	HARDI Control Box with all basic control functions.
Junction box	Box on the sprayer for Controller and Control Box.
Jobcom	Box on the sprayer with SafeTrack computer and/or AutoSectionControl.
Transducer	Device that transforms variations to a signal. Also called a sensor.
[abc]	Text shown on the Controller display.
[X] or [Y]	Variable figures.
PPU	Pulses per unit. For speed and flow calibration, the unit measure is metre and litre respectively.
EVC	Electric Valve Control unit. Designates an equal pressure liquid system.
EFC	Electric Fast Control unit. Designates a no equal pressure system.
VRA	Variable Rate Application (often referred to "GPS").
UCR	Unit Canopy Row, an application unit used on mistblowers.

Text shown in the shaded rectangular windows are what will be seen on the Controller display when pressing buttons as described in the explanations. An example on display read-out are shown to the right.



HARDI LookAhead

With LookAhead, the pressure regulation valve can predict the correct setting before the main switch goes to ON. It improves application precision, also when re-starting after a tank fill.

LookAhead helps farmers who have tractors with semiautomatic gearbox, meaning the "hardimatic" function does not work due to constant PTO revs.

The LookAhead system has 3 main features:

1. To improve regulation response time when sections are shut OFF or opened.
2. To improve regulation response time when the spraying speed changes during headland turns.
3. To stabilise regulation during pressure/flow fluctuations in the period immediately after main ON/OFF function is turned ON.

The LookAhead feature is active when the boom is unfolded and the LookAhead menu is activated and calibrated.

When the power is switched to ON, note the regulation valve will adjust from the actual setting to the minimum setting and then back again to determine its actual position.

For LookAhead to function correctly the controller must know which nozzles and application rate will be used. This is selected from a number of nozzle choices stored in memory. At start up of the controller, it will prompt user for a choice between using nozzles used at last spray job or select a new nozzle to be used.



ATTENTION! The tractor gearbox must be an automatic or semi-automatic type with constant revolutions P.T.O. or the tractor must be driven with constant R.P.M. for the LookAhead to work properly.

Pressure based regulation (optional equipment)

To improve the non-equal systems EFC and PrimeFlow an optional sensor can be mounted to switch from flow to pressure based regulation. When active, the system automatically switches to pressure based regulation when the flow drops below the minimum flow rate for the flowmeter.

The drop of flow can be due to number of sections selected for the boom and number of nozzles in each section. If there are few or only one nozzle in the last section of the boom and the sprayer is spraying in an angle and only the last section is open there is almost no flow in the liquid system, resulting it to close down.

Same will happen if the sprayer is fitted with a large flow house. The flowmeter will stop rotating and measure no flow with small boom sections or nozzles with low output.

SafeTrack and IntelliTrack

SafeTrack and IntelliTrack are a steering mechanism for the HARDI sprayers. When using a track system, sprayer stability is a common concern. Many factors influence the sprayer and conditions where the sprayer might tip over have to be dealt with. The factors that the driver can influence with are:

- Driving behaviour
- Field conditions
- Tyre width
- Tyre pressure

Read sprayers instruction book for further information.

If unsafe driving occurs an alarm will be triggered, and the sprayer will align. Be aware that the alarm can not be turned off as long as unsafe driving still occurs! (See paragraph "Menu 3.6 Track")



ATTENTION! If necessary the level of security can be adjusted - please contact your local HARDI dealer.



DANGER! The system has been calibrated during driving on flat fields. Special attention should be made when driving in hilly conditions.



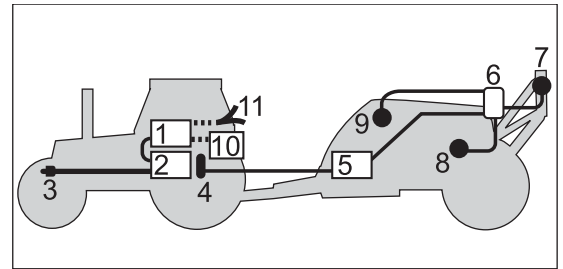
DANGER! When driving on fields with deep tracks, then the speed must be decreased.

3 - Description

System description

Overall description

1. Controller
2. Spray Box
3. To 12 Volt power supply
4. Multi wire plug and cable
5. Junction box (on sprayer)
6. Jobcom (optional)
7. Flow transducer
8. Speed transducer
9. Tank contents transducer (optional)
10. Printer (optional)
11. Harness for tractor speed/area switch/foot remote ON/OFF



Keys

General key description

The HC 5500 controller buttons are placed in three groups; navigation keys, shortcut keys, distance key and the auto key.

The shortcut keys can be used for the following:



Short press: Displays volume sprayed for the active register.

Long press: Enter Register select (menu 1.3.1 Register select).



Short press : Displays the actual speed.

Long press: Enter Speed calibration (menu 3.1.1 Speed).



Short press: Displays the actual tank contents.

Long press: Enter Tank contents menu (menu 1.2 Tank contents).



Short press: Show Area covered for active register.

Long press: Enter Register select (menu 1.3.1 Register select).




Short press: Show the selected volume rate.

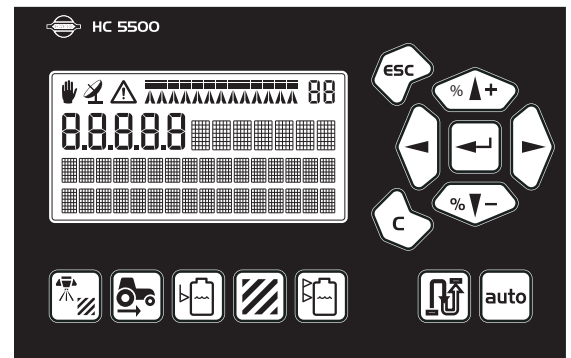
Long press: Enter Volume rate menu (menu 1.1 Volume rate).



Short press: Shows remaining spraying distance with actual tank contents.

Long press: Enter Measure distance menu (menu 4.1.1 Distance).


Pressing  will: Enable Autofunction.



3 - Description

The navigation keys are initially used for set up in the menu system and working screen.

To navigate the menus then press  to start this process. Then buttons can be used for the following:

Pressing  will:

- Scroll up,
- Increase an value.

Pressing  will:

- Scroll down,
- Decrease a value.

Pressing  will:

- Move  the cursor to the left.

Pressing  will:

- Move the cursor to the right.

Pressing  will:

- Escape a menu (hold to escape all menus),
- Escape without changing a value.

Pressing  will:

- Clear a value,
- Reset the active register (hold until countdown is finished).

Pressing  will:

- Enter a menu,
- Confirm (accept) a value.

When having the working screen then the navigation keys can be used for the following:

Pressing  will:

- Increase volume rate in steps or select another preset application rate.

Pressing  will:

- Decrease volume rate in steps or select another preset application rate.

Pressing  will:

- Reset the active register (hold until countdown is finished).

Pressing  will:

- Enter a menu.

General keystrokes, Example: Tank contents

The following is a general description in keystrokes and display readout. The following example, of changing the Tank contents value, is used to illustrate this. Try it! The same method is used in all the menus.



ATTENTION! When a menu is open, the blinking number or value is the one that can be altered.

Press to enter the menu system [1 MAIN MENU].

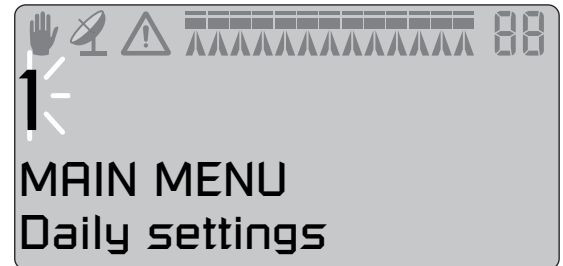
The 2nd line will show the menu number.

The 3rd line will read the present menu.

The 4th line will show a choice.



Note the menu number [1] is blinking.

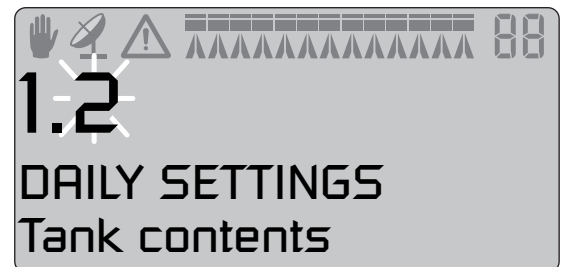


Press to enter menu [1.1 Daily settings].

Press or to scroll to [1.2 Tank contents].



NOTE! The last digit of the menu number [1.2] is blinking.



Press to enter [1.2 TANK CONTENTS].



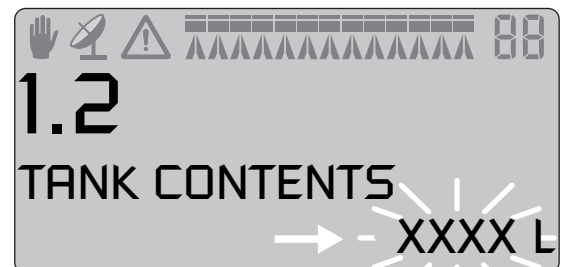
NOTE! The value that can be changed is blinking.

Press or to move the cursor.

Press or to set the desired value.

Press to confirm.

Press and hold, to exit the menu system.



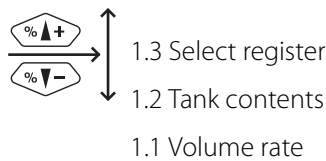
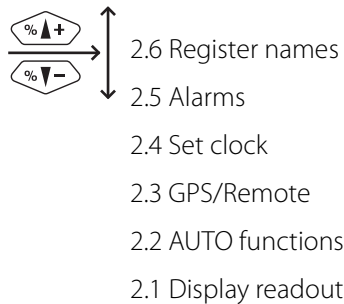
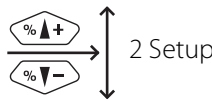
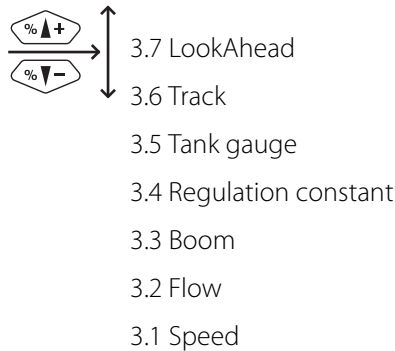
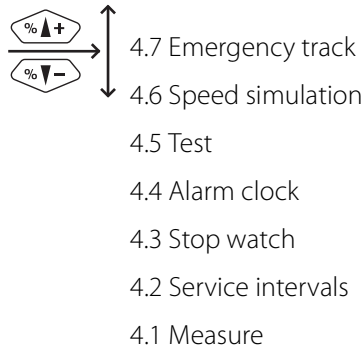
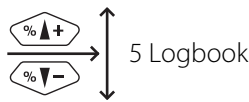
3 - Description

Keystroke menu tree

The first steps to choose a menu are shown below.

Press  to proceed into the menu. See the relevant section in the book.

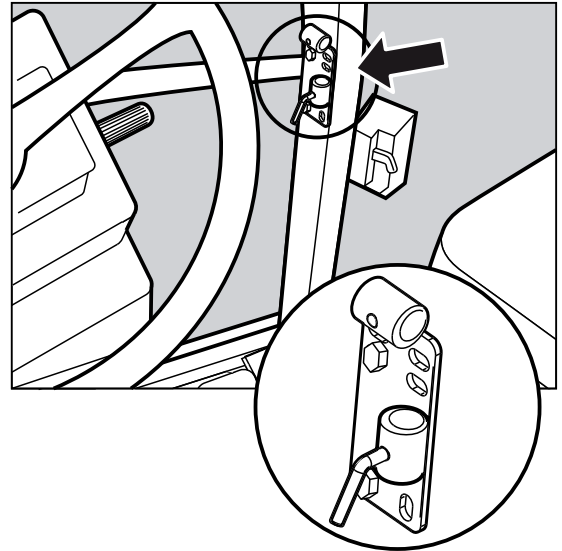
Press  and hold to exit the menu system.



Tractor installation

Control units

Find a suitable place in the tractor's cabin to secure the control units from movement. Best recommended placement is to the right of the driver seat. The supplied bracket will fit most tractors. Threaded mounting holes may be hidden behind front corner cover.

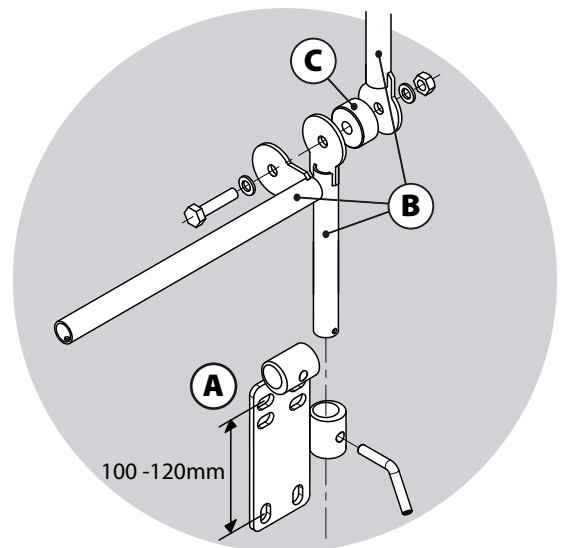


Installation of control unit brackets

The supplied tractor pillar bracket (A) has a hole spacing of 100 and 120 mm. Check tractor instructions manual for information regarding attachment points.

