CONTROLLER HC5500

Service Manual - SW 4.XX

679060-700 - Version 7.00
GB - 03.2008

www.hardi-international.com

Service Manual
HC5500

679060-700
Rev. 7.00
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Software 4.XX

Table of contents:

Introduction

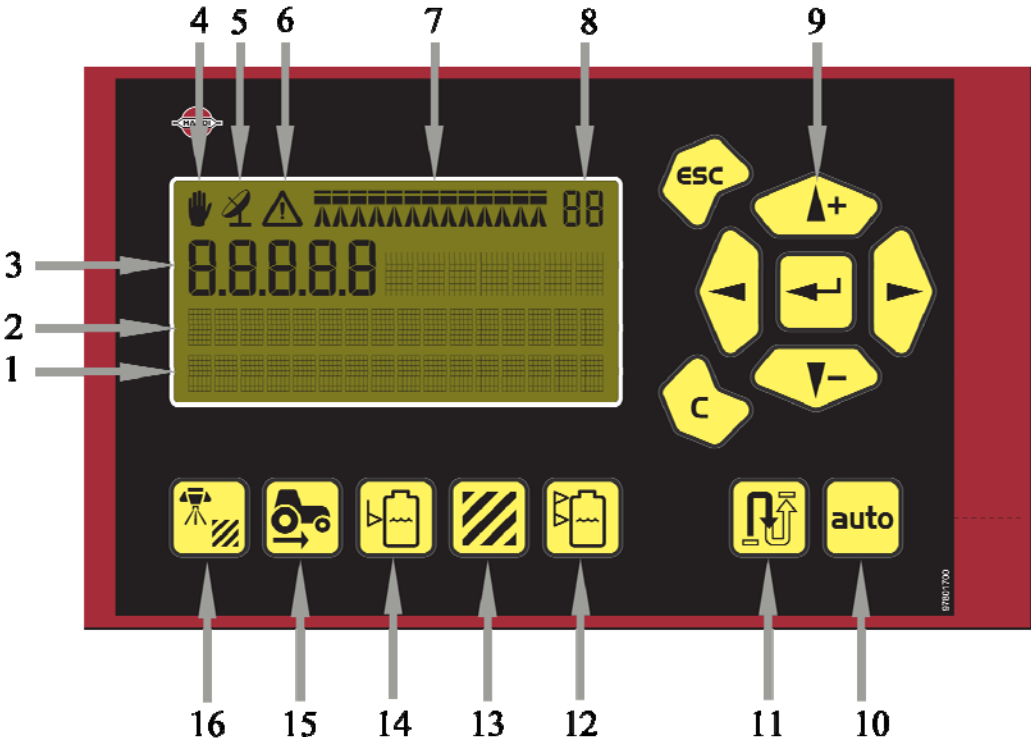
This manual covers the HARDI Controller 5500 and the options it supports like SafeTrack on the Commander and IntelliTrack on Navigator.

It assumes the reader has knowledge of the more basic HC2500. The menu systems, calibration and operations of the HC5500 are built up from the HC2500. The sensors used are also similar or the same.

This manual also at times has notes on the HC6500. This is because the HC6500 is built up around the HC5500 and has many similarities.

Specifications

HARDI HC5500 Controller:



Display:
1. 4th line
2. 3rd line
3. Main Readout
4. Manual
5. External rate
6. Warning
7. Boom line status
8. Register no.

Navigation keys:
9. Multi function keys

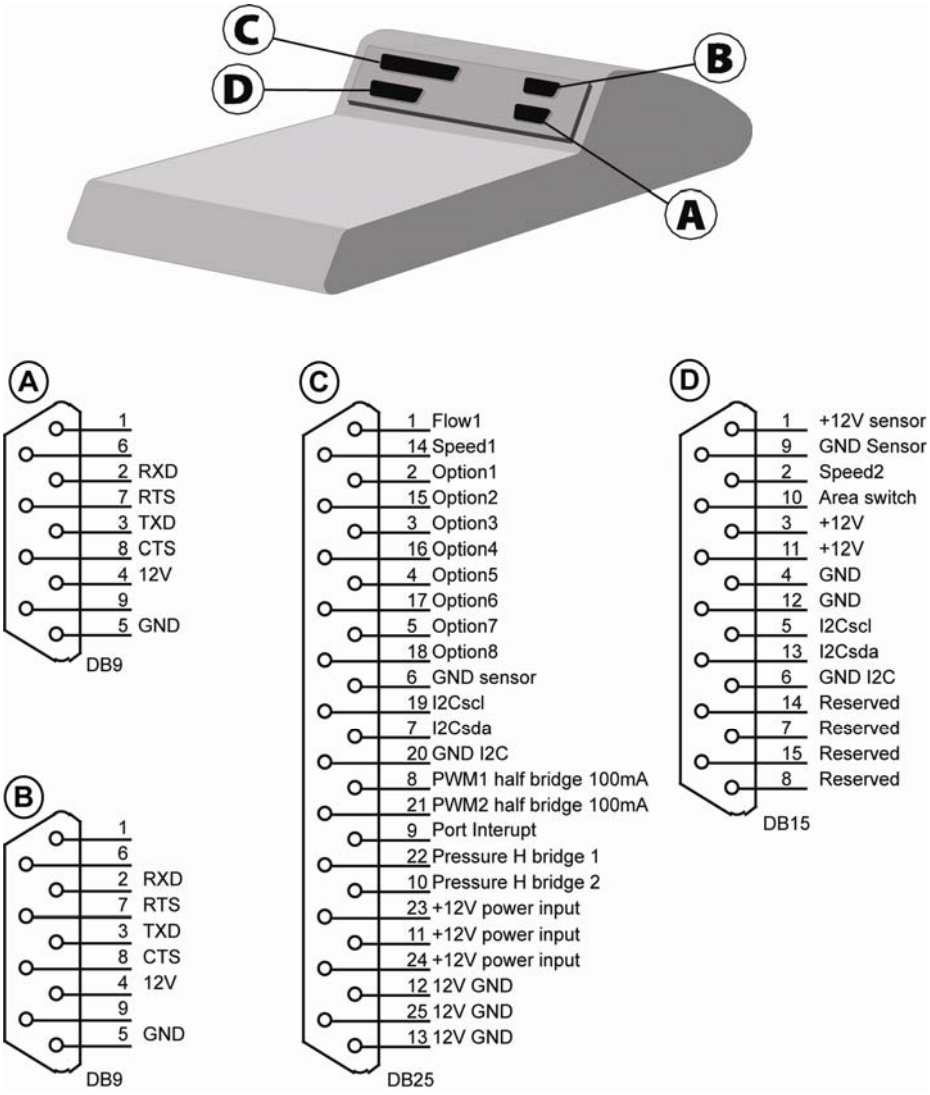
Readout presets & Short cuts:
10. Auto On
11. Remaining Distance or Area
12. Volume used
13. Area covered
14. Tank volume
15. Speed
16. Volume rate

HC5500, Spray box and Jobcom power supply and protection

Power supply:	
Operating range:	9-16V DC
Controlled processor shut down:	< 9 VDC
Protected against over voltage:	28 VDC
The electronics are protected against reverse polarisation of the power input.	
Ambient temperature:	– 5°C to + 70°C
Memory:	Flash PROM non-volatile
Analog transducers typ. press. (option 1):	
Supply:	12 V
Input:	4 to 20 mA
Minimum speed for volume regulation:	0.5 km/h
Digital transducers typ fan speed (option 2):	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

Functions and functionality

Connectors at the back of the HC5500:



The connectors functions are:

A: COM 1:

This can be used for dumping data, receiving data or for the connection to the printer. Use COM 1 for software updates.

B: COM 2:

This has the same function as COM 1, though not for software updates.

C: Control box:

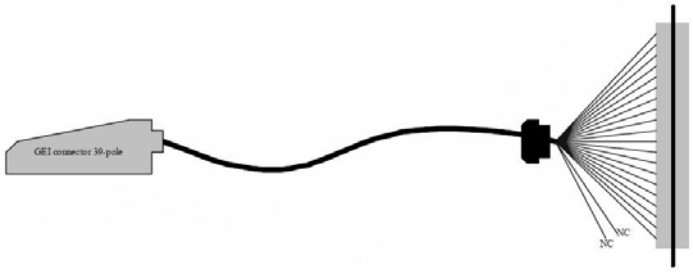
This is used for the liquid control box Spray I or Spray II box.

D: AUX:

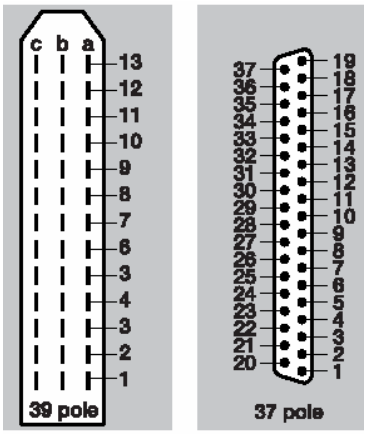
This is used if the tractor speed sensor or the foot pedal is connected to the HC5500. Harness P/N 28027600 is necessary.

Sprayer connection:

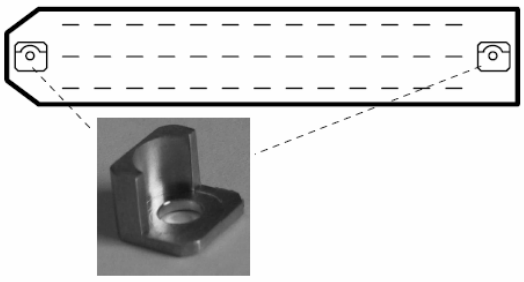
37–39 pole cable between HC5500 and the Jobcom / Breakout Circuit Board



39-pol	37-pol	Spray	Spray II
1a	5	S1+	S1+
1b	6	S1-	S1-
1c	26	END NOZZLE L	END NOZZLE L
2a	7	S2+	S2+
2b	8	S2-	S2-
2c	25	END NOZZLE R	END NOZZLE R
3a	9	S3+	S3+
3b	10	S3-	S3-
3c	29	+12V SENSOR	+12V SENSOR
4a	11	S4+	S4+
4b	12	S4-	S4-
4c	4	GND 1	PWM 1TX
5a	14	S5+	S5+
5b	15	S5-	S5-
5c	27	GND 2	GND
6a	16	S6 +	S6 +
6b	17	S6 -	S6 -
6c	13	GND 3	OPT5 REG FEEDBACK
7a	18	S7 +	S7 +
7b	19	S7-	S7-
7c	33	OPTION1 4-20Ma	OPTION1 4-20Ma
8a	37	3-pos 1a	S8+
8b	36	3-pos 1b	S8-
8c	32	Option2 frq	Option2 frq
9a	35	3-pos 2a	S9+/AIR ANGLE 0-5V
9b	34	3-pos 2b	S9-/FAN SPEED 0-5V
9c	NC	(option3)	option3/TANK GAUGE
10a	21	On/off+	On/off+
10b	22	On/off-	On/off-
10c	NC	(option4)	PWM2 OUTPUT OPTION
11a	23	Pressure+	Pressure+
11b	24	Pressure-	Pressure-
11c	28	Flow	Flow
12a	20	FM up	FOAM BLOB 0-5V
12b	1	FM dn	OPT 4 RX
12c	31	Speed	Speed
13a	3	FM L	FM L
13b	2	FM R	FM R
13c	30	Gnd sensor	Gnd sensor



The 37 - 39 pole connector has the same wiring combination for the hydraulic and fluid system.
Therefore the cables are coded with a dowel so they can not be connected to the wrong box.

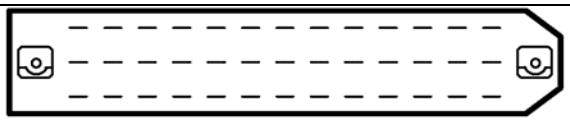


The dowel is set as when viewed into the plug on the cable.
Re-coding the dowel allows switching from liquid to hydraulic and vice-versa.

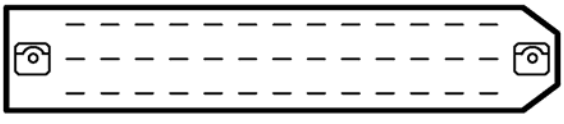
Technical data:

Jacked	Black, min 1.5 mm
Working temp	0-70 deg C
Voltage rating	>50 V
Multi-wire	Colour-coded
	Din 47100
Thickness	max 15.5 mm

Coding of 37-39 pole cables:



Cable for liquid



Cable for hydraulic

AMP connectors

The AMP connectors have each of the legs numbered so they are easy to identify. The table shows how the wires are mounted in the plug and what function the wires have.

AMP plug	Pin & Wire connection		
	**AMP Super Seal**	**Function**	**Color**
	2	+	Brown
	3	Signal	Blue
	1	-	Black

Optional extras for the HC5500

Printer

A printer can be fitted for the HC5500, as shown on Picture 1.

Picture 1: Printer for the HC5500

The printer can print out several kinds of data from the HC5500.
Picture 2 is an example of a printed register and Picture 3 a printed configuration.
Register printout gives the user sprayed area, volume rate that has been used etc.
The configuration print is very useful for a quick overview of how the controller is set up and for spotting errors.

HARDI HC5500

Serial number	6023892
Register	12
Volume applied	0 L
Area	0.00 ha
Travelled spray distance	0.0 km
Start date	00.00.00
Start time	00:00
Stop date	00.00.00
Stop time	00:00
Time used (spraying time)	00:00
Work rate	0.00 ha/h
Average spray speed	0.0 km/h
Max. spray speed	0.0 km/h
Average volume rate	0 L/ha
Date printed	19.02.08
Time printed	18:35

Picture 2: Print of the register

HARDI HC5500 - Configuration

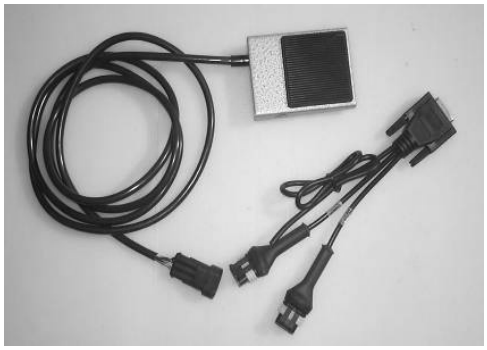
Serialnumber		6023892
SW version		4.00
1	Daily settings	
1.1	Volume rate	300 L/ha
1.2	Tank contents	29 L
1.3	Select register	12
2	Setup	
2.1	Display readout	
2.1.11	Pressure	
2.1.2	Flow rate	
2.2	AUTO functions	
2.2.1	Auto ON/OFF	Off
2.2.2	Foam marker	Disable
2.2.3	Dual line	Disable
2.3	VRA/Remote	Off

Picture 3: Print of the configuration

The connection from the printer to the HC5500 is done through COM 1 or COM 2. The printer is powered through the COM port so there is only one plug for the connection.
The configuration of the com port is done in Extendet Menu 4.
In menu E4.1.1 *Equipment type*, Printer must be chosen and in menu E4.1.2 the baud rate must be set to 9600.
In the section "Configuration of HC5500 to dump data" is a detailed description of the setup.
If the printer does not work, then check the connection to the COM port and see if it is correct.
If it does not print, check the paper is threaded correctly (not reverse side).

Foot pedal for main ON/OFF function

The foot pedal is an extra option for the HC5500. The pedal is connected through the wire harness that can be seen on Picture 4 and Picture 5.
The wire harness is plugged into the AUX connector.
The "Speed2" connector has GND on pin1, +12V on pin 2 and Speed signal on pin 3.
The "Switch" connector has GND on pin 1, +12V on pin 2 and Switch signal on pin 3.



Picture 4: Foot pedal for the HC5500

Picture 5: Wire harness for the HC5500

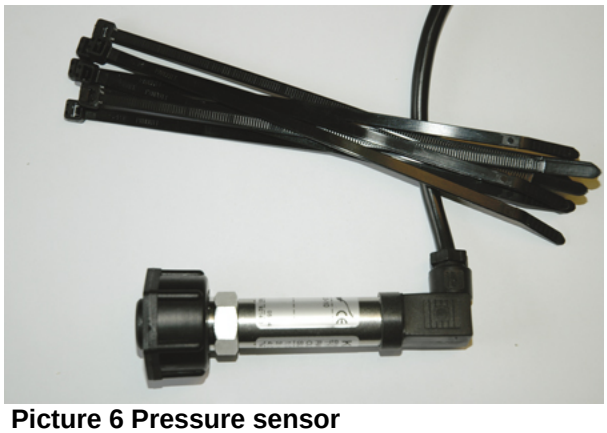
The setup of the foot pedal to the HC5500 is done in E8.5.1. The menu tree can be seen in section "Extended Menu 8". There are two choices depending on the switch type.
The HC5500 can be set to a toggle or a pulse function. The standard HARDI foot pedal is a toggle type.

Speed sensor for Tractor: Wheel, gearbox or radar

The HC5500 can have several different kinds of speed sensors. It can have an inductive sensor mounted on the back wheel, (the same sensor as on the trailed sprayers) or it can be connected to the tractors speed sensor, in the gearbox, or radar.

The sensors are connected to the HC5500 through wire harness on
Picture 5.
The signal from the tractor or the radar must be between 0 - 5 Volt and below 2,000 Hz. Most radar's have this signal range.
The signal from the tractors can however change a lot from brand to brand, consult your manual or tractor dealer for more information.
The setup of the speed sensors in the HC5500 is done in the menu 3.1. Further instructions about the connection and calibration can be found in the instruction book.