Three tubes (B) are supplied. One, two or all 3 may be used. They can be bent and shortened. A spacer (C) is also supplied to allow further attachment possibilities. Find the best solution for your tractor or vehicle.

Tube (B) plate is staggered so if correctly orientated, all boxes will line up.



The recommended setup is to place the spacer (C) between the two tubes (B) used for the controllers and the 3rd tube (B) which is to be mounted in the bracket (A), as shown on the picture.



ATTENTION! An extension cable is available as an option if the HC 5500 control unit is to be placed further away from the EFC control unit. (Ref. no. 261933)



4 - System setup

Power supply

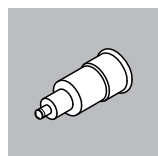
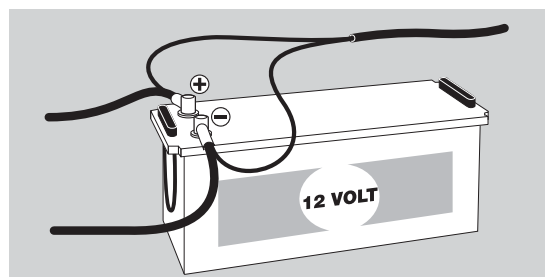
The power requirement is 12-15 Volt DC. Always note polarity!

Brown wire is positive (+)

Blue wire is negative (-).

Power supply must come directly from the battery. For proper function of the electric equipment, the wires must have the following recommended cross sectional areas and correct fuses to ensure a sufficient power supply. The delivered power connectors follows the standard of most newer tractors. If having a tractor with another power connector it is necessary to disassemble connector and fit it to the actual tractor connector.

Use the HARDI Electric distribution box (Ref. no. 817925) if the tractor has a doubtful wiring.



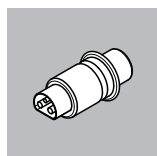
CIGAR CONNECTOR

Spray control unit requires:

Wire 2.5 mm, Fuse 10 Amp

Hydraulic control unit requires:

Wire 4.0 mm, Fuse 16 Amp



JOBCOM CONNECTOR

The unit requires:

Wire 6.0 mm, Fuse 25 Amp



WARNING! Do not connect to the starter motor or generator/alternator. Warranty is void if this is done.



ATTENTION! See paragraph "System start-up" for more about connecting the controller.

Printer

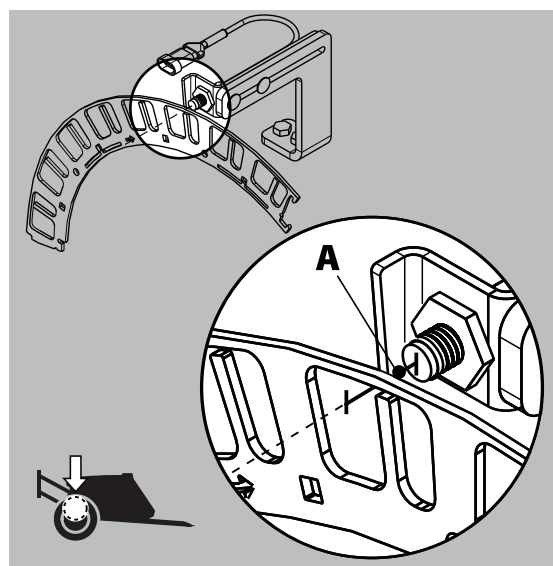
If the 12 Volt printer is fitted, the supplied tube can be utilised to fit the printer on the Controller/Terminal brackets.



ATTENTION! The Controller/Terminal should be protected from moisture and should be removed when not in use, if the tractor does not have a cabin.

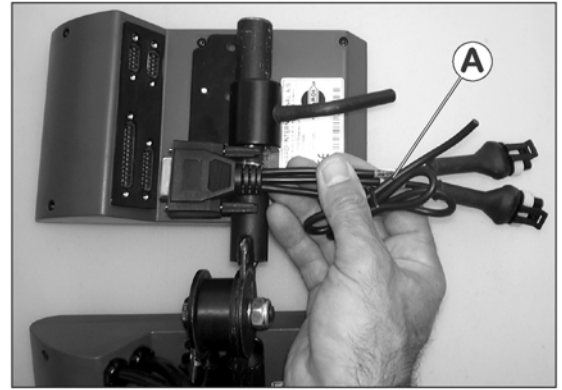
Speed transducer for sprayer

The speed transducer is located at the inside of the sprayers right wheel. It is an inductive type that requires a metallic protrusion to pass by it to trigger a signal. To trigger a speed ring is used. It should be adjusted so transducer is placed to the centre of the holes in the speed ring (vertical direction). Recommended distance between protrusion and transducer (A) is 3 to 6 mm. Check this in the whole circumference. Correct fitting is indicated by constant blinking from transducer when the wheel rotates.



Speed transducer for tractor

It is possible to connect a speed sensor from tractor gearbox or radar/GPS to the controller. A speed/switch harness (A) and extension cable are needed to connect the speed transducer to the Controller/Terminal.



Foot pedal remote ON/OFF (optional)

Note the following if the Foot pedal remote is to be fitted.

Remote ON/OFF switch has to be activated from the extended menu at installation. The HARDI Service centre does this.

The speed/switch harness (A) is connected to the Controller/Terminal. Connect the plug from the Foot pedal ON/OFF to the correct connector on harness (A). **WARNING!** Connector "H" must be connected to \pm pole on the battery. Do NOT connect to ground on tractor as this might blow the controller!

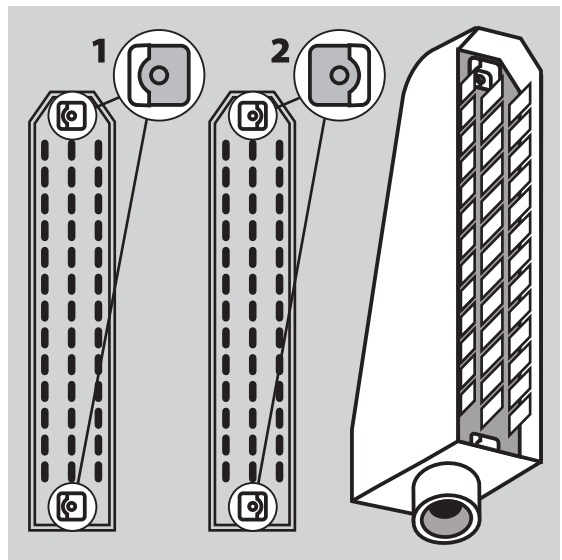


ATTENTION! The main ON/OFF valve switch at Spray Box overrides all remote switches. It must be set to ON for the optional Remote ON/OFF switch to function.



Initial system start-up


When connecting the 39 pin plug from the sprayer, then note the one-way brackets inside the connector and connector plug. There are two different brackets to designate connector plug for respectively liquid (1) and hydraulic (2) boxes. **ATTENTION!** The Controller/Terminal should be protected from moisture and should be removed when not in use, if the tractor does not have a cabin.



4 - System setup

When connecting the 39 pin plug from the sprayer, then note the one-way brackets inside the connector and connector plug. There are two different brackets to designate connector plug for respectively liquid (1) and hydraulic (2) boxes.

After connecting the plugs, the power is turned on at the Spray Box. Model, software version number, number of sections and size are displayed briefly. At initial start up, Controller also prompts for input of time and date. [Set clock to enable register].




Press  to continue.



ATTENTION! At first start-up the clock must be set in order to make the registers work properly. See "Menu 2.4 Set clock".



Screen contrast adjustment

The screen contrast can be adjusted by pressing  and then use the  or  to find the correct setting. This can only be done when "driving screen" is active, i.e. not when any menus are active.


Note that this function will only be available on hardware version 2.0 and higher

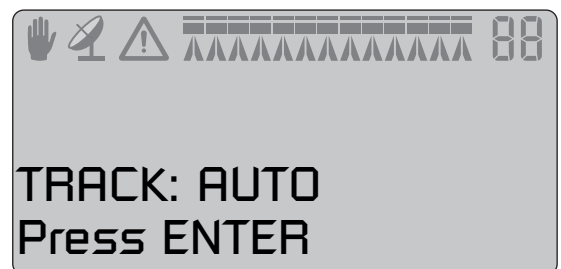
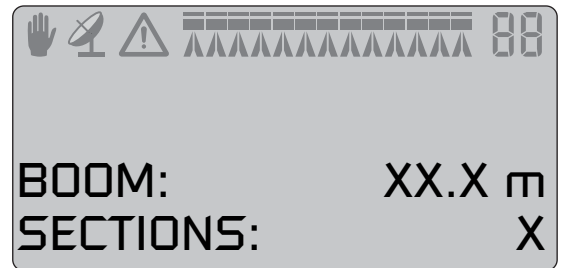
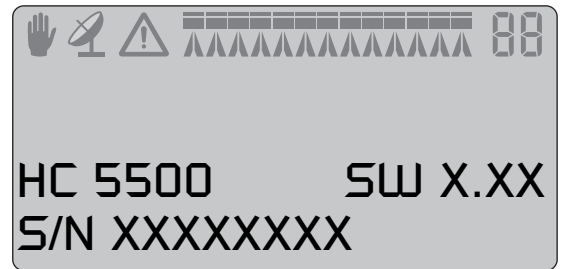
Daily settings

System start-up

When the HC 5500 is turned on a boot sequence is started while the controller is initiating it self. If the Controller is put into operation for the very first time it will prompt for date and time, [Set clock to enable register]. Please see "Menu 2.4 Set clock" for details on setting of clock.


During start-up it shows information about itself in the following order:

1. A screen showing that the controller is a HC 5500 and a software version in 3rd line of display. In 4th line of display a serial number for the specific controller is shown.
2. A screen showing boom length in 3rd line of the display. Number of sections programmed into the controller are shown in the 4th line. These datas should reflect the sprayer it is mounted to - if not, please contact your local HARDI dealer to correct this.
3. If the sprayer is equipped with LookAhead and this is enabled in the HC 5500 it will prompt user for a nozzle choice - see section "LookAhead nozzle choice". If no LookAhead is available this screen will not appear and HC 5500 will be ready for use.
4. To prevent unintended Track movements the track selection switch on the hydraulic control box must be set to "auto", if the HC 5500 is switched on while the boom is unfolded and/or the sprayer is steered out. The display then tells that "auto" is on. If "auto" has not been selected, the controller will prompt you to select "auto" on. Press  to confirm this and then the controller is ready to use.






LookAhead nozzle choice

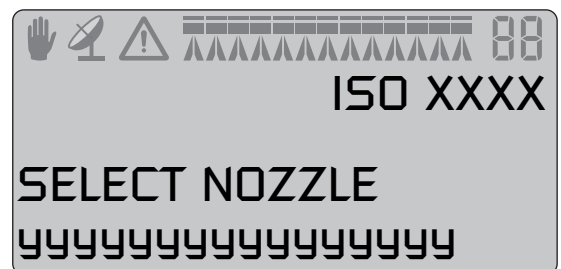
If LookAhead or pressure based regulation is enabled the HC 5500 it will prompt user for a nozzle choice at every start-up of the controller. Display will show last used nozzle by displaying its colour and ISO code in the display.

If the nozzle used at last spray job is going to be re-used, then press .

Selecting another nozzle:






1. Select another nozzle by pressing  or .
2. Confirm the choice by pressing .
3. If a selected nozzle holds no LookAhead calibration in the HC 5500 memory then it should be calibrated - see section "Menu 3.7 LookAhead" in the chapter "Menu 3 Calibration".

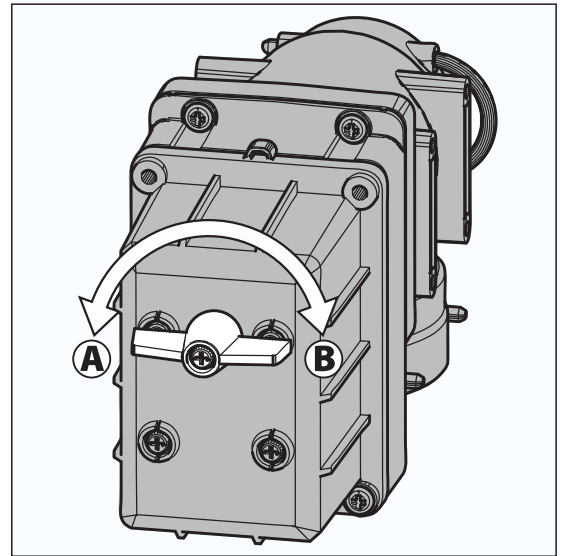
Custom nozzle flow rate is also defined in "Menu 3.7.X LookAhead calibration".



4 - System setup

Check LookAhead pressure regulation at speed change




1. Press  button for pressure regulation on the Controller. Check that fly-leg icon appears in upper left corner of the display.
2. Go to menu [4.6 speed simulation]. Key in e.g. 9 km/h and press  to use the value. Stay in this menu (i.e. do not press ESC to leave).
3. Start PTO at nominal RPM.
4. Press main ON/OFF to ON, to open all sections. Check that the pressure regulation valve rotates and that pressure stabilises at 5 bar.
5. In menu [4.6 speed simulation]. Key in e.g. 6 km/h and press  to use value. Check that pressure regulation valve rotates and that pressure stabilises at 2 bar.
6. When pressure regulation valve is stable (i.e. does not rotate/adjust), then wait 30 seconds before proceeding.
7. Press main ON/OFF to OFF, to close all sections.
8. Go to menu [4.6 speed simulation]. Key in e.g. 9 km/h and press  to use the value. Check if pressure regulation valve rotates counterclockwise (to reduce pressure) immediately after pressing . If pressure regulation valve rotates when all sections are closed, then LookAhead is activated and works correctly.
9. Press main ON/OFF to ON, to open all sections. After a delay of approx. 3 sec the pressure regulation valve begins rotating to adjust actual flow to set flow.

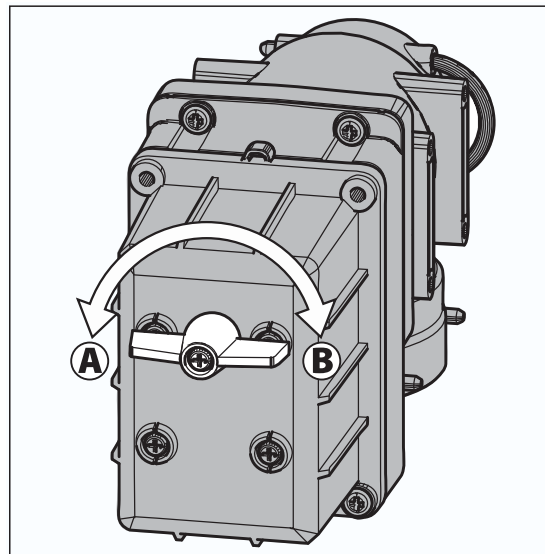


Rotation counterclockwise (A)	Rotation clockwise (B)
Decreasing pressure	Increasing pressure
Lower boom flow	Higher boom flow
Closing section	Opening section
Decreasing speed	Increasing speed

Open/close the Main On/off = No movement

Check LookAhead pressure regulation at section change

1. Go to menu [4.6 speed simulation]. Key in 6 km/h and press  to use the value.
2. Press  to leave to workscreen.
3. Press  button for pressure regulation on the Controller. Check that fly-leg icon appears in upper left corner of the display.
4. Start PTO at nominal RPM.
5. Flip down all section switches.
6. Press main ON/OFF to ON, to open all sections. Check that pressure regulation valve rotates and that pressure stabilises at 2 bar.
7. Press main ON/OFF to OFF, to close all sections.
8. Flip up half of the section switches to close half of the sections. Check if pressure regulation valve rotates counterclockwise (to reduce pressure) immediately after the change of section switches. If pressure regulation valve rotates when all sections are closed, then LookAhead is activated and works correctly.





Rotation counterclockwise (A)	Rotation clockwise (B)
Decreasing pressure	Increasing pressure
Lower boom flow	Higher boom flow
Closing section	Opening section
Decreasing speed	Increasing speed

Open/close the Main On/off = No movement

Pressure based regulation (optional equipment)

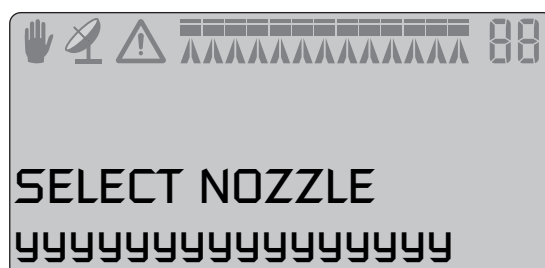
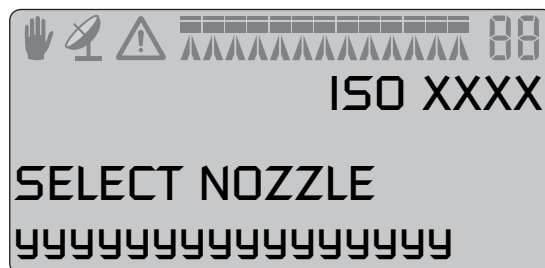
When the pressure based regulation is enabled the HC 5500 will prompt for a nozzle choice. The display will show the nozzle description of the last used nozzle.

If the nozzle and application rate used at last spray job is going to be re-used, then press  and the minimum pressure screen will appear (see below).

If another nozzle will be used then confirm your nozzle selection by pressing . Then the minimum pressure screen will appear. If LookAhead is enabled, then LookAhead calibration will be done before the minimum pressure screen appears.

Select the minimum pressure with  or . Change digit with  or . Confirm the selection by pressing .





In practice this means the regulation valve will stop if the pressure goes below this value. See "Check LookAhead pressure regulation at speed change" for illustration of pressure regulation valve functionality.

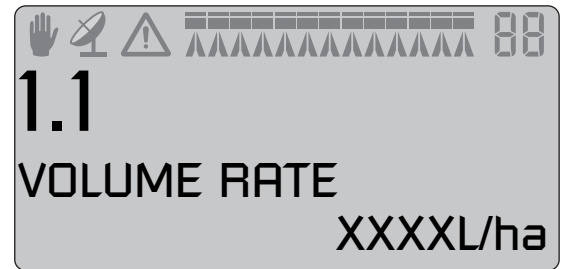


Menu 1.1 Volume rate

How to change the volume rate

The volume rate can be changed by:


1. Setting the desired rate in the Controller.
2. Manually raising or lowering the pressure via the Spray Box.
3. In the menu: Pressing  or  to apply over or under in a preset percentage, e.g. 10% (the 3rd line indicates when this is active) or
4. When working (working screen): Pressing  or  to change to one of 3 preset volume rates.



When having a mistblower, see chapter 10 for more details about spraying with UCR.



To read the Volume rate


Shortcut 


Press  and hold until menu [1.1 VOLUME RATE] is shown.

To change volume rate

Move cursor with  or  to the value to be changed.

Use  or  to change the value.

Press  to confirm.

Press  and hold to exit the menu system.


If the volume rate is set up with 3 programmable rates, there are three possibilities to enter volume rate.

[1.1.1 Rate 1](Default)

[1.1.2 Rate 2]

[1.1.3 Rate 3]

Manual dosage

To dose in manual mode, use the pressure switch on the Spray Box. The manual mode is indicated by the  symbol at the top of the display.

To go from manual to preset volume rate, press .





ATTENTION! Under 0.5 km/h, the Controller will not regulate automatically.

5 - Menu 1 Daily settings

Menu 1.2 Tank contents

To change the displayed Tank contents

Shortcut 

Press  and hold until menu [1.2 TANK CONTENTS] is shown.

The maximum size of the tank is displayed

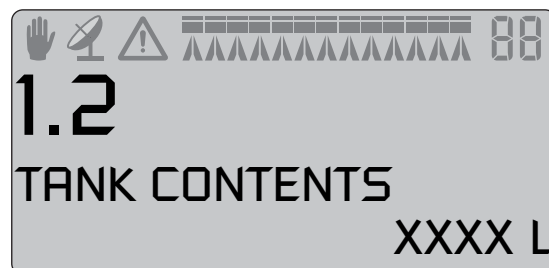
Press  again and the tank contents maximum value is shown.

Press  or  to move the cursor to the value to be changed.

Press  or  to set the desired value.

Press  to confirm.

Press  and hold, to exit the menu system.



Menu 1.3 Select register

Menu 1.3.1 Register readout and selection

Register 1 to 98 can be used for individual areas.

Register 99 is a tally of register trips 1 to 98. They are identified with a number and it is also possible to name them. The active register is always visible in the right upper corner of the display. The data is memorised when the system is switched off.



To read the totals of all registers

Shortcut

Press and hold until menu [1.3.1 Register XX] is shown.

Press or to go to register 99. The number is shown on the 1st line and if present, the name on the 4th line.

Press to enter the register.

Press to scroll through the data.

Press and hold to exit the menu system.

To read the data in the active register

Shortcut

Press and hold until menu [1.3.1 Register XX] is shown.

Press to enter register.

Press to scroll through the data.

Press and hold to exit the menu system.

To reset register

Press and hold until the countdown has ended.

Reset of a register can be stopped if the key is released before countdown has ended.

To change the register

Shortcut

Press and hold until menu [1.3.1 Register XX] is shown.

Press or to change the register.

The number is shown on the 1st line and if present, the name on the 4th line.

Press . If necessary, the register can be reset.

Press until the countdown has ended.

Press and hold to exit the menu system.



ATTENTION! The active register number is always visible in the right upper corner of the display.



ATTENTION! Naming of registers are done in menu 2.6.

Menu 2.1 Display readout

General info



The following menu explanations assume you have mastered the general keystrokes and you can “find your way” to the specific menu. If this is not so, please re-read section “Keys”.


Menu 2.1.5 Work rate

It is possible to freely choose which function is to be shown on the 3rd or 4th line of the display. Choose the submenus of menu [2.1 Display readout].

Choose a submenu e.g. menu [2.1.5 Work rate].

Press  to confirm.


Use  or  to choose which line is to show data. Picture will change as shown.


Press  to confirm.



DISPLAY TEXT	DESCRIPTION
[2.1.1 Program: Actual]	Programmed and actual application rate
[2.1.2 Flow rate]	Flow rate out to the boom
[2.1.3 Optional sensor]	There are 8 sub-choices
[2.1.4 Time]	Actual time
[2.1.5 Work rate]	Rate shown in hectares per hour
[2.1.6 Volume rate]	Actual rate in Litres per hectare
[2.1.7 Tank contents]	Main tank contents
[2.1.8 Speed]	Driving speed
[2.1.9 Volume: Area]	2 readouts on the same line
[2.1.10 Active boom size]	Active boom size including end nozzle



 ATTENTION! As some readouts need extra sensors, the relevant sensor has to be connected to get a readout.

 ATTENTION! If using UCR for mistblowers:

- Readout is only possible on the 4th line.
- Readout changes as listed below.

2.1.1 Program Actual	Programmed and corrected rate
2.1.5 Work rate	Rate shown in Metres per hour
2.1.6 Volume rate	Actual rate in Litres per UCR
2.1.9 Volume Area	2 readouts in the same line

6 - Menu 2 Setup

Menu 2.2 Auto functions

Menu 2.2.1 Main ON/OFF

The Controller can be set to open the main ON/OFF function above a certain speed and close it below the same speed. This allows the user to concentrate on driving. If the speed is set at zero the function is deactivated. Suggested speed setting is spraying speed less 20%.

When the Auto ON/OFF is active and the main switch and boom section switches are on, the boom status symbol on the 1st line will blink when speed is under the trigger value.



WARNING! Remember to set the main ON/OFF switch to OFF before leaving the field, otherwise the main ON/OFF will open under transport.

Menu 2.2.2 Foam Marker (optional)

The Controller can be set to operate the HARDI Foam marker automatically through the main ON/OFF valve. When the main ON/OFF is ON, it will automatically start the Foam marker.

Furthermore, the Foam marker can be set for up and back spraying or race-track (round and round) spraying.

Setting	Activity
[Disable]	The marker will only follow the setting of the switch on the Spray Box.
[Same side]	The Controller will automatically activate the same side for race-track spraying.
[Change side]	The Controller will automatically change side for up and back spraying.

Foam marker status is shown briefly on the line 4 of the screen.

Menu 2.2.3 Dual line (optional)

If the sprayer is fitted with 2 sets of boom lines this function can be used to ensure volume rate and droplet size is maintained during large changes to forward speed.

The boom lines are pronounced A and B.

System options:

2 step: A to B

3 step: A to B to A&B

Menu 2.2.3.1:

Here the lower limit are selected. Depending on the setup, either speed or pressure can be the trigger for changing between the steps.

Menu 2.2.3.2:

Here the upper limit are selected. Depending on the setup, either speed or pressure can be the trigger for changing between the steps.




ATTENTION! Note this menu is only shown if Jobcom hardware is fitted, and the software is enabled.

Menu 2.3 VRA/Remote control

Variable Rate Application (VRA) / Remote / HARDI AutoSectionControl

If the volume rate is to come from an external source (e.g. a site specific application map or a remote sensor), this menu has to be enabled.

The  symbol on the 1st line will be visible. Manual pressure regulation and stepped over/under application is still possible.

The external source is connected to the COM 1 or COM 2 via a 9 pin sub D connector.

The baud rate for the equipment should be set at one of the following before transmitting data:

19200 baud

9600 baud (HC 5500 default)

4800 baud

2400 baud

1200 baud



ATTENTION! The COM port may have to be set up in the extended menu. Contact your HARDI service center.



ATTENTION! Use of HARDI AutoSectionControl requires a sprayer equipped with JobCom computer. If in doubt whether your sprayer has a JobCom installed, please contact your local HARDI dealer.

6 - Menu 2 Setup

Menu 2.4 Set clock

How to set clock

If the Controller prompts for date and time, [Set clock to enable register]:

This must be done before the Controller is put into operation for the first time, otherwise no start and stop time will be recorded in the registers.



ATTENTION! If no prompt, the dealer may already have done this.


Press .

Press  to menu [2 Setup].



Press .

Press  to menu [2.4 Set clock].