Pressure sensor



Picture 6 Pressure sensor

An optional 4 to 20 mAmp pressure sensor can be fitted to the liquid system.
With the sensor, the controller can switch to pressure based regulation when the flow drops below the minimum rate measurable by the flow meter. Preventing Look-Ahead from winding the pressure regulation valve down too far when driving very slowly.
In menu E8.1.7 the sensor has to be set to "Active".
The sensor can be set for a minimum pressure. If the pressure drops below the set value, pressure regulation stops.
The HC5500 has min and max pressure alarm that will be shown in the display menu.
The cable is connected to the "PCB for section valves".
The version of the PCB used depends of what type of sprayer the sensor in mounted on.
For the wire connections to the PCB, see section "PCB's" on pages 65.
When the pressure sensor is mounted on the sprayer, the HC5500 is setup to the sensor. In menu "5" on pages 19, the setup is shown.
The pressure sensor has a fixed measuring range in Bar or PSI.
In Menu E5.1 the minimum value is typed in and in menu E5.2 the maximum is typed in.
The measuring range is written on the pressure transducer. Our standard is 0 to 10 Bar.
Note that the sensor is ignored if the minimum input is less than 3 mAmp.
In menu E8.1.3 is the minimum allowed pressure typed in. In practice, this means the regulation will stop if the pressure goes below this value.
These setting are done in the Extended Menu.

For a readout, the sensor must be setup. In Menu 2.1 Display readout / Optional sensor Menu 2.1.3, the pressure sensor is chosen so the actual pressure can be seen.

Fan speed on TWIN

The Fan speed sensor can measure the revolutions on the blower unit on a TWIN sprayer.
The sensor is mounted on blower as shown in Picture 7.
For connecting the wiring from the Fan speed sensor see section “PCB’s” on pages 65.

Picture 7 Fan speed sensor

When the Fan speed sensor is mounted and the wires are connected, the HC5500 must be setup for the sensor. In menu E5.2 the PPU value is set. The PPU value can be seen in the menu E5.2.1. The default value is 1.
For a reading on the HC5500 display, the Fan speed sensor must be setup for the display. In Menu 2.1, Display readout / Optional sensor, Menu 2.1.3, is the Fan speed sensor chosen so the fan r/min can be seen.

Note the following for the Linak actuators on the TWIN FORCE sprayers

Spray II box & Linak actuator	AMP connector	Linak Part no.	Voltage (min to max stroke)	Signal
Breakout PCB	4 pin	262034	1.0 to 5.0 V	Analogue
Jobcom PCB	4 pin	262034	1.0 to 12.0 V	PWM (Hz)

TankGauge

The TankGauge (digital contents sensor) is a sensor that can measure how much liquid is in the tank. It has no automatic function. It can give a warning when the tank is about to run dry.

Picture 8 TankGauge sensor

Technical specifications

Model	WIKA S11
Range	0 to 250mBar
Accuracy	0.5% (0.25% BSL)
Supply voltage	12V (9-16V automotive)
Output	100-2600Hz, open collector NPN
Pull up	10K ohms to Vcc
Cable	1m
Process	G1/1B
Protection	IP67
Compensation	Thru Goretex membran

Ordering the TankGauge:

Order number for TankGauge kit:	72373300
Order number for 10K ohms resistor:	261202

Connecting TankGauge

Wire between Jobcom and 26007300

AMP Super Seal	PCB	Wire	Wire (old version)
2	+	Brown	Green
3	Sig	Blue	White
1	-	Black	Brown

Figure 1 Wire for connection between Jobcom and TankGauge

The cable is fitted with an AMP plug and three lose wires at the other end. It is attached to the Jobcom at J1, “Tank gauge”.

For Jobcom with hardware version before 2.0, a 10Kohm resistor is fitted between connector 2 & 3 on the Jobcom.
Figure 2 shows the resistor location.

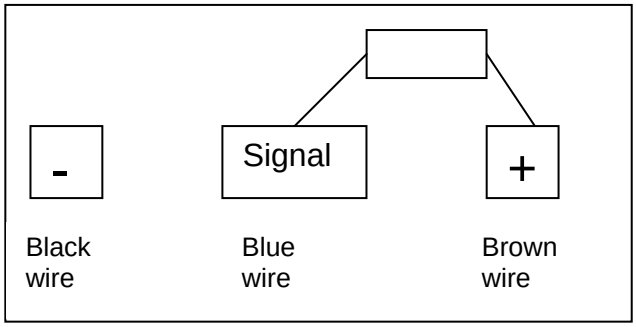


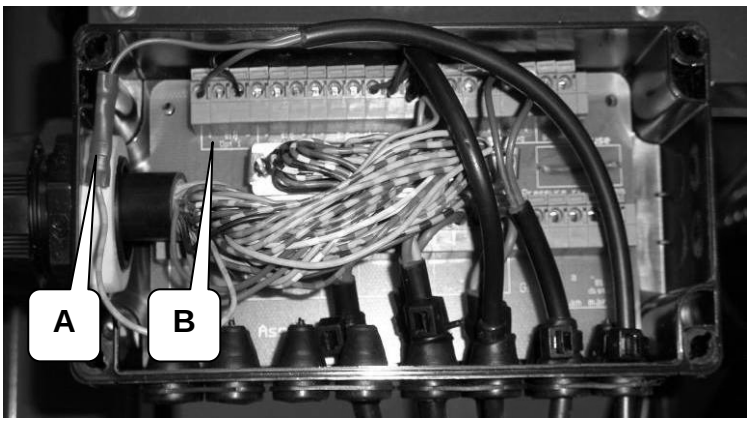
Figure 2 Mounting of the 10 K ohm resistance in the Jobcom

Models without Jobcom:

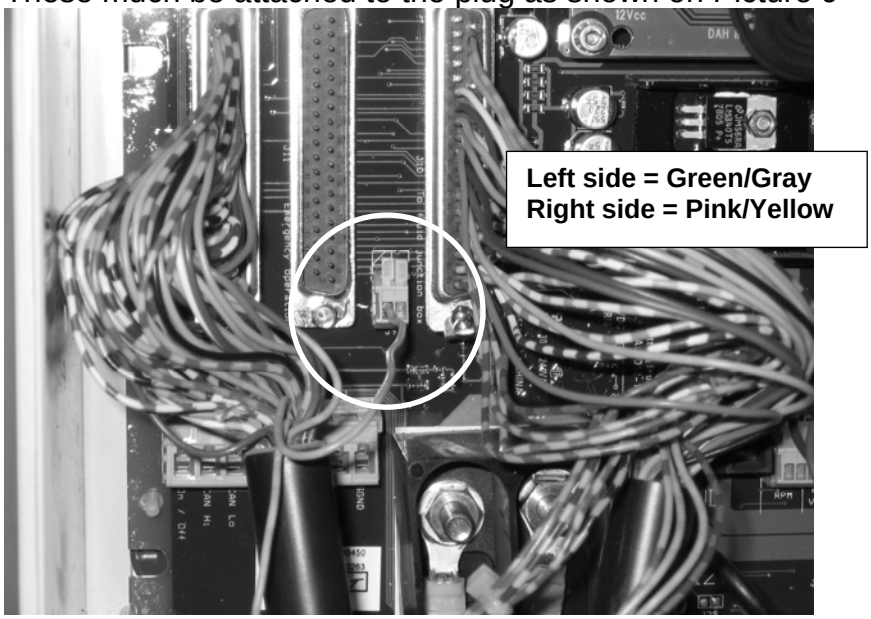
A. TankGauge is mounted on PCB in distribution valves junction box. Green/Grey wire is connected to the blue wire from TankGauge.

B. Is mounted in OPT 1 as shown.
Brown wire +
Black wire –
If a speed sensor is present, connect it in parallel.

Distribution Valves Junction Box



The cable from the Spray box has two lose wires which are not connected in the Jobcom. These much be attached to the plug as shown on Picture 9



Picture 9 Connection of the two wires from Spray box cable

The sensor is mounted on the back side of the sump of the tank.

Settings in the HC5500
“Extended Menu 5 Optional sensors" is the setup menu. In Menu E5.3.1 chose “HARDI”.
To check the connections, the frequency with an empty tank can be checked.
Menu 4.5.3.3, Tank Gauge, should read be between 100 and 200 Hz.

How does it work?
The TankGauge sensor measures the pressure created by the water in the tank. The sensor sets data points for each 25 mm of water level. 100 data points are available. The data points are registration marks where the tank sensor registers the pressure and therefore how much water there is left in the tank at this water level.
The data points can be seen in Menu E8.2.3. They can also be edited in this Menu.
For setting the data points, the flow sensor must first be calibrated.
Next step is to fill the tank completely with a known quantity of water.
When the calibration starts, the flow sensor will register how much water is sprayed out and the tank sensor will register the pressure for every 25 mm water level until the tank is empty.
At the end of the calibration, the actual verses the theoretical quantity of water is set just like doing a “Tank Method” calibration of the nozzles. This will fine tune the flow sensor PPU.

The calibration of the TankGauge is described in the instruction book.

When the TankGauge is used in use, there are two modes:

- When the sprayer is moving
- When the sprayer is stationary

When the sprayer is moving, the HC5500 will calculate an average value of the read out from the TankGauge. The average value is necessary because of the movement of the liquid in the tank will when the sprayer is moving. If a not averaged value was shown, the readout would be useless for the driver.

When stationary, the value is not averaged. The movement of the liquid in the tank should stop and the average value is therefore not necessary.

End nozzle kit

The End nozzle kit is connected to the “PCB for section valves”, seen on page 66. For accurate boom width whilst using the end nozzles, Menu 3.3.4 needs to be set up. For more information, see in the instruction book for the HC5500.

Picture 10 End Nozzle kit

Extended Menu for sw 4.00

To access Extended Menu, press and hold the “ESC” button, switch the power ON and wait until the menu is opened.
The **“[xxx]”** indicates the choices or range.
The factory default and helpful notes like increments of change are in *italics.*

Extended Menu 1 Language: Here the is language choice. There are standard languages and place for two local languages that can be uploaded to the HC5500 by a service person.
Note: For Russian, the HC5500 hardware version with Cyrillic text is used.

Extended Menu 2 Unit: Is for what unit the controller shall use.

Extended Menu 3 Sprayer type: The basis setup of what kind of sprayer is the HC5500 attached to and what kind of liquid system is mounted on the sprayer.

Extended Menu 4 Data exchange: Setup of the data communication.
HC5500 can be attached to other units like a PC, printers, variable Rate Application or remote control. The communication between the HC5500 and the unit has to be set up correctly.
The setup and use of the com ports are described in the “Software” section of this manual.

Extended Menu 5 Optional sensors: Setup of optional sensors that can be fitted. It is typically the pressure, fan revolutions and tank contents (TankGauge).

Extended Menu 6 Service interval: Setup of the service interval.

Extended Menu 7 Factory settings: Setup of factory settings

Extended Menu 8 Settings: Settings of the regulation, tank, track and misc. settings are done.

Extended Menu 9 JobCom: Is for setup of the JobCom, TWIN actuators and read out of the software version and serial number..

Extended Menu 1 Language

E1 Language **[UK, D, DK, F, SF, HU, Local 1, Local 2]**
Default is UK.
Local 1 & 2 are languages that can be added with a PC and the “HC 5500 Language config” software or another HC5500.

Extended Menu 2 Unit

E2 Unit **[Metric, US]**

Extended Menu 3 Sprayer type

E3 Sprayer type

E3.1 Field sprayer

E3.1.1 Liquid system

[Equalization, Not equalization, Circulation]
Default is Equalization.
Equalization = System with liquid return to tank from section valves; e.g. EVC.
Not equalization = System without returns to tank; e.g. EFC on CM05.
Circulation = System where liquid constantly circulates in the boom lines.

E3.1.2 Dual Line

E3.1.2.1 System type

[Not present, 2 stage, 3 stage]
Default is Not present.
2-stage: Line A will always be open, and Line B can be switched on and off automatically.
3-stage: Line A switches to B, then Line A comes on so both A & B are on.

E3.1.2.2 Sensor type

[Pressure, Speed]
If a pressure transducer is fitted, pressure is used to trigger the line change.

E3.1.2.3 System lag

[Second]
Default is 1.0 sec.
System lag prevents oscillation when spray lines change.

E3.1.2.4 Line overlap

[Second]
Default is 1.5 sec.
System overlap allows the activated spray line to stabilise before the other line is turned off.

E3.2 Mistblower

E3.2.1 Liquid system

[Equalization, Not equalization, Circulation]
Default is Equalization.
Equalization = System with liquid return to tank from section valves; e.g. EVC.
Not equalization = System without returns to tank; e.g. Solenoid controls.
Circulation = System where liquid constantly circulates in the boom lines

E3.2.2 Sub unit

[Standard, UCR]
Default = Standard (UCR affects menu 3.3)
UCR = Unit Canopy Row. Bases application on the size of the tree canopy.

Extended Menu 4 Data exchange

E4	Data exchange	**E4.1**	COM 1 setup	**E4.1.1**	Equipment type	**[Printer, Dump, Printer & dump, GSM, VRA/remote]** *Dump is for data transfer to a PC via for example Microsoft HyperTerminal.* *GSM is not used.* *Variable Rate Application/remote is signal from an external source.*
				E4.1.2	Baud rate	**[19200, 9600, 4800, 2400, 1200]** *Default is 9600.* *Use 9600 for HARDI 12 volt printer.*
				E4.1.3	Protocol select	**[HARDI VRA proto.]** *Only one protocol available at the moment.*
		E4.2	COM 2 setup	**E4.2.1**	Equipment type	**[Printer, Dump, Printer & dump, GSM, VRA/remote]** *Dump is for data transfer to a PC via for example Microsoft HyperTerminal.* *GSM is not used.* *Variable Rate Application/remote is signal from an external source.*
				E4.2.2	Baud rate	**[19200, 9600, 4800, 2400, 1200]** *Default is 9600.* *Use 9600 for HARDI 12 volt printer.*
				E4.2.3	Protocol select	**[HARDI VRA proto.]** *Only one protocol available at the moment.*

Extended Menu 5 Optional sensors

		E5.1	Pressure	**E5.1.1**	Minimum			
			Connected to section valve PCB.			**[-9.9 to 9.9]** *Default is 0.0 Bar* *4 -20 mAmp sensor.* *See sensor for minimum value.* *See "Pressure sensor" section.*		
				E5.1.2	Maximum			
						[0 to 99.9] *Default is 10.0 Bar* *See sensor specifications for maximum value.*		
		E5.2	Fan speed	**E5.2.1**	PPU			
			Connected to section valve PCB.			**[0 to 99.99 PPU]** *Default is 1* *Digital input.* *One pulse per revolution = 1.00 PPU.* *See "Fan speed" on TWIN section*		
E5	Optional sensor	**E5.3**	TankGauge	**E5.3.1**	Sensor Type			
			For sprayers with Breakout PCB or Jobcom.			**[Not present, Fillmeter, ME Tank Control, Hardi]** *For Hardi TankGauge, choose Hardi.*		
				E5.3.2	PPU			
						[0.000 to 999.999 PPU] *Connect to Breakout PCB or Jobcom.* *See "TankGauge" section.* *Hardi has the TankGauge 0-250mbar pressure transducer fitted to sump.*		
		E5.X	Sensor x				Unit	Default
			Only with Breakout PCB or Jobcom	**E5.4**	Wind speed		PPU	1
				E5.5	Wind direction	**E5.5.1**	min	0
						E5.5.2	max	359
				E5.6	Air temperature	**E5.6.1**	min	-20
						E5.6.2	max	70
				E5.7	Relative humid	**E5.7.1**	min	0
						E5.7.2	max	100
				E5.8	RPM sensor		PPU	1
				E5.9	Extra 1		PPU	1
				E5.10	Extra 2		PPU	1
				E5.11	Extra 3	**E5.11.1**	min	0
						E5.11.2	max	5
				E5.12	Extra 4	**E5.12.1**	min	0
						E5.12.2	max	5

Extended Menu 6 Service interval

E6	Service interval	E6.1	A hours	*10 hours.*
		E6.2	B hours	*50 hours.*
		E6.3	C hours	*250 hours.*
	PIN = 04711	E6.4	D hours	*Hours are not defined.*
		E6.5	Nozzle	*50 hours.*

Extended Menu 7 Factory settings

E7	Factory settings	E7.1	Total register	E7.1.1		*Register 0. Shows start & stop dates & time.*
				E7.1.2		*Shows total volume & area.*
				E7.1.3		*Shows average & max. speed.*
				E7.1.4		*Shows distance travelled & spraying time.*
				E7.1.5		*Show work rate & average volume rate.*
		E7.2	Master reset			*Resets all values except for Register 0.*
			PIN = 12345			
		E7.3	Send configuration	E7.3.1	Config only	*Readable text file that can be sent to a HC 5500 or a PC.*
				E7.3.2	With language	*Readable text file*
		E7.4	Receive configuration	E7.4.1	Config only	*Readable text file that can be received from a HC 5500 or a PC.*
				E7.4.2	With languages	*Readable text file*
		E7.5	Send program			*For sending HC 5500 program to PC*
		E7.6	Receive program			*For receiving HC 5500 program from PC*
		E7.7	Send Language	E7.7.1	Box to box	**[UK, D, DK, F, SF, HU, Local 1, Local 2]**
						Readable text file. Select language.
						Use communication cable Ref. No. 72271600.
				E7.7.2	Box to PC	**[UK, D, DK, F, SF, HU, Local 1, Local 2]**
						Readable text file. Select language.
		E7.8	Receive Language	E7.8.1	Box to box	*Readable text file. Use communication cable Ref. No. 72271600.*
				E7.8.2	PC to box	*Readable text file. Use communication cable Ref. No. 72271600.*

Extended Menu 8 Settings

E8 Settings

E8.1 Regulation

E8.1.1 Min. duty cycle — **[2%]**
Minimum and default is 2%.
Increase value if motor hesitates to turn.
For LookAhead, set to 5% +/- 1%.
See “Description 2 Min. duty cycle” on page 26

E8.1.2 Min. speed — **[0.5 km/h]**
Minimum speed required before regulation valve will operate. Default is 0.5 km/h.