Press  to enter menu [2.4.1 SET CLOCK].

Now you can choose between 24 hour or 12 hour clock with .

Press .

Set minutes, hours, year, month, day with  and .

Press  to confirm.

Press  and hold to exit menu system.

Menu 2.5 Alarms

How to set up alarms

Six different alarms can be set up. Choices are listed as follows.

DISPLAY TEXT	NOTES
[2.5.1 Volume rate]	Suggested setting is 10%
[2.5.2 Tank contents]	Measured in Litres
[2.5.3 Spray pressure]	High/low pressure
[2.5.4 Fan speed]	High/low rpm
[2.5.5 Speed]	Speed max./min.
[2.5.6 Audio level]	0 = no sound, 5 is max. volume
[2.5.7 Sections off]	Sections switched to OFF

When outside the alarm parameters, the relevant warning will flash. The alarm beep can also be adjusted in audio level in menu [2.5.6 Audio level].

Examples shows volume rate alarm for over or under application for more than 20 seconds.

Suggested setting is 10%. For no alarm, set at 0.



Menu 2.5.6 Audio level

It is possible to change the sound level for alarms.

Procedure:


Press .

Press  to menu [2 Setup].


Press .


Press  to menu [2.5 Alarms].


Press .

Press  to enter menu [2.5.6 AUDIO LEVEL].

Press .

Set the sound level by changing sound step with  and .

Press  to confirm.

Press  and hold to exit menu system.



6 - Menu 2 Setup

Menu 2.6 Register names

How to name the registers

If desired, the registers can be given names. Once set up, a name can be copied and edited.

Press or to toggle between [Yes] or [No].

Press if the name can not be copied or edited.

A "?" will blink on the 3rd line.

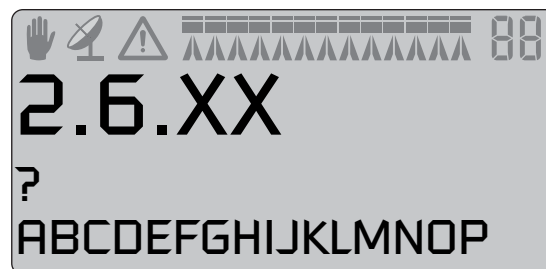
Menu 2.6.XX Copy name

Register number

Menu number

3rd line blinking

Character set



Moves "?" one step to right.

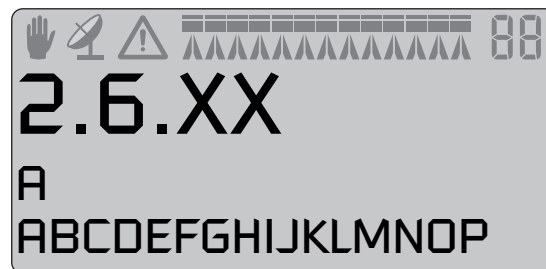
Moves "?" one step to left.

or Changes character set.

Activates cursor in 4th line exchanging with "?" in 3rd line.

Leaves the menu.

No effect.



Assuming is pressed, "A" will blink in both 3rd and 4th line.

"B" will blink in both 3rd and 4th line.

"P" will blink in both 3rd and 4th line.

or Changes character set.

Selects character and returns to 3rd line.

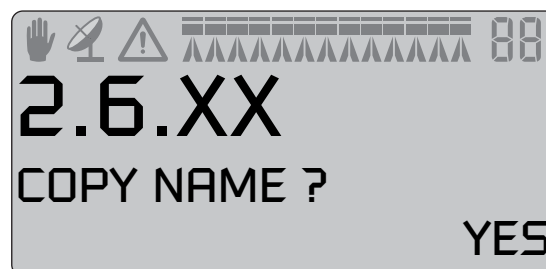
The second letter can now be selected.

Press to select [Yes].

Press or to scroll through the defined names. The register number on the 1st line will change accordingly.

Press to select.

The name can be copied and edited. The blinking cursor is for editing.




Menu 3.1 Speed calibration

Menu 3.1.1 Sprayer

The calibration process is the same for each sensor type. In the following example a "speed sensor on sprayer" is used.

Shortcut 


1. Press  until menu [3.1.1 Sprayer] is shown.

It is possible to connect the speed sensor at different locations. See chapter 4 - System setup for more about this. They are calibrated in the following menus:




[3.1.1 Sprayer]Speed sensor on sprayer

[3.1.2 Tractor]Speed sensor on tractor

[3.1.3 Radar]Radar speed sensor

2. Choose with the navigation keys.
3. Press  to confirm. The last confirmed sensor is the active speed sensor.

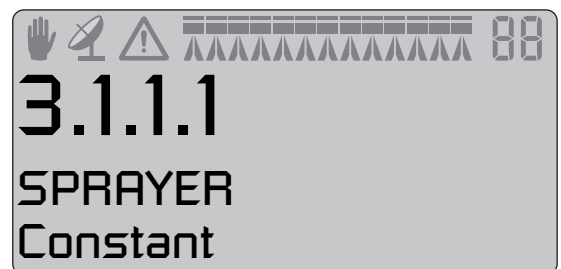
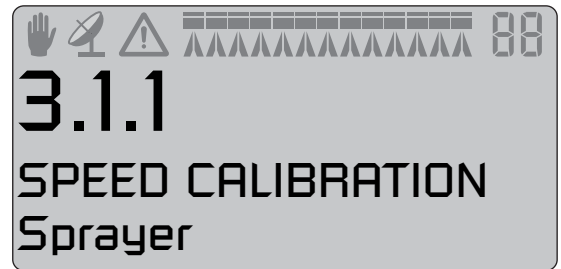
Shortcut 

4. Press  until menu [3.1.X "Speed abc"] is shown.
5. Choose speed transducer. (Sprayer, Tractor or Radar) [3.1.1 Sprayer]
6. Press  to confirm.
7. Press  to read PPU value.



ATTENTION! Be aware that even tractor speed sensor and radar speed sensor uses the same connector, then PPU value may be very different.

The speed transducer can be calibrated theoretically or practically. The practical method is recommended.



7 - Menu 3 Calibration

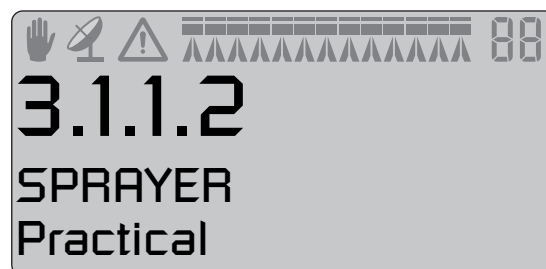
Menu 3.1.1.1 Constant

The theoretical speed constant, pulses per unit (PPU), is the distance in metre on the circumference of the wheel between holes (A) (or protrusions / magnets (B)) that the speed sensor records.



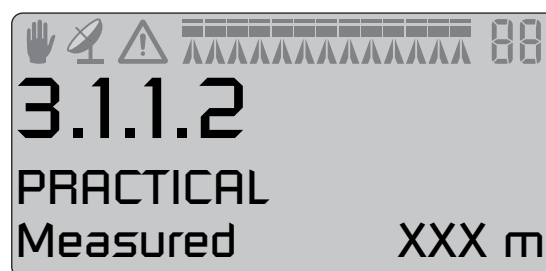
Menu 3.1.1.2.1 Practical

Practical calibration of speed is done by driving a measured distance and correcting the display so that the actual and the calculated distances are the same. Calibration should take place in the field with a half full tank and normal working tyre pressure in order to obtain the wheel's real "working radius".



Method

1. Measure a distance not less than 75 metres.
2. Park the tractor at the start of the measured distance.
3. Press . When zero distance [0 m] shows, drive the distance.
4. Press .
5. Correct the distance shown on the display with the or to read the actual distance.
6. Press to confirm.



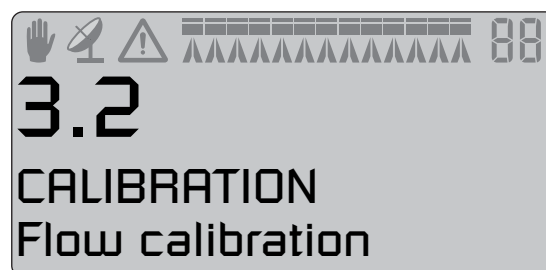
Menu 3.2 Flow calibration

Which method to use

The flow transducer can be calibrated theoretically or with two practical methods. The practical methods are preferred. Calibration is done with clean water. The Flow Tank method is time consuming, but is more accurate than the Flow Nozzle method.

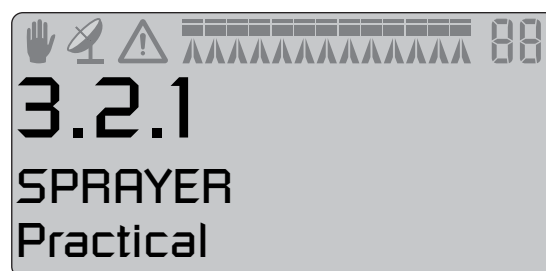
When changing to nozzles with more than a 100% increase or decrease in output, it is recommended to recalibrate the flow transducer.

Calibration is recommended to be done at least once during the spraying season. Use the chart at the back of the book to record the values.



Menu 3.2.1 Flow constant

Use the navigation keys to change the flow constant theoretically.



Approximate PPU values for different flow housings are as follows in the table. Different flow housings are designated by groove (A).



Housing	Housing identification (A)	Flow range L/min.	Orifice mm	PPU value
S/67	Three grooves	1-30	6	310.00
S/67	Four grooves	2.5-75	9.5	180.00
S/67	One outside groove	5 -150	13.5	120.00
S/67	No groove	10-300	20.0	60.00
S/67	Two outside grooves	35 - 600	36.0	17.00

Pressure drop over 13.5 mm orifice is 1 bar at 150 l/min.



ATTENTION! PPU indicates the number of pulses which theoretically come from the flow transducer whilst 1 litre of liquid passes through.

7 - Menu 3 Calibration

Menu 3.2.2 Nozzle method



During practical flow calibration the individual nozzle output on the display is compared to the actual individual nozzle output. The output displayed is corrected to read the actual output.

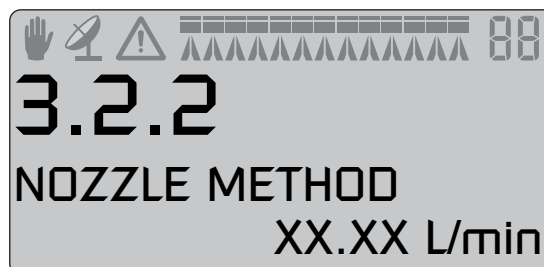
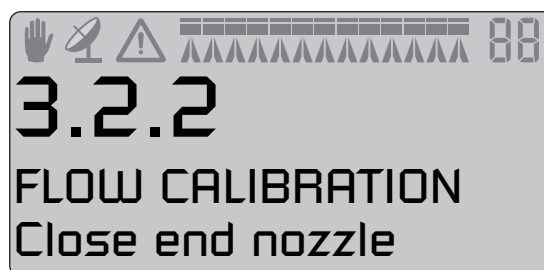
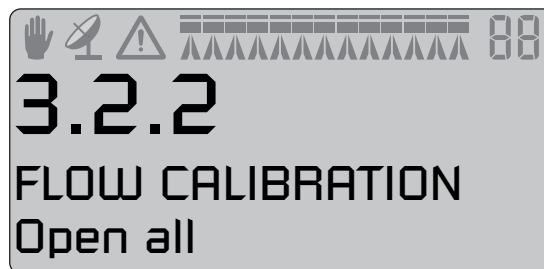
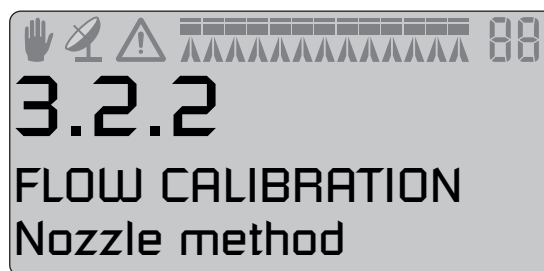


ATTENTION! See menu [3.3 Boom] if no boom data has yet been entered.

If a section has not been opened or a end nozzle is not closed, the warnings below (2 next pictures) will show up in the lowest line on display. If the boom symbol on the 1st line blinks, set menu [2.2.1 ON/OFF] to [0.0 km/h].

Method

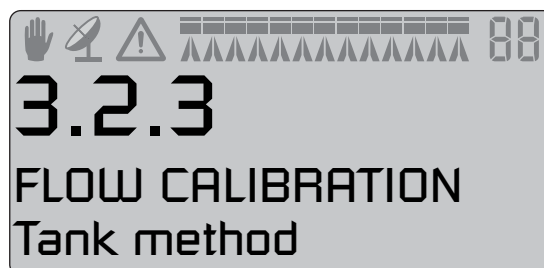
1. Open all boom sections. Switch the main ON/OFF to ON. Close end nozzles (if fitted).
2. Go to menu [3.2.2 Nozzle method]. The display will then show the individual nozzle output per minute.
3. Using a HARDI calibration jug, check the actual nozzle output per minute. It is recommended that an average of several nozzles be taken.
4. Press .
5. Correct the output shown on the display with the navigation keys to read the average output measured with the calibration jug.
6. Press  to confirm.