E8.1.3 Min. pressure — **[0.0 Bar]**
Default is 0.0 Bar. At 0.0 Bar, feature is disabled. Pressure transducer needed.
If pressure drops below the set value, the pressure regulation will stop.

E8.1.4 Valve test — **[Start test? Yes, No]**
This tests the regulation valve with position feedback. Valve must not be at max. setting. Valve will increase 2 turns and then decrease 2 turns.

E8.1.5 Look Ahead — **[Yes, No]** See “LookAhead” on page 33
Default = No. Regulation valve must have position feedback transducer and Boom sensor must be fitted.

E8.1.6 Regulation delay — **[0 to 9 sec]**
Default = 3 seconds.
This is time the regulation valve waits before starting.
Delay allows fluid system to stabilise before regulation valve starts operation.
For few boom sections and or big liquid flow, 3 s is recommended.
For many boom sections and or small liquid flow, 1 or 2 s is recommended.

E8.1.7 Sensor

E.8.1.7.1 Pressure
[Active, Passive]
Default = Passive

E.8.1.7.2 Rpm
[Future use]

E8.2 Tank

E8.2.1 Tank size — **[L]**
Default is 1000
Value set if a TankGauge is not fitted.
Maximum fill:
CM 3200=3500
CM 4400=4900
CM 6600=7000
NAV 3000=3300
NAV 4000=4400

E8.2.2 (Future use)

E8.2.3 Data points — **[0000]**
Calibration values for HARDI TankGauge. Can be edited by use of Navigation and Enter keys.

E8 Settings **E8.3** (Future use)

E8.4 Track

E8.4.1 Enable — **[No, Yes]**

To enable Safe- or IntelliTrack function.

E8.4.2 Sensor test

E8.4.2.1 Front sensor
Approx. 2.50 V when straight.
Alarm given if < 0.2 Volt or > 4.8 Volt.

E8.4.2.2 Rear sensor

E8.4.2.2.1 Readout in deg and Volts
Approx. 2.50 V when straight
If DAH interface is used, an alarm given if < 0.5 Volt or > 4.5 Volt.

E8.4.2.2.2 CALIBRATE (Only NAV)

Turn the drawbar full right
E8.4.2.2.3 - - > (Only NAV)
Readout and setting right extreme
E8.4.2.2.4 < - - (Only NAV)
Readout and setting left extreme

E8.4.2.3 Boom 1 sensor
For CM: 0.8 V when unfolded and 5.0 V when folded.
For NAV: 0.0 V. Sensor is optional.
Values < 0.5 V = not connected

E8.4.2.4 Boom 2 sensor
0.8 V when unfolded and 5.0 V when folded.
Value < 0.5 V = not connected.

E8.4.2.5 Lock sensor
For CM: 0.8 V when locked and 5.0 V when unlocked.
For NAV: 0.0 V. Sensor is optional.
Values < 0.5 V = not connected

E8.4.3 Chassis — **[CM05 S, CM05 M, CM05 L, NAV S, NAV M]**
Default is CM05 M
For CM:
Use S for 3200, M for 4400, L for 6600.
For NAV3000L and 4000L:
Use NAV 07 M.

E8.4.4 Sprayer drawbar — **[0-200cm]**
Default for CM: 101 cm
Length from drawbar pin hole to front anchor bolt for drawbar.
Default for NAV: 100 cm
Length from drawbar pin hole to rear bolt on pump base.

E8.4.5 Manual angling — **[- 9 to 9%]**
Default is 0.
Sets the manual steering speed.
Note + and - can be changed by toggling.
Use steps of 10% as a guide.

		E8.4.6	Boom sensors	**[0, 1, 2]** *Default: 1.* *This is the number of boom fold sensors present.* *For CM: Choose 1 or 2* *For NAV: Choose 0*
		E8.4.7	Error print	**[Yes]** *Prints last 3 hazardous situations and shows Alteration log changes.*
		E8.4.8	Minimum radius	**[6.0 m]** *Default = 6.0 m for NAV.* *CM Minimum turning radius allowed for the trailer.* *Tank size 3200 L= 6.5, 4400 L= 7.0, 6600 L= 9.0.* *Increase to achieve a soft-stop (prevent bottoming out) on trapeze cylinders.*
		E8.4.9	Half steer	**[No,Yes]** *Default = No* *SPC/SPZ, only active with 2 boom sensors*
		E8.4.10	Safety factor	**[100%]** *Raising this value increases captiousness.* *Default is 100% for a CM 4400.* *For CM 3200, use 90%* *For CM 6600, use 120%.* *Use steps of 10% as a guide to changes.*
		E8.4.11	Boom type	**[L, M, H]** *Not active* *Default: M* *Classification of boom type. Light, Medium or Heavy.*
E8.5	Misc.	**E8.5.1**	Foot switch	**[Disable, On/off level, On/off pulse]** *For remote ON/OFF of main switch, it allows the use of other switch systems.* *See "Foot pedal" section.*
		E8.5.2	Rate deviation	**[Step size: XX %]** *Default is 10%.* *Can be altered.* *If set at 0%, this allows 3 rates to be set up in menu 1.1.*
		E8.5.3	Capacity left	**[Distance, Area]** *Affects readout from Display icon. Will show distance or area remaining.*

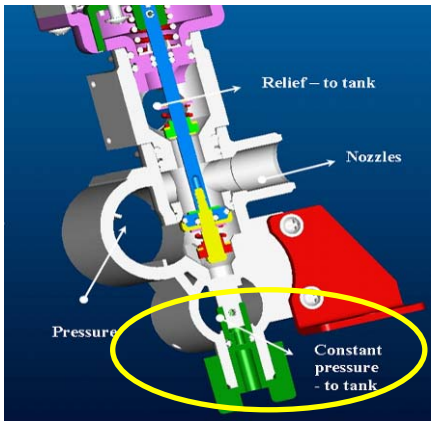
Extended Menu 9 Jobcom

E9	Jobcom	**E9.1**	Enable			**[Yes, No]** Must be enabled for use with Track or AutoSectionControl.		
		E9.2	Communication			**[ID x; ACK: x NACK: x; Timeout x]** *ACK=acknowledged message, NACK= not acknowledged.* *ID= identification where "0" is Jobcom, Timeout=No answer from Jobcom.*		
		E9.3	ComLog	**E9.3.1**		*Date and time for error, ID of hardware with fault, M = Message No., E = Error.*		
			9 latest communication errors	**E9.3.X**		*As above*		
				E9.3.9		*As above*		
		E9.4	Input test	**E9.4.1**	Frequency	**E9.4.1.1**	Speed	Hz
			Shows actual sensor reading.			**E9.4.1.2**	Flow1	Hz
						E9.4.1.3	Flow2	Hz
						E9.4.1.4	Flow3	Hz
						E9.4.1.5	TankGauge	Hz
						E9.4.1.6	Wind speed	Hz
						E9.4.1.7	Fan speed	Hz
						E9.4.1.8	RPM sensor	Hz
						E9.4.1.9	Extra 1	Hz
						E9.4.1.10	Extra 2	Hz
				E9.4.2	Switch	**E9.4.2.1**	Pendulum lock	hi/lo
						E9.4.2.2	Ladder up	hi/lo
						E9.4.2.3	(Future use)	
						E9.4.2.4	Filter S	hi/lo
						E9.4.2.5	Filter P	hi/lo

			E9.4.3	Analogue	**E9.4.3.1**	Slant Volt
					E9.4.3.2	Boom height Volt
					E9.4.3.3	Tilt L Volt
					E9.4.3.4	Tilt R Volt
					E9.4.3.5	Foam blob dist Volt
					E9.4.3.6	Twin angle Volt
					E9.4.3.7	Twin fan speed Volt
					E9.4.3.8	Distance L Volt
					E9.4.3.9	Distance R Volt
					E9.4.3.10	Distance centre Volt
					E9.4.3.11	Extra 3 Volt
					E9.4.3.12	Extra 4 Volt
					E9.4.3.13	Air temperature Volt
					E9.4.3.14	Relative humid Volt
					E9.4.3.15	Wind direction Volt
					E9.4.3.16	SmartValve1 setpoint Volt
					E9.4.3.17	SmartValve2 setpoint Volt
E9.5	Reset Jobcom		*Reset of Jobcom*			
	PIN = 74650					
E9.6	TWIN actuators	**E9.6.1**	Fan speed	**[Fwd. Rev]**		
				To reverse present setup for actuator.		
		E9.6.2	Air angle	**[Fwd. Rev]** *To reverse present setup for actuator.*		
E9.7	Serial number		*Shows software version and serial number*			

Description 1 EVC compared to EFC

The difference between the EVC and the EFC section valve is that the EFC section valve has no pressure equalisation. The equalisation is adjusted by the pressure regulation valve and is controlled by the computer.
Picture 11 shows the EVC section valve, the circled being the equalisation valve. This is the clearest difference between the EVC and the EFC when looking at the section valves.
Picture 12 shows the EFC. Here there are no equalisation adjustment valves.



Picture 11 EVC with the equalization system

Picture 12 EFC without the equalization

Description 2 Min. duty cycle (or PWM, Pulse Width Modulation)

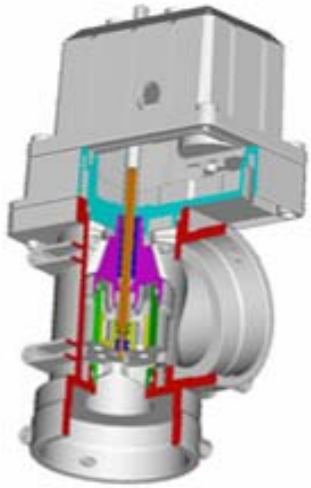


Figure 3 Pressure regulation valve

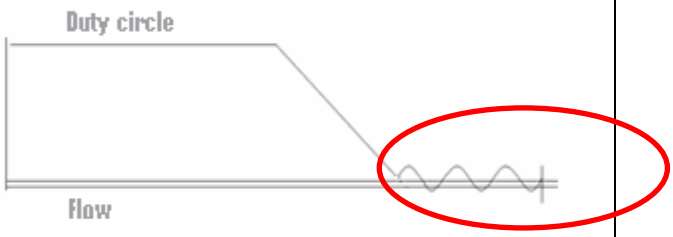


Figure 4 Duty circle for the pressure regulation

Menu: E 8.1.2
Minimum duty cycle (or PWM) is for adjusting the speed of the pressure regulation valve. When the valve is trying to find the right flow, the speed of the valve must not be too high or to low. If the speed is too high, the valve will be unsteady – if the speed is too low, the valve not move as it can not overcome the friction.
Adjustment of the valve can therefore be as follows; find out where the valve is unsteady and then reduce the min. duty cycle a bit.

The best setting for duty cycle is shown on Figure 4 in the circle. It shows the duty circle as the setting should be. The flow, bottom line, is stable and the duty circle is circling around the flow setting until it finds the right position.

Track setting in Extended Menu:

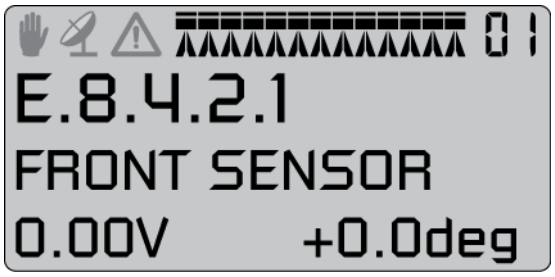
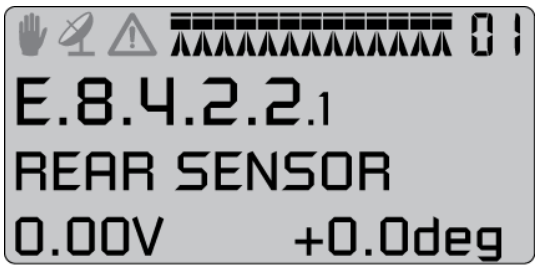
The configuration of the sprayer is saved in the controller; these setting should only be set again after a master reset of the controller.

Menu E 8.4.1 Enable

Tracking can be either enabled/disabled in this Menu. If tracking is set to disabled, it will trail as a normal trailer.

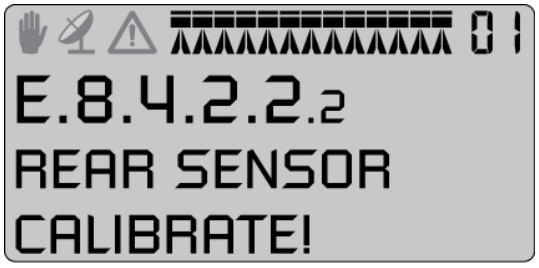
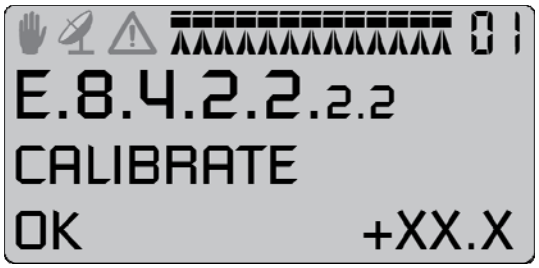
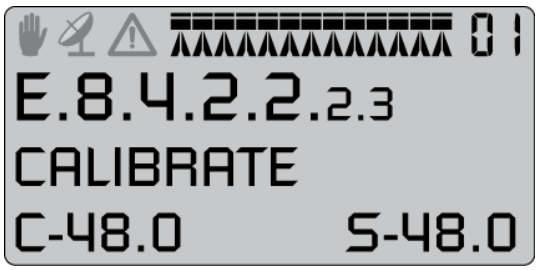
Menu E 8.4.2 Sensor test

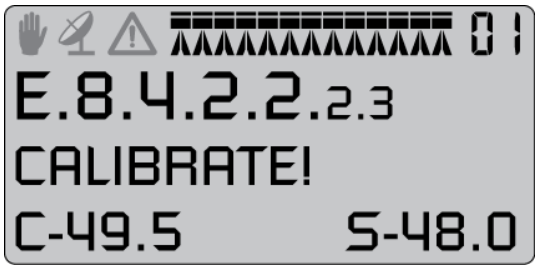
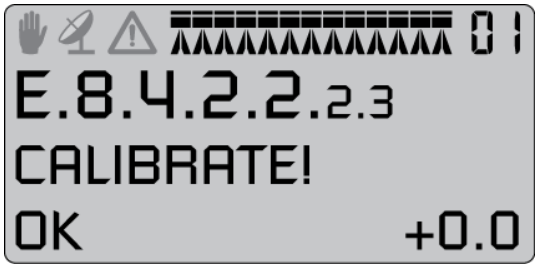
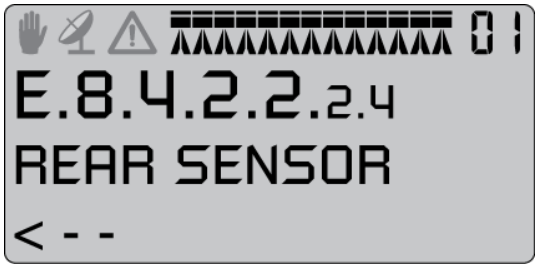
Front sensor adjustment:

COMMANDOR and NAVIGATOR **E8.4.2.1 Front sensor** Adjust front potentiometer to 2.50 V when straight. Alarm given if < 0.2 Volt or > 4.8 Volt.	
Only NAVIGATOR Use the protractor, ref. no. 72547300 to adjust the drawbar angle to 0 degrees	
COMMANDOR and NAVIGATOR Enter menu: **E8.4.2.2.1 Rear sensor** Adjust rear potentiometer to 2.50 V when straight. Alarm given if < 0.2 Volt or > 4.8 Volt	

Intellitrack rear sensor calibration:

At the factory of the angle of the drawbar is mesaured and there should be a label with the angel inside the JobCom lid of the sprayer. If you find the label with the angel it is not nessasary to do the following measurement with the protractor, you can just put in the angle. If you do not find the lable with the angel do following measurment:

E8.4.2.2.2 CALIBRATE Open menu E.8.4.2.2.2 to program the controller	
Turn the drawbar to full right **E8.4.2.2.2.1**	
Program the measured angle in the controller **E8.4.2.2.2.2**	
This is the measure result for right angle.	

Use the protractor, (72547300), to measure the maximum right angle	
Key in values in E.8.4.2.2.2.3 as shown. S: Value from rear sensor. C: This is the actual physically measured value with the protractor. Use the arrow keys to chance the value, finish with ENTER, and continue with the calibration.	
E8.4.2.2.3 - - > *Readout and setting right extreme*	
Do the same for the left angle in menu **E8.4.2.2.4 < - -**	
Note the measured values inside the Jobcom lid. In case of master reset the calibrations procedure must be done again. H=right L=left	

Menu: E 8.4.3 Chassis

The correct chassis with tank size must be set. Choices are:

COMMANDER	Setting	**NAVIGATOR**	Setting
3200 L	CM05 S	3000 L	NAV 07 S
4400 L	CM05 M	4000 L	NAV 07 M
6000 L	CM05 L		

If the HC5500 is not set up to the correct chassis, the system will not be accurate.