Menu 3.2.3 Tank method

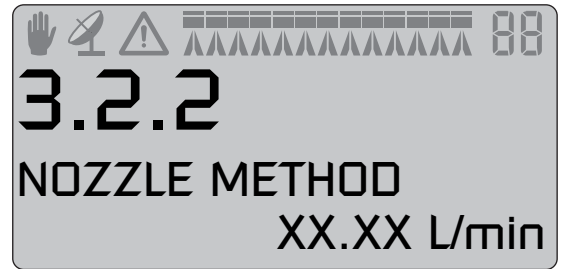
During practical flow calibration the tank is partly emptied through the nozzles. Whilst emptying, the display calculates the quantity emptied on the basis of the actual calibration value (PPU). The quantity displayed is compared with the quantity actually dosed.

This can be according to the tank contents level indicator or by weight difference before and after. The quantity displayed is corrected to read the quantity actually dosed.



Method

1. Place the tank on level ground and fill it up with water until the level reaches a unique mark on the tank contents level indicator, e.g. 1000 litres.
2. Open all boom sections.
3. Go to menu [3.2.3 Tank method] and switch the main ON/OFF to ON.
4. Engage the P.T.O. The display unit will then begin to count the volume being emptied through the nozzles.
5. When for example, 600 litres have been emptied out, as shown by the tank contents level indicator, disengage the P.T.O. and switch the main ON/OFF to OFF.
6. Press .
7. Correct the volume shown on the display with the navigation keys to read the volume shown on the tank contents level indicator.
8. Press  to confirm.

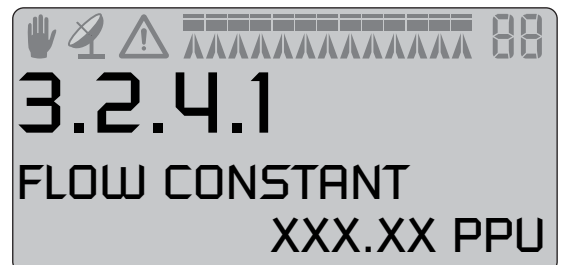


Menu 3.2.4 Circulation

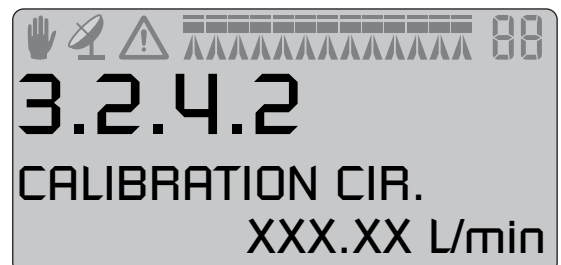
The following is only relevant for sprayers equipped with circulation liquid system with 2 flowmeters. The circulation type liquid system has to be set up from the Extended menu at installation. The HARDI Service centre does this.




See menu [3.2 Flow calibration] for calibration of "Flow 1". Flow constant from "Flow 1" is shown.

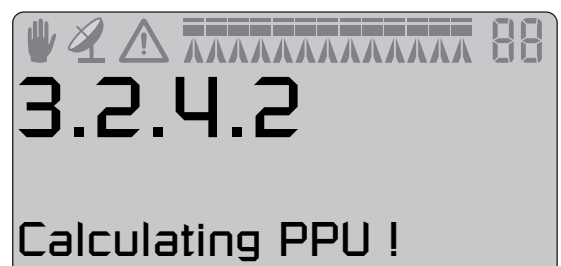


"Flow 1" is used as a reference when calibrating circulation flow, "Flow 2".



Method

1. Ensure all boom sections and end nozzles are closed.
2. Go to menu [3.2.4.2 Calibrate circulation].
3. Press . The automatic calibration is initiated and line 4 will show "Calculating PPU".
4. When finished the menu returns to [3.2.4.1 Flow constant] to show the new PPU.



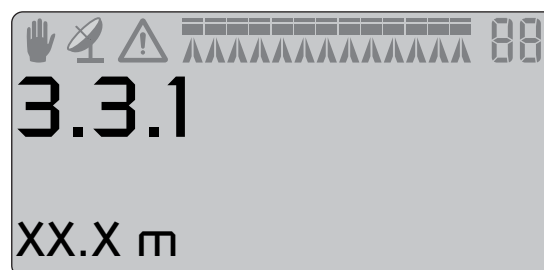
7 - Menu 3 Calibration

Menu 3.3 Boom

Menu 3.3.1 Width

Use the navigation keys to enter boom width.

Press  to confirm.

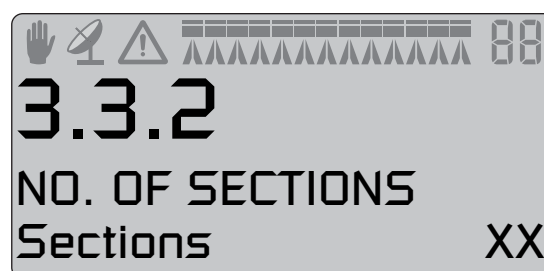


Menu 3.3.2 Number of sections

Use the navigation keys to set number of boom sections.

Press  to confirm.


For mistblowers, see section on mistblowers.



Menu 3.3.3 Nozzles/section

Use navigation keys to set correct number of nozzles per section.

Press  to continue to next boom section.

Press  after the last section.



Menu 3.3.4 End nozzles (optional)

If end nozzles are fitted, set the value to the equivalent coverage by the boom nozzles. E.g. End nozzle coverage is 2 metres. This is equal to [04 Boom nozzles].



ATTENTION! It is important that the volume applied from the end nozzle matches the volume applied under the boom. This is a comparison of volume per minute per length. (Litre/min/metre).

When the end nozzle is active, the area covered and volume sprayed is calculated and registered. If "Active boom size" is displayed, it will show an increase when the end nozzle is activated.



Menu 3.4 Regulation constant

Regulation constant

The sensitivity of pressure regulation valve can be adjusted. The goal is to find a value where the regulation does not overshoot the set point, but slows down and stops right before the set point.

Increasing the regulation constant will give a faster response on the pressure regulation valve. If the constant is too high, the valve will become unstable. There will also be excessive wear on the valve.

The range is in percent and is typically set between 30% to 50%. Begin with regulation constant set at 50%.

Monitor the regulation valve, does it overshoot? Then adjust until the valve slows down and stops right before the set point:

If yes it overshoots, reduce the regulation constant in steps of 5%.

If no it do not overshoot and the valve stops far away from the set point, then increase constant in steps of 5%.

7 - Menu 3 Calibration

Menu 3.5 Tank gauge

General info

This menu item is only present if the HARDI Tank Gauge is fitted. For increased accuracy it is recommended to do the flow calibration [3.2] before proceeding.

Present accuracy is up to +/- 25 litre. This is at the widest liquid surface area in the tank. The smaller the liquid surface area, the more accurate the readout. The accuracy is also affected of the sprayer being level. Assume the height of hitch point measured from the ground should be 550 mm, then readout of tank contents changes with the hight of the sprayer at the hitch point. In the schematic an example of the difference in tank contents can be seen.

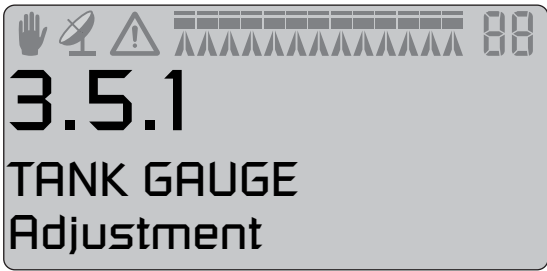
Height at hitch eye	COMMANDER 3200	COMMANDER 4400	COMMANDER 6600
Actual content*	2800 litre	3900 litre	6000 litre
450 mm	2900 litre	4000 litre	6100 litre
500 mm	2950 litre	3950 litre	6050 litre
550 mm**	2800 litre***	3900 litre***	6000 litre***
600 mm	2750 litre	3850 litre	5950 litre
650 mm	2700 litre	3800 litre	5900 litre
*known amount of water measured with a calibrated flowmeter.			
**specified height.			
***Displayed contents at correct hitch height.			

Menu 3.5.1 Adjustment

The correction factor for the specific gravity of the liquid sprayed can be set.

Default value is 1.000.

For liquid fertilisers, the specific gravity may range up to 1.3 kg/L. The value in this case would be 1.300.



Method

1. Press to change value.
2. Use and to move cursor to the figure to be changed.
3. Change figure by pressing and .
4. Repeat until all figigures are correct. Confirm setting by pressing .




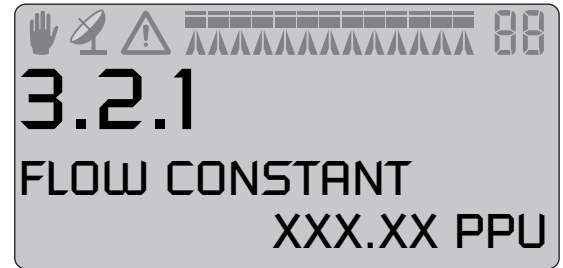
Menu 3.5.2 Total

Calibration of the HARDI Tank Gauge is necessary to take in account height of hitch point on the tractor and tyre mounting. Avoiding this may result an inaccurate calculation of the tank contents.

Therefore it is recommended to begin the custom calibration with connecting the sprayer to the tractor that will be used for spraying. Later changes of tractor can affect the accuracy of the Tank gauge.

To make a custom calibration of TankGauge, do the following:

1. Check that menu [3.2.1 Flow calibration] uses the correct PPU value corresponding to the sprayers flow housing.
2. Go to menu [3.5.2 Total].
3. Fill the sprayer completely up to the filler lid in the top of the tank, with a known amount of water, using an external calibrated flowmeter. Alternatively weight the sprayer before and after filling, and note the weight difference.
4. Press .



ATTENTION! As the accuracy of the custom calibration is affected, it is of high importance that the external calibrated flowmeter measures the correct quantity within a 2 % deviation. Same accuracy of 2 % must be kept if weighting the sprayer before/after filling is used.



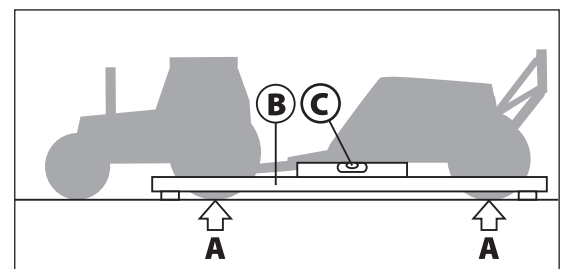
WARNING! Do not leave the sprayer whilst filling the tank and keep an eye on the level indicator in order NOT to overfill the tank.

5. Press  after ensuring the sprayer is level. Refill the tank up to the tank lid if the sprayer is re-levelled.

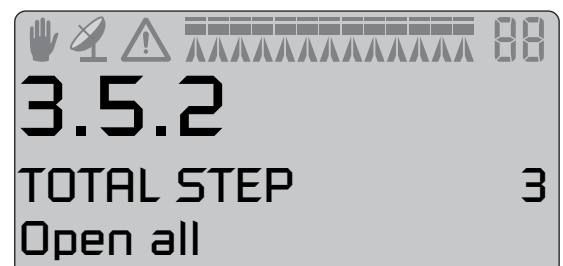


Levelling the procession of sprayer is of great importance as the accuracy is directly affected!

Assumed that the same tractor will be used after custom calibration, it is not necessary for the sprayer to be level itself. But the whole procession of tractor and sprayer (A) need to be level.



6. Engage the pump and set P.T.O. revolutions at 540 rpm or 1000 rpm (depending on pump model).
7. Open all boom sections and empty the tank.









7 - Menu 3 Calibration

8. The pulses from the flow transducer are logged as data points. During this session the screen shows: [xxxx] as the actual water level in millimetres and [yyyyyyy] is the number of pulses from the flow meter.



ATTENTION! The definition of having an empty tank, is when no spray comes out of the nozzles anymore. Note that when empty, there will still remain about 10 litre in the sump of the tank.

9. Press  when the tank is empty.
10. Correct the displayed volume to the actual volume sprayed out. Use the  or  and change digit with  or . Actual volume is the volume filled with the calibrated flowmeter.
11. Press . The new custom gauge table is calculated and the calibration of the HARDI Tank Gauge is finished.



Menu 3.6 Track

General info

There is no standard setting for the Track set up. The Track needs to be adjusted for different kinds of tractors, the sprayer and spraying practices and can only be found under the actual conditions.

For example; for spraying done at high speed (20 to 25 km/h), the Track must be set up so it reacts slowly and the dead zone could be set higher than the standard setting.

Another example; spraying with relatively low speed (7 to 10 km/h) in a crop where the precision must be high, the dead zone can be reduced for more precision.

For each adjustment is described what happens if the setting is changed and what effect will it have on the sprayer.

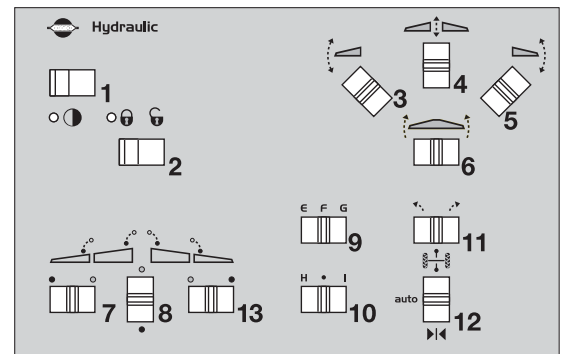
Track


The Track is operated at the hydraulic control box. The following switches are used for this purpose:

11. Manual track switch
12. Track selection switches

The track selection switch (12) has 3 positions:

- A. When the switch is in the lowest position the sprayer will align to be in position for folding the boom.
- B. When the switch is the middle position the system is in auto and the sprayer track will follow the track from the tractor.
- C. When the switch is in the upper position the system is in manual, and the switch (11) can be used for steering the sprayer right and left.

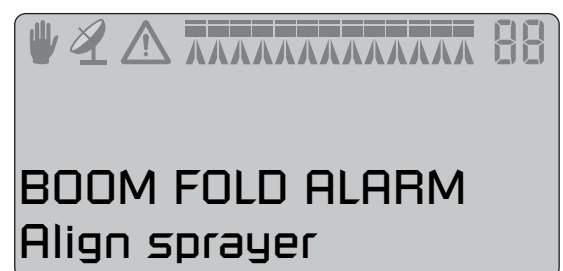


If unsafe driving occurs an alarm will be triggered, and the sprayer will align. Press  to turn alarm off. Switching to “manual” (12) or pressing “align” (12) will also turn alarm off. Be aware that the alarm can not be turned off as long as unsafe driving still occurs!



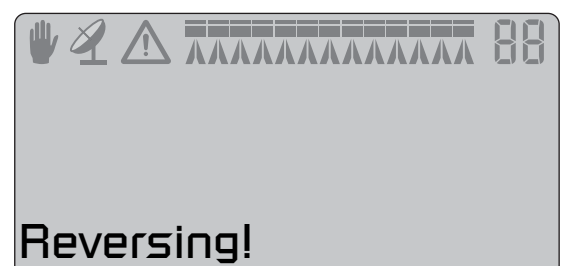
ATTENTION! When driving in hilly terrain (crab walk) in auto mode the manual steer button (11) can be used to optimize the tracking. Before reaching the headland switch the track selection switch (12) to manual and back to auto to neutralize the offset.

Before folding the track selection switch (12) must be set in the “align” position before any boom folding takes place. Failure to do this will cause an alarm signal when pressing a folding switch. Press track selection switch (12) down to align the sprayer and re-start the folding procedure.



Reversing the sprayer

When reversing the sprayer the controller will prompt “Reversing!” in the display. When the track is in “auto” mode, then the track will lock in the position it had when the tractor was stopped. This means that same steering angle, if any, will be kept when the sprayer is reversed.



7 - Menu 3 Calibration

Menu 3.6.1 Track width

Here the track width can be entered. The track is measured from right side tyre centre to left side tyre centre of the sprayer wheels. It is important that the right track width is entered. The controller will calculate the speed to the centre of machine and not the speed of the wheel.

If the track width is incorrect, it will influence on track precision and the safety factor.

Factory setting: 180 cm



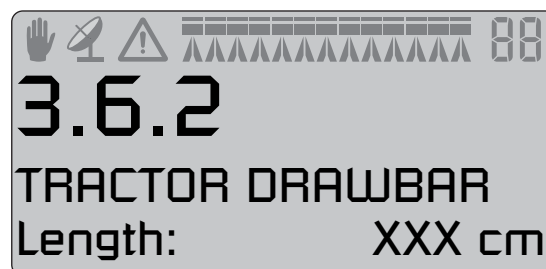
Menu 3.6.2 Tractor drawbar

Here the length of the tractor drawbar is entered. The measurement is from the centre of the tractor rear axle to the centre of the drawbar pin. This has to be adjusted every time a new tractor is hooked on to the sprayer. When hooked on, check the rigidity of the tractor drawbar mounts. There must be no sideways movement.

Factory setting: 80 cm

Too short measurement: The Track reacts faster, but will make the sprayer steer too large curves.

Too long measurement: The Track reacts slower, but will make the sprayer steer to short curves.



Menu 3.6.3 Dead zone

This is the non regulation zone when the sprayer is straight behind the tractor. If the sprayer is oscillating in the hydraulics when driving straight, this value must be increased.

Factory setting: 5 cm: Over 15 cm not recommended.

Decreasing value: Reacting on small deviations. Tendency to oscillate that will damage the boom. High precision, but more unstable driving with small corrections all the time.

Increasing value: No oscillation but tendency to sway. Low precision, but very steady driving with less corrections.



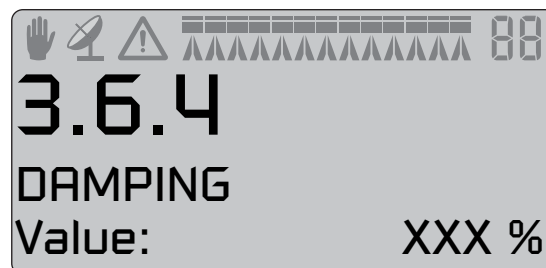
Menu 3.6.4 Damping

If the system is too aggressive the damping constant must be increased. Failure to do so may damage the boom.

Factory setting: 50%

No damping (0%): High precision, but very unsteady. Fast reaction time, but more aggressive movement that potentially can damage the boom.

Full damping (100%): Low precision, but very steady. Slow reaction time, but less aggressive.



Menu 3.6.5 Alignment offset

Here the fine tuning of tractor and sprayer alignment is done. This is to compensate if the front potentiometer is placed offset to the centreline when the sprayer is attached.

Note +/- can be changed with  and 

Factory setting: 0 %

Negative setting will move the sprayer to the left of the track, and positive setting will move the sprayer to the right of the track. The sprayer must follow the tractor in a straight line in all situations. If the value is over 10 cm, it is recommended to manually adjust position of the front angle sensor.



Menu 3.6.6 Sensitivity




The purpose of this menu, is to adapt the track regulation to the tractor hydraulics and to the characteristics of the sprayer hydraulics system. Preferably this is done in the field.

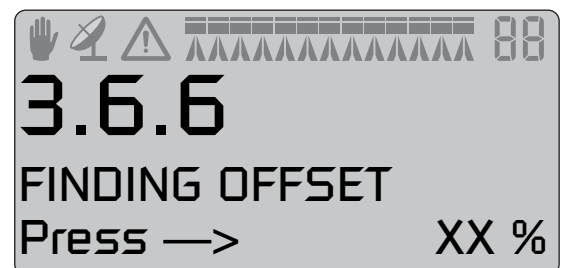
Calibration procedure is divided into 4 steps where an offset and gain value is found to both left and right movement, 4 values in all.

Method:

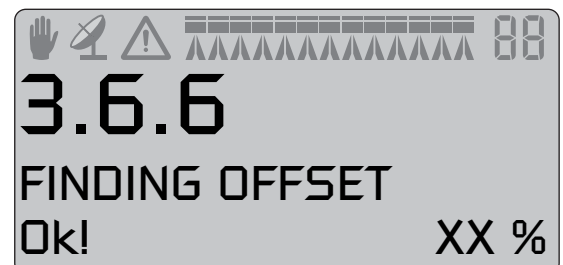
1. Unfold boom and without driving set P.T.O. to spraying R.P.M.
2. Press down the track mode button to align sprayer and then set the track mode button into middle position to enable "auto" at the controller.


First left/right offset is found:

3. Go to menu [3.6.6 Sensitivity] and select "Yes" with  or  and press . Calibration starts.
4. Press and hold the manual track button to the direction indicated by the arrow in the display. Display will show an increasing percentage ending with an "OK" when offset is found.



Afterwards same procedure is repeated for opposite direction.

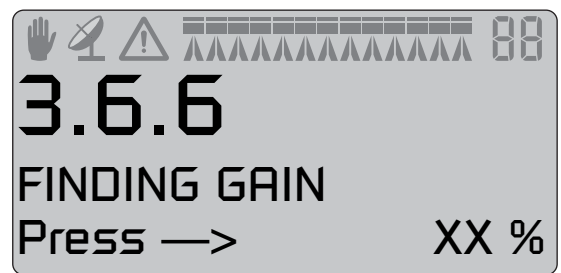


ATTENTION! If values has not been reached at 40 % the display will read "Fail!". Accept this by pressing . Then increase hydraulic oil flow from tractor and retry calibration again.

Then calibration automatically continues with gain calibration:


7 - Menu 3 Calibration

5. Press and hold the manual track button (11) to the direction indicated by the arrow in the display. Display will show a counting percentage ending with an "OK" when gain is found.



6. Afterwards same procedure is repeated for opposite direction



7. The display reads "CALIBRATION OK" when calibration has finished. Confirm and leave menu by pressing .




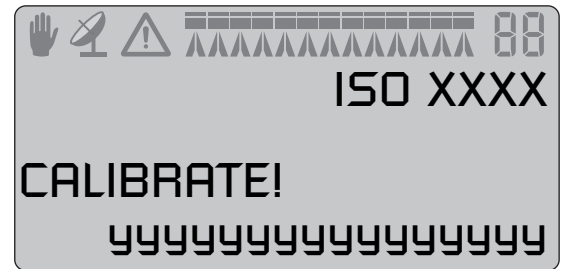
Emergency Track

If a problem with the Track should occur, please see "Menu 4.7 Emergency Track".




Menu 3.7 LookAhead

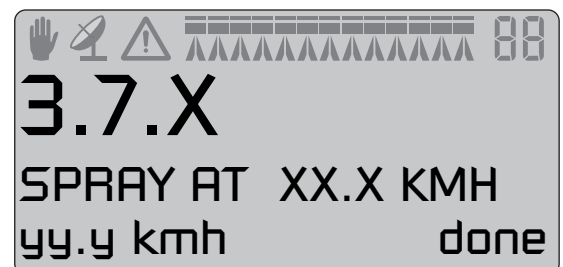
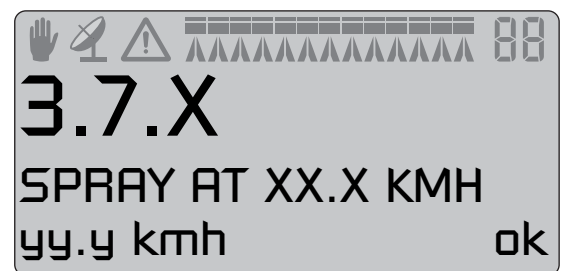
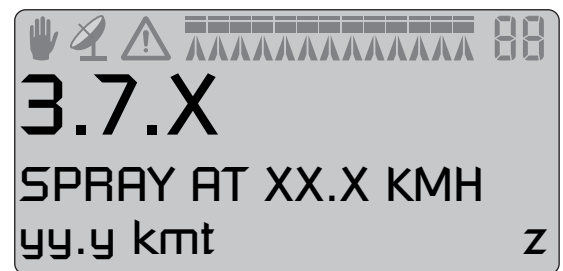
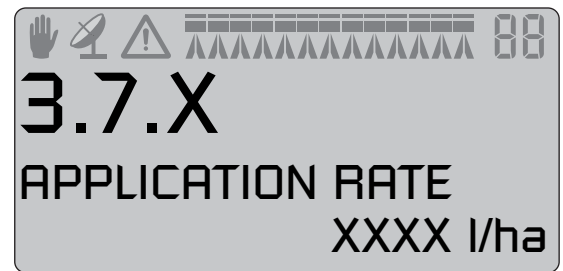
Menu 3.7.X LookAhead calibration

At start-up of the HC 5500 user is prompted for a nozzle choice. If the selected nozzle holds no LookAhead calibration in the HC 5500 memory, it will need to be calibrated. Press  to enable "auto" mode prior to calibration.




Calibration method

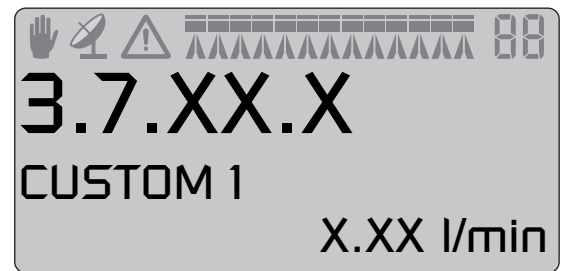
1. Press  to begin calibration. Enter an application rate in the display suitable for this nozzle.
2. Confirm by pressing .
Two spraying speeds for calibration are now calculated in the HC 5500.
3. Start spraying at the suggested speed shown in the 3rd line. Speedometer in 4th line of display shows actual speed.
4. While spraying at suggested speed, a digit in lower right corner of display is counting up to 9. If calibration value is found a "ok" is shown in the display. If a value is not found, the digit start re-counting up to 9 until a value is found.
5. Another suggested speed is now shown in the display. Repeat point 3 and 4 again for this 2nd suggested speed.
6. The digit in right corner counts up as told in point 4. But when a value is found it will this time be shown with a "done" as calibration now has finished.
7. Leave calibration by pressing .



7 - Menu 3 Calibration

If custom nozzle LookAhead calibration is selected the flow at 3 bars must first be defined.

1. Enter value.
2. Confirm by pressing .
3. Do all the above calibration routine as usual.



ATTENTION! To calibrate, the speed must exceed the minimum speed set in the controller memory. If minimum driving speed is set too high, please contact your local HARDI dealer.