Menu: E 8.4.4 Sprayer drawbar

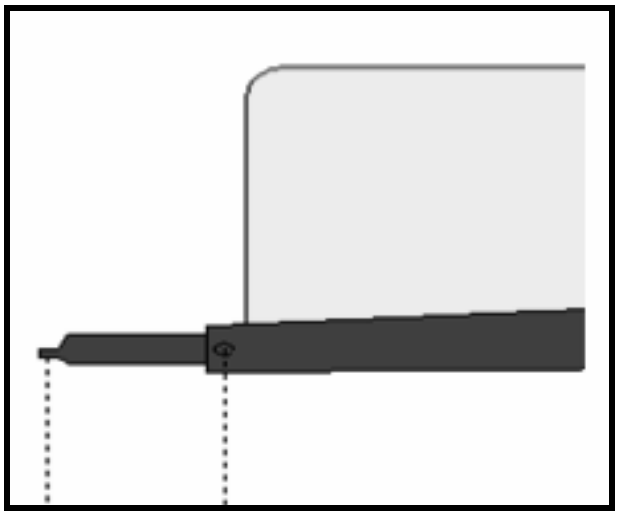
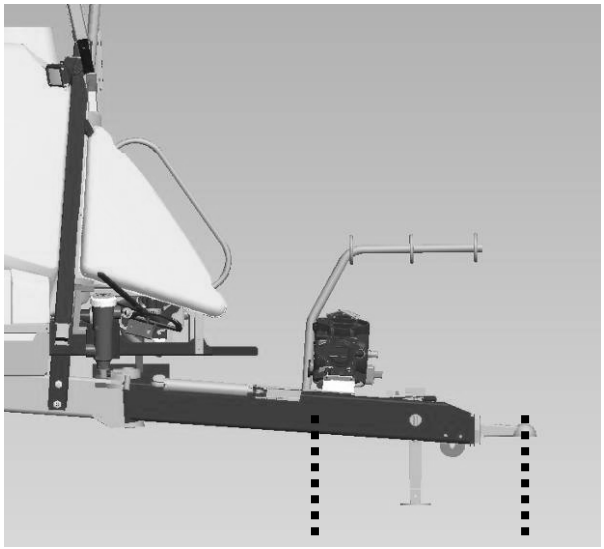


Figure 5 Sprayer drawbar for CM

SafeTrack on COMMANDER

Sprayer drawbar length is measured from the drawbar pin hole to the middle of the first bolt that holds the drawbar on the sprayer. See Figure 5

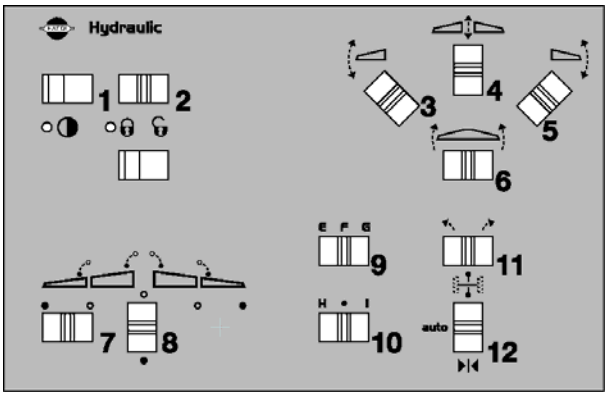


IntelliTrack on NAVIGATOR

Sprayer drawbar length is measured from the drawbar pin hole to rear bolt on pump base.

Menu E 8.4.5 Manual speed

The manual speed is how fast the sprayer will turn when the sprayer is manoeuvred manually. Switch 11 is used when the sprayer is manoeuvred manually. See Picture 13.



Picture 13 Hydraulic control box with track

Menu E 8.4.6 Boom sensor

The sensor detect whether the boom is folded or unfolded.
For CM, boom sensor is normally set to one.
For SPC and Eagle boom, there will be 2, one for each boom wing on CM.
For NAV, this sensor is optional. If it is not present, set value to “0”.

Menu E 8.4.7 Error print

A menu used to print track errors and setup in the event of an accident.

Menu E 8.4.8 Minimum radius

Minimum radius is normally set to the sharpest possible turning radius and allow for a soft stop of the cylinder before it bottoms out.

Menu E 8.4.10 Safety factor

The Safety factor combines many parameters to help the operator out of a potentially dangerous situation. The safety factor is a combination of:
Speed
Track wide
Angle of the front potentiometer
Tank contents (if TankGuage is fitted)

The Safety factor change the reaction of the sprayer, the higher the value is more safe is the sprayer to drive, but it will also give more alarms.
If the speed is too high when turning, it will straighten the sprayer so it will not follow the tractor tracks and prevent it from tipping over.

The Safety factor will give an alarm and then straighten up the sprayer.
The alarm can be accepted by pressing “Enter” on the HC5500 and it will operate normally again once the track is set to “Manual” and back to “Auto” on the Hydraulic control box.

Menu E 8.4.11 Boom type

In this Menu is the boom type is chosen. At the moment it has no influence and is reserved for future developments.

LookAhead

The LookAhead can be activated in the Extended Menu E8.1.5, this is only for EFC regulation.
There are no adjustments for the system, it can only be activated or disabled.
In section “Extended Menu 8” on page 21, it shows where the LookAhead system is activated or disabled in the HC5500.

What is the LookAhead?

The LookAhead is a system using the following components:

- Motor with a pulse generator (pressure regulation valve)
- Speed input (speed sensor)
- Boom position (boom sensor)
- Flow registration (flow sensor)
- Detection of section status (Spray box)

If the optional pressure sensor is fitted, menu E.8.1.7, the system switches from flow based sensing when less than 5 Hz to pressure based sensing.

A description of how the pressure regulation valve works is in section Pressure regulation valve for LookAhead” on page 35.

The LookAhead can predict the correct setting of the pressure regulation valve when the main ON/OFF function is OFF e.g. on the headland. The pressure regulation valve will continue to regulate in relationship to the speed and number of active sections.

When the main ON/OFF function is switched ON again e.g. in the crop, the pressure regulation valve will be very close to the right position for the right flow.

When spraying, the LookAhead logs the valve position every time the correct application has been maintained for more than 10 seconds.
The logged position is related to the calibrated value and an offset is done if it is not the same. This could be due to, for example, a different setting on the agitation. LookAhead learns as it sprays.

When the sprayer is in transport position, the boom sensor deactivates the LookAhead so it will not function on the road.

Figure 6 shows the LookAhead system compared to the old pressure regulation valve. The main difference between the two valves is how fast the pressure regulation valve finds the right flow. The three circles mark where changes are made in the flow.

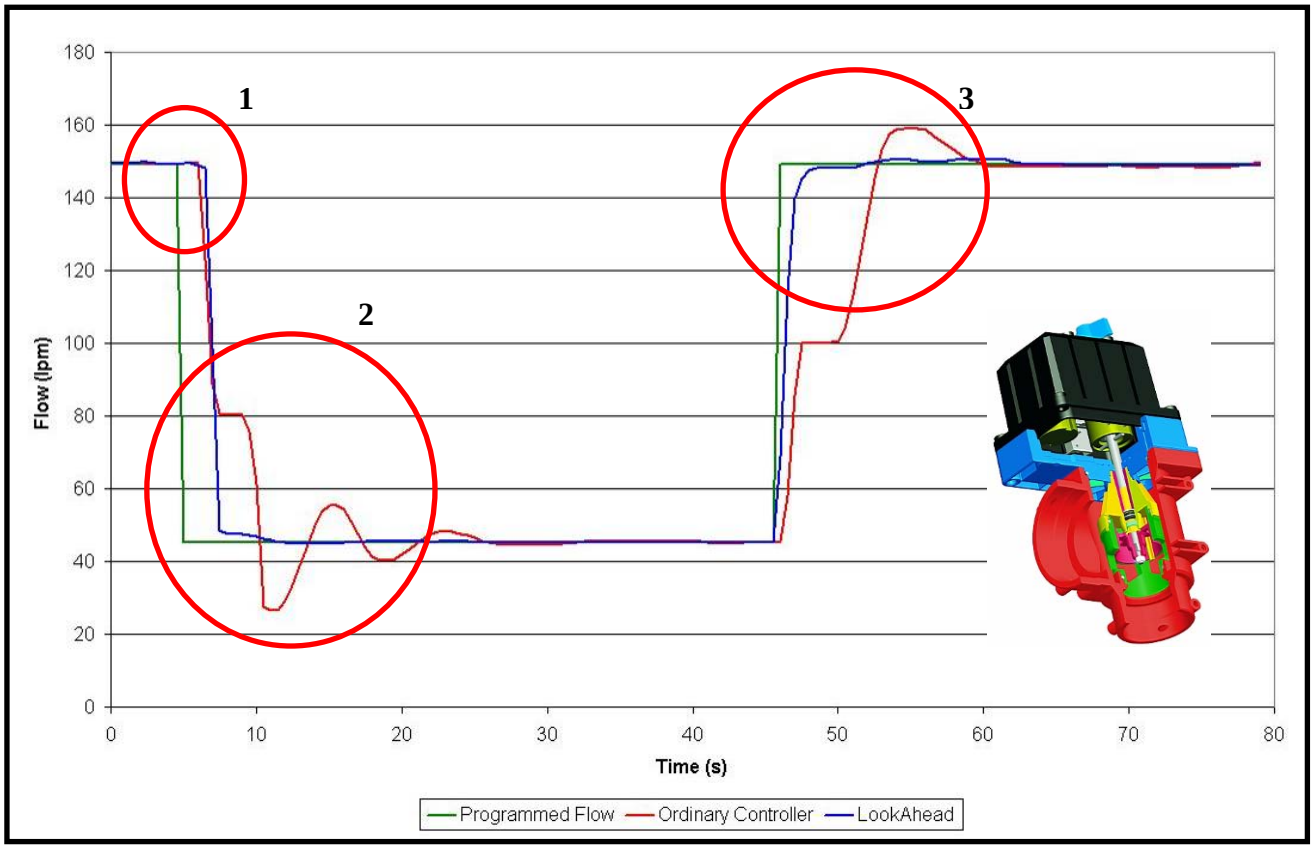


Figure 6 LookAhead system compared to the old pressure regulation valve.