ATTENTION! If all section valves are turned off then LookAhead is standby. When turning single sections off, e.g. in wedge shaped fields, then last valve must be turned off by using the main on/off.



ATTENTION! During the entire calibration process the fluid system should be in "Auto" mode. If not, press * to enable it.



ATTENTION! When using very large nozzles it could be necessary to reduce speed until application rate is stable.




ATTENTION! If controller suggest a speed lower than min. regulation speed, then choose a higher application rate.

Menu 4.1 Measure

Trip meter

This is a simple electronic trip meter. You can measure distance. If the implement width is entered in menu [4.1.3 Working width], area can also be measured in menu [4.1.2 Area].

Use  to clear the value.

8 - Menu 4 Toolbox

Menu 4.2 Service intervals


Menu and intervals

Service intervals and a nozzle check are programmed into the Controller. This makes it easier for the operator to remember the service intervals.

From the factory, the Controller is set up with three service and a nozzle check reminder.

Menu & interval	Hours	Action
[4.2.1 Check filters]	10	See sprayer instruction book, Maintenance.
[4.2.2 Grease boom]	50	See sprayer instruction book, Maintenance.
[4.2.3 Grease track and centre]	250	See sprayer instruction book, Maintenance.
[4.2.4 Miscellaneous service]	-	Not defined from factory.
[4.2.5 Check nozzles]	50	Check flow rate. Change nozzles if more than 10% of rated flow.

Entering the above menu's will display the hours remaining until next service. The importer or dealer may have added a "Miscellaneous service" Interval. If no interval is set, [Miscellaneous service not defined] is shown.

Press  to register service or control, if displayed when switched on. The warning  will remain present until the service interval is reset.

Service interval reset

To reset service interval, go to relevant interval menu listed:

Menu & interval	Hours	Action
[4.2.1 Check filters reset]	10	See sprayer instruction book, Maintenance.
[4.2.2 Grease boom]	50	See sprayer instruction book, Maintenance.
[4.2.3 Grease track and centre]	250	See sprayer instruction book, Maintenance.
[4.2.4 Miscellaneous service]	-	Not defined from factory.
[4.2.5 Check nozzles]	50	Check flow rate. Change nozzles if more than 10% of rated flow.

Press  to reset hour meter.

Press  to confirm.

Menu 4.3 Stop watch

Use as timer

The clock can be used as a timer.

Press  to start and stop.

Use  to clear the value.

8 - Menu 4 Toolbox

Menu 4.4 Alarm clock

How to use alarm

The clock can be set to give an alarm when the time is reached.

Press  or  to set alarm and confirm with .

Menu 4.5 Test

How to test

All readouts for the transducers are in accumulated counts, i.e. one signal gives one count, except for optional (analog) transducers that is read in milli-ampere.

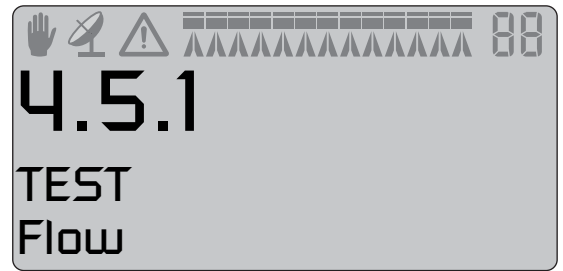
Go to menu [4.5 Test]. Choose the item to be tested and open the menu. Activate sensor and see if the signal is detected.

[4.5.1 Flow]. Enter this menu to test the flow sensor.

[4.5.2 Speed].

[4.5.3 Optional sensor].

[4.5.4 Active switches].



8 - Menu 4 Toolbox

Menu 4.6 Speed simulation

How to use speed simulation

Speed may be simulated for certain purposes. A two figure value may be entered. The state remains valid until the Controller is restarting or the value is set to "0".

Menu 4.7 Emergency Track

Menu 4.7 Emergency Track

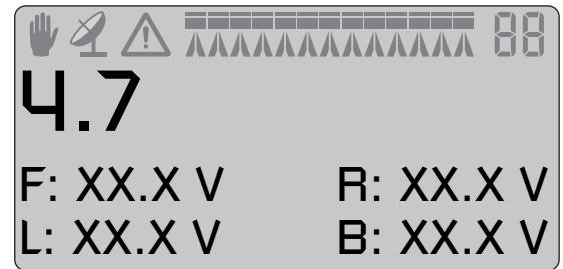
When this menu is entered the "bypass" function is active, so that all sensors are ignored. The system can be operated manually so it is possible to fold the boom and drive home. In the menu the sensor voltages can be checked, which is useful for the HARDI service to solve the problem.

F: Front potentiometer

R: Rear potentiometer

L: Lock sensor (optional on IntelliTrack; no sensor reads 00.0 Volts)

B: Boom sensor



Lock sensor (optional on IntelliTrack)

If the lock sensor indicates "released" (high voltage) and the track selection switch is in either "auto" or "manual" it is possible to use the "Left/Right steer" and "Fold inner in" switches disregard any other inputs the Controller receive from sensors.

If the lock sensor indicates "locked" (low voltage) and the track selection switch is in either "auto" or "manual" it is possible to use "Fold inner in" switch disregard any other inputs the Controller receive from sensors. Manual or automatic tracking is not possible.

If the track selection switch is switched to "align" the trapeze lock is attempted locked disregard any sensor reading. No automatic align is attempted. Manual or automatic tracking is not possible.

Once the boom is folded into transport position, exit the menu. This will activate the track lock if it is not damaged. As an extra security, switch power to HC 5500 to OFF and stop oil flow to the sprayer.



DANGER! Emergency only. Don't track with the boom folded! Safety system is disabled.



ATTENTION! Note this menu is only shown if Jobcom hardware is fitted, and the software is enabled.

Menu 5.1 Print

What you can print

This menu has to do with printing of data.

The following can be printed via the 12 volt printer.

[5.1.1 Register number] A specific register

[5.1.2 All registers] Register 1 to 99. Only active ones will be printed.

[5.1.3 Configuration] This records all the parameters of the Controller.

Two examples of printouts is shown. To the left is a printout of a specific register (menu 5.1.1). To the right is a printout of the configuration (menu 5.1.3).

HARDI HC5500			HARDI HC5500 - Configuration		
Serial number	06023892		Serial number	06023892	
Register	12/ERIK		SW version	3.38	
Volume applied	0 L				
Area	0.00 ha		1	Daily settings	
Travelled spray distance	0.0 km		1.1	Volume rate	300 L/ha
Start time	00.00.00		1.2	Tank contents	29 L
Stop date	00.00.00		1.3	Select register	12
Stop time	00:00		2	Setup	
Time used (spraying time)	00:00		2.1	Display readout	
Work rate	0.00 ha/h		2.1.1	Pressure	
Average spray speed	0.0 km/h		2.2	AUTO functions	off
Max. spray speed	0 L/ha		2.2.1	Auto ON/OFF	Disable
Average volume rate	0 L/ha		2.2.2	Foam marker	Disable
Date printed	19.02.08		2.2.3	Dual line	off
Time printed	18:35		2.3	VSA/Remote	off
Notes:			2.4	Set clock	19.02.08 18:38
			2.5	Alarms	
			2.5.1	Volume rate	+/- 0 %
			2.5.2	Tank contents	0 L
			2.5.3	Pressure	
			2.5.3.1	High limit	10 bar
			2.5.3.2	Low limit	0 bar
			2.5.4	Fan speed	
			2.5.4.1	High limit	0 rpm
			2.5.4.2	Low limit	0 rpm
			2.5.5	Speed	
			2.5.5.1	Maximum value	10.0 km/h
			2.5.5.2	Minimum value	1.0 km/h
			2.5.6	Audio level	0
			2.5.7	Sections off	Enable
			3	Calibration	
			3.1	Speed	
			3.1.1	Sprayer	Active
			3.1.1.1	Constant	8.730 PPU
			3.1.2	Tractor	
			3.1.2.1	Constant	1.000 PPU
			3.1.3	Radar	
			3.1.3.1	Constant	1000.000 PPU
			3.2	Flow	
			3.2.1	Flow constant	121.60 PPU
			3.3	Boom	
			3.3.1	Width	28.0 m
			3.3.2	No. of sections	7
				Nozzles/section	7; 7; 9:10:0



ATTENTION! For UCR and configuration printout, total area and total average volume rate values are not relevant.

9 - Menu 5 Logbook

Menu 5.2 Data dump

How to dump data

Enables data dump to an office printer. This could be done for example, by using the Hyper Terminal function in Microsoft Windows. Note the Hyper Terminal has to be activated and a communication cable (ref. no. 72271600) and 12 volt power supply to the Controller and Spray Box is needed.

The Hyper Terminal baud rate should be set at one of the following before transmitting data:

19200 baud

9600 baud (HC 6500 default)

4800 baud

2400 baud

1200 baud

If only the display unit is to be removed from the tractor, a 12 Volt power supply cable (ref. no. 72244500) is necessary. The following can be printed to an office printer.

[5.2.1 Data dump of raw data]

[5.2.2 Hyper terminal service report] Permits data to be set up with a column header.

Soft keys

General info

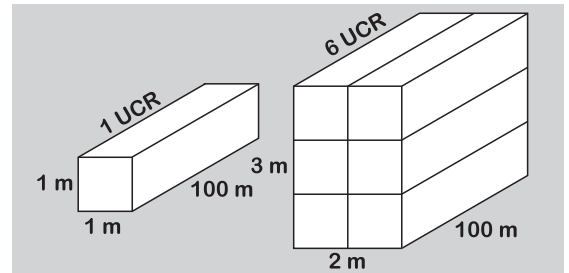
Points to note if the system is used on a mistblower.

- For flow calibration, the Tank method is easiest.
- Fan revolutions can be read on the display if transducer is fitted.

Unit Canopy Row

Unit Canopy Row (UCR) is a calibration method based on the height and width of the canopy and the row length rather than area. UCR takes into account the three dimensions of a fruit tree or vine.

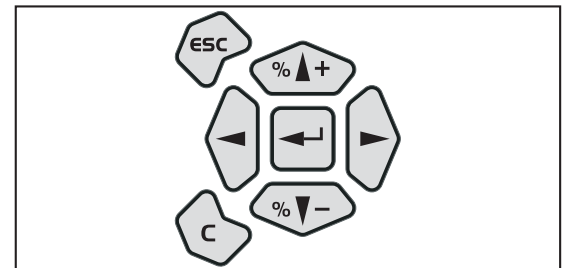
UCR is defined as a unit of canopy measuring 1 metre wide x 1 metre high x 100 metre long. Future labelling of pesticides may include rate/UCR.



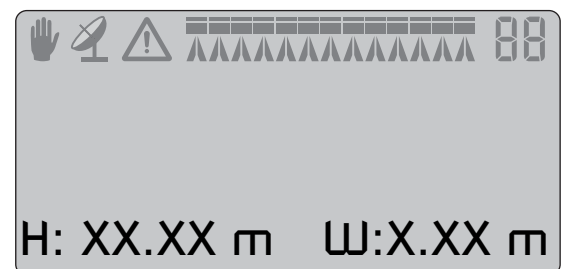
How to control canopy

The Controller can be set up for mistblower to handle UCR. This is done by your local HARDI dealer. Please contact your HARDI service centre if the Controller is not set up for UCR. Once done, the 3rd line of the screen will show crop width and height and the application unit will be UCR. The crop width and height can be changed during the season or on the go with the arrow keys to match the canopy size:

- To increase of canopy height, in steps of 25 cm
- To decrease of canopy height, in steps of 25 cm
- To increase of canopy width, in steps of 25 cm
- To decrease of canopy width, in steps of 25 cm



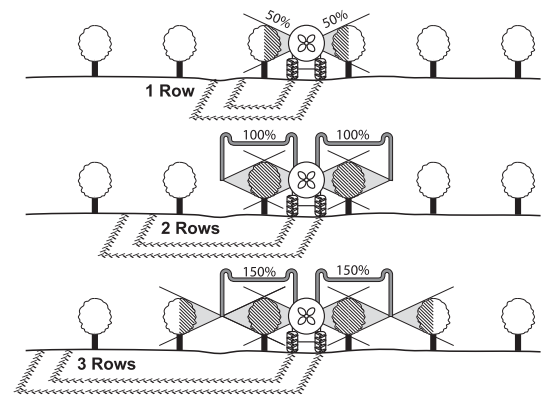
Fixed read out of canopy measures.



10 - Mistblowers

Fixed read out of canopy measures

The width is defined as the number of rows the sprayer can cover. This is readout only and can not be changed. It is a result of the data in menu 3.3.3. See the diagram on row coverage definition.



Menu 3.3.2 Number of sections

This describes the controls of the orchard sprayer. Typically, they have 2, a left and a right.

Example

Orchard sprayer with 2 section Spray box that is capable of spraying two complete rows.

Menu [3.3.2 Number of sections] = 2

Menu [3.3.3 Section size] = 100%

Menu [3.3.1 Width] is readout only and it will show "2 rows".

Menu 3.3.3 Section size

Section width is entered in % row coverage. If a section covers half a row, the section coverage must be set to 50%. If a section covers 2 rows, the width must be set to 100% per section.

Off-season storage

Storage

When the tractor and sprayer is parked, disconnect the power supply to the Spray Box. This will stop the system from using power.

The Controller and Spray Box should be protected from moisture and should be removed if the tractor does not have a cabin.

Emergency operation

In an emergency situation

The Spray Box can operate the control unit without the Controller. If you suspect the Controller is faulty, disconnect it from the Spray Box. Spraying can now be continued. If the fault persists, it is not the Controller.

12 - Fault finding

Operational problems

Operational faults

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Area is not being measured.	Boom width or speed constant have not been entered. Missing speed sensor.	Enter the values in menu [3.3.1 Width] and [3.1 Speed calibration]. Check the sensor using menu [4.5.2 Speed], check the cable to the sensor for damage. If necessary, replace the sensor. Check sensor location [3.1 Speed calibration].
The volume rate L/ha is continuously displayed at "0".	Constant has not been entered. Pulses of the flow meter are not reaching the sprayer control unit.	Enter constant in menu [3.2.1 Flow calibration]. Check wiring. Check the impeller of the flow meter, using menu [4.5.1 Flow] - it may be stuck.
The volume rate display is not correct.	The flow meter is not working properly. The area is not being registered.	Test the flow meter using menu [4.5.1 Flow]. Check boom width and adjust if necessary. Re-calibrate speed [3.1 Speed].
The intended volume rate cannot be reached. The volume is below the pre-set rate.	The pressure motor has been wrongly poled. The rate is controlled downwards instead of upwards. The pump cannot deliver the required amount. The filters are blocked. Wrong flow PPU.	Check the control by using the +/- keys in manual mode. Change the control motor connections if necessary. Increase PTO speed. Change to a lower gear. Clean the filter. Check PPU using menu [3.2 Flow calibration].
The volume rate lies above the pre-set rate.	The pressure motor has been wrongly poled. The rate is controlled downwards instead of upwards. The return flow from the pressure motor to the tank cannot take superfluous quantity.	Check the control by using the +/- keys in manual mode. Change the control motor connections if necessary. Check the tube system. Reduce the power of the pump (lower PTO speed, higher gear).
Volume application rate not stable when only one or two boom sections are open.	Flow below minimum frequency of flow transducer.	Set pressure manually when spraying with so sections. Install a pressure transducer. Under 5 Hz from the flow transducer will result in the system switching to pressure based sensing for volume application rate.
Safetrack not responding.	Sensor not reading correctly. No speed signal.	Check menu [4.7 Emergency track] and correct sensor distance, replace sensor. Check sensor using menu [4.5.2 Speed]

Mechanical faults

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
No speed readout.	Incorrect speed sensor location chosen. Defect sensor or cable.	Select the correct sensor on Sprayer, Tractor or Radar in menu [3.1.1 , 3.1.2 or 3.1.3]. Check sensor using menu [4.5.2 Speed].
Error message that fuse is active.	Short circuit in system. The Spray box has 3 thermal fuses: Fuse 1 = Section valves to left side of centre and centre switch. Fuse 2 = Section valves to right of centre switch. Fuse 3 = Short circuit in options and pressure regulation.	Turn power OFF and locate problem. When fuses has cooled down the system can be powered on again.
Error message "Low voltage".	Voltage below 9 Volts.	Check battery and connections.
Speed readout not stable.	Perforated wheel transducer plate fitted back the front. Speed transducer set to close to upper or lower sides of perforated wheel sensor plate.	Relocate transducer.
Attempt to release lock, but no "release" signal from lock sensor.	No hydraulic pressure. Misadjusted lock sensor. Mechanical defect.	No hydraulic pressure. Misadjusted lock sensor. Mechanical defect.
Attempt to lock, but no "lock" signal on sensor input.	Lock sensor misadjusted. Mechanical defect prevents lock to penetrate hole. Misadjusted rear angle sensor.	Adjust lock sensor gap to max. 5 mm. Change defected parts. Adjust rear angle sensor to center.
Lock is detected released unintentionally.	Poor lock sensor adjustment. Lock cylinder fallen off.	Re-fit new lock cylinder. Adjust lock sensor gap to max. 5 mm.
Lock is detected released.	Hydraulic pressure established. Misadjusted lock sensor.	Adjust lock sensor gap to max. 5 mm.
Lock is detected locked unintentionally.	Missing hydraulic pressure on lock cylinder. Misadjusted lock sensor.	Check pressure from tractor. Adjust sensor gap to lock to max. 5 mm.
No lock release when hydraulic pressure is established, and the HC 5500 is powered up.	Hydraulic pressure hoses P and T are turned around.	Turn hydraulic pressure around. T = blue P = red.
Power to Jobcom.	Power supply not sufficient. The power cable to the Jobcom has to be a unbroken power line from the battery.	The cable from the battery to Jobcom has to be 6 square millimetres. Fit 72266300 tractor power cable. The fuse on the cable has to be 25A.
Rear angle sensor alarm.	In menu 4.7 the rear angle sensor will read app. 0.02 Volt.	Check 10A fuse on DAH PCB in the Jobcom. Check sensor cables for damage.

12 - Fault finding

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Unable to lock the Safetrack.	The back angle sensor possibly need adjustment.	A 16-17 mm bolt is pasted in the calibrating hole on the lock. Then the rear angle sensor is adjusted to 2.50 Volt.
Alarm # 1	Lock is locked but it should be open.	Activate tractor hydraulics. Check/adjust lock sensor. Mechanical defect.
Alarm # 2	Attempted to lock but lock sensor signals not achieved.	Check/adjust lock sensor. Mechanical defect. Check/adjust angle sensor.
Alarm # 3	Lock is detected released unintentionally.	Poor lock sensor adjustment. Lock cylinder fallen off.
Alarm # 4	Lock is detected released unintentionally.	Missing hydraulic pressure on lock cylinder. Misadjusted lock sensor.
Alarm # 4	Section valve defective.	Change valve.

Testing and fine tuning

Fine tuning the flow constant - PPU

Calibration of the flow transducer is carried out with clean water but small changes may occur when adding pesticides or fertiliser. This will effect the final readings. This is typically noted when the volume displayed on the display does not equal the actual known volume that was sprayed out. The below formula can be used to “fine tune” the flow transducer PPU.

$$\text{NewPPU} = \frac{\text{Original PPU} \times \text{Displayed Volume}}{\text{Sprayed Volume}}$$

For example, the spray tank is filled with 2400 litres of spray liquid.

When sprayed out, the display showed a total of 2300 litres. (Original PPU = 120.0)

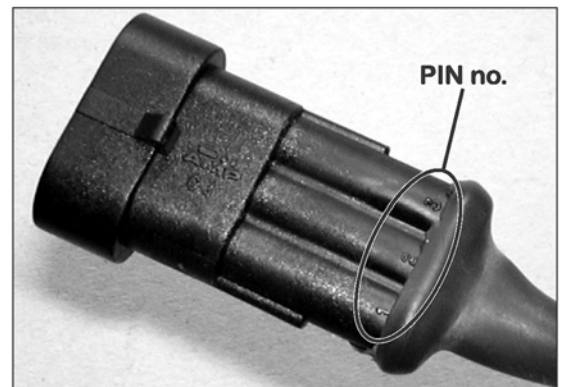
$$\text{NewPPU} = \frac{120\text{PPU} \times 2300\text{Litres}}{2400\text{Litres}} = 115,0 \text{ PPU}$$

Note the relation is inverse

- To raise the displayed volume, the PPU is lowered.
- To lower the displayed volume, the PPU is raised.

Pin & Wire connection

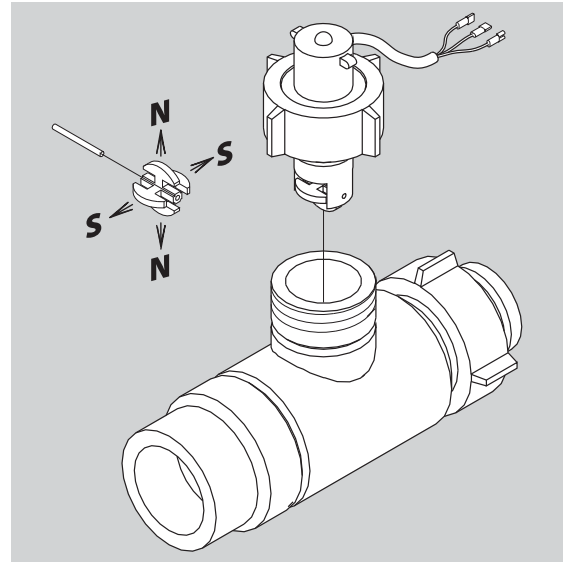
AMP Super Seal	Box	Color coding
2	Positive	Brown
3	Sig.	Blue
1	Negative	Black



13 - Testing and fine tuning

Testing flow transducer

- BROWN wire to positive of 12 volt battery.
 - BLACK wire to negative.
 - BLUE wire to multimeter positive.
1. Check the rotor turns freely.
 2. Each vane in the rotor has a magnet in it with the pole facing out. Check that the 4 magnets are present.
 3. Use a magnet to check that every second magnet in the rotor has the same pole orientation. The rotor magnets must be N - S - N - S.
 4. Connect negative from multimeter to negative of battery.
 5. Set multimeter to DC volt.
 6. By turning the mill wheel slowly, this will register approx. 8.0 +/- 1 volt with the diode on and 0.3 +/- 0.1 volt with the diode off with every second magnet.



Testing speed transducer

- BROWN wire to positive of 12 volt battery. BLACK wire to negative.
 - BLUE wire to multimeter.
1. Connect negative from multimeter to negative of battery.
 2. Set multimeter to DC volt.
 3. Bring a metallic object (distance 3 to 5 mm) up to the transducer. This will register 1.4 +/- 0.2 volt and the diode will turn on.
 4. By removing the object, this will register 12.0 +/- 1.0 volt. Diode is OFF.

Specifications

Specifications

Supply voltage:	12 Volt DC
Controlled shutdown "low battery":	9 Volt DC
Maximum supply:	16Volt DC
Maximum peak:	28 Volt DC
Ambient temperature:	– 5°C to + 70°C
Memory:	Flash PROM non-volatile
Digital transducers (option 2, 3 and 4):	Square signal
Frequency:	0.5 Hz to 2 kHz
Trigger high:	4.0 to 12.0 Volt DC
Trigger low:	0.0 to 2.0 Volt DC
Analog transducers (option 1):	
Supply:	12 V
Input:	4 to 20 mA
Minimum speed for volume regulation	0.5 km/h

Flow ranges for the flow transducers

Housing	Housing identification (A)	Flow range L/min.	Orifice mm	PPU value
S/67	Three grooves	1-30	6.0	310.00
S/67	Four grooves	2.5-75	9.5	180.00
S/67	One outside groove	5-150	13.5	120.00
S/67	No groove	10-300	20.0	60.00
S/67	Two outside grooves	35-600	36.0	17.00

Pressure drop over 13.5 mm orifice is 1 bar at 150 l/min.

Baud rate

The Controller is capable of running the following baud rates when transmitting data to an external component via the RS232 connectors:

- 19200 baud
- 9600 baud (HC 5500 default)
- 4800 baud
- 2400 baud
- 1200 baud

14 - Technical specifications

Materials and recycling

Disposal of electronics

Cardboard: Can recycle up to 99% and therefore should be put into the waste collection system.

Polyethylene: Can be recycled.

When the operating unit has completed its working life, it must be thoroughly cleaned. The synthetic fittings can be incinerated. The printed circuit boards and metallic parts can be scrapped.

Packaging information

Materials used for packaging are environmentally compatible. They can be safely deposited or they can be burnt in an incinerator.

Charts

Chart for recording values

Menu	Function	1 - Values	2 - Values	3 - Values
[3.2.1 Flow constant]	Flow PPU			
[3.1.X.1 Speed constant]	Speed PPU			
[3.4 Regulation constant]	%			

Index**A**

Alarms, 35
Alignment offset, 49
Auto functions, 32

B

Boom, 42
brackets, 19

C

Chart, 75

D

Daily settings, 23
Declaration of conformity, 7
Description, 14
Display readout, 31
Dual line, 32
dump data, 62

E

Emergency operation, 67
Emergency Track, 59

F

Flow calibration, 39
Flow constant, 39
Flow ranges, 73
flow transducer, 72
flow transducers, 73
Foam Marker, 32

H

Housing, 73

M

Main ON/OFF, 32
Mounting of tractor harness, 21

N

Nozzle method, 40
Nozzles/section, 42

O

Off-season storage, 65

P

Power supply, 21
PPU, 71, 73
Pressure based regulation, 25
Print, 61
Printer, 21

R

register, 29
Regulation constant, 43

S

Service interval reset, 54
Service intervals, 54
Spare parts, 79
Specifications, 73
Speed calibration, 37

Speed simulation, 58
Speed transducer, 22
speed transducer, 72
Storage, 65

T

Tank contents, 28
Tank gauge, 44
Tank method, 40
Test, 57
Track, 47
Tractor installation, 19
Trip meter, 53

V

Volume rate, 27

W

Wire connection, 71

Spare parts

To see updated spare part information the website www.agroparts.com can be visited. Here all parts information can be accessed when free registration has been made.



HARDI INTERNATIONAL A/S

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