Circle 1: Start position, the flow is set for 150 l/min, the flow is changed for 50 l/min and the flow starts to drop.
Circle 2: An ordinary pressure regulation valve drops down to 80 l/min and has wait for a stable flow before proceeding.
LookAhead knows where to go, so it is not necessary to wait for the flow sensor. The LookAhead makes a fine adjustment on the pressure regulation valve and finds the correct flow quickly.
The ordinary regulation valve makes more adjustments before the right position is found and this takes more time.
Circle 3: When the flow increases to 150 l/min, the same happens again.

How to use the LookAhead

Operators with tractors that can changes gear without using the clutch are basically the ones that will benefit mostly with Look Ahead.

New tractors are often driven with clutch free gearboxes, e.g. Vario – Dynashift – CVX. These new gearboxes corrupt the Hardi-Matic system in the liquid system of the sprayer because they can change the ground speed without changing the rpm on the engine, PTO hence or liquid pump on the sprayer.

When the LookAhead is active, the rpm on the PTO should be constant at all time, also in the headland. The reason for this is that the pressure regulation valve reads the position on the regulation valve and it registers the flow from the pump as well.
If the PTO rpm is changed, the flow and valve position relationship will be altered thus making the logged LookAhead values less accurate.

Calibration of LookAhead

LookAhead needs to be calibrated to the capacity of the nozzles. Boom size and number of sections also have an influence so no standard calibration value that can be put into the HC5500.
In some cases, LookAhead may have limited effect. For example:

1. Nozzles of low capacity are used (e.g. ISO 01, ISO 02).
2. The boom has many sections.
3. A combination of all the above.

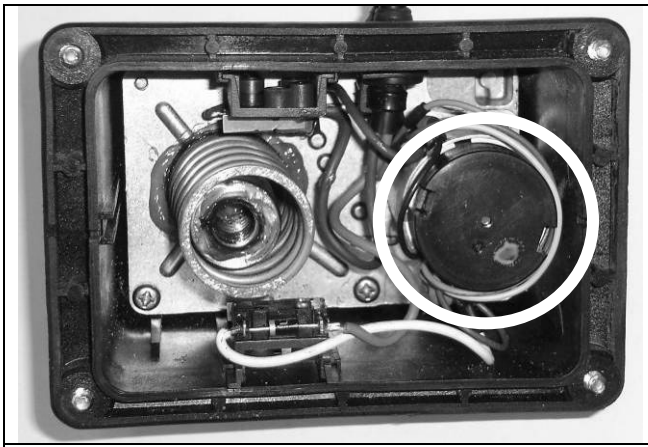
Recommendation is as follows:

Extended Menu E8.1.1	Min. Duty Cycle (PWM) = 5%
Extended Menu E8.1.6	Regulation delay = 3 seconds
Menu 3.4	Regulation constant = 50%

A lower PWM value (e.g. 2%) will result in the pressure regulation valve takes longer to reach the correct application rate.

Pressure regulation valve for LookAhead

The new pressure regulation valve that works with the LookAhead system has a pulse generator built on to the motor. See Picture 14.
It counts how many revolutions the motor has taken and hereby the electrical motor finds marked positions.
When sprayer starts spraying, LookAhead registers the position (revolutions number on the motor), speed and the flow to this position. When the sprayer is turned OFF, LookAhead will use the registered flow, speed and valve positions and thereby be able to predict the position of the pressure regulation valve when the sprayer is turned on again at different forward speed.



Pressure regulation valve knob is colour-coded Yellow.

The ratio between knob and motor turns is 1 to 150.

1 pulse pr. motor rpm.

Picture 14 Pressure regulation valve with the pulse generator

Software

The software in the HC5500 and Jobcom can be upgraded. Examples for this are improvements for better performance and bug fixes.

When the software for the controller is changed, it will be available from Hardi's Technical Service department. The software can be sent as an attached Zipped file on the E-mail.

Uploading new software to the controller will normally not have any visible effects and will delete the settings / memory of the controller.

A master reset can delete the settings and memory in the controller. After a master reset all settings in the controller must be set again, perform always a master reset after a software update.

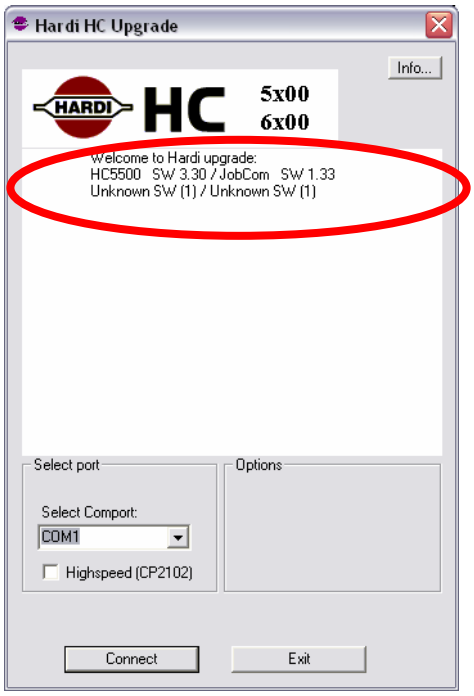
To prevent too manually setup of all parameters in the HC5500 after a master reset is it possible to dump the configuration to a computer before the reset and transfer it again to the controller after the reset.
Parameters saved in the JobCom and following parameters will not be saved and should be setup manually:

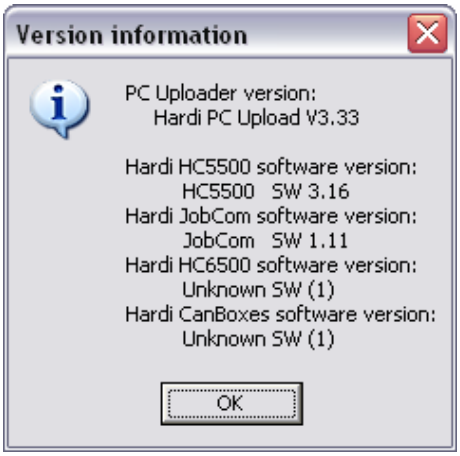
Menu		Parameter	Menu		Parameter
E8.1.7.1	Pressure	Active/Passive	E9.6.1	Fan speed	Fwd, Rev.
E8.4.1	Enable	Yes/No	E9.6.2	Air angle	Fwd, Rev.
E8.4.2.2.3	----->	Right extreme			
E8.4.2.2.4	<----	Left extreme	3.6.1	Track width	
E8.4.3	Chassis	CM05, Small, Med, Large, NAV 07 M	3.6.2	Tractor drawbar	
E8.4.4	Sprayer drawbar	0-200cm	3.6.3	Dead zone	
E8.4.5	Manual angling	Default is 0	3.6.4	Damping	
E8.4.6	Boom sensors	0, 1, 2	3.6.5	Alignment offset	
E8.4.8	Minimum radius	Default: 6m	3.6.6	Sensitivity	
E8.4.9	Half steer	No/Yes	3.7	Look Ahead	All menu 3.7.1 to 3.7.x
E8.4.10	Safety factor	Default 100%			

See the chapter "Dump of data from HC5500 Controller" how to handle the dump of data and transfer of the configuration file to the controller again.

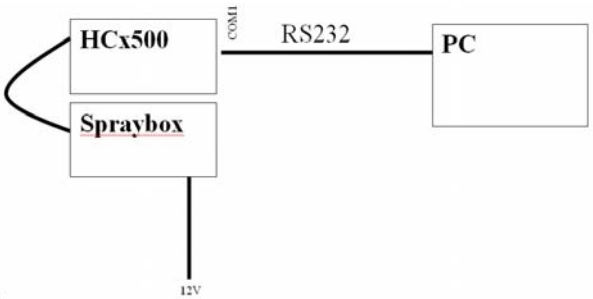
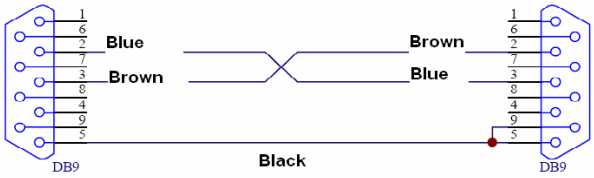
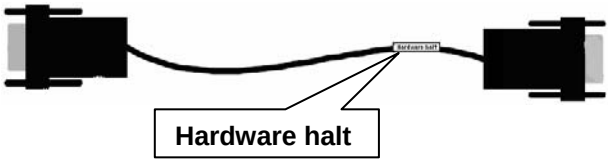
Software program for the controller

The software sent in a mail as Zip file.	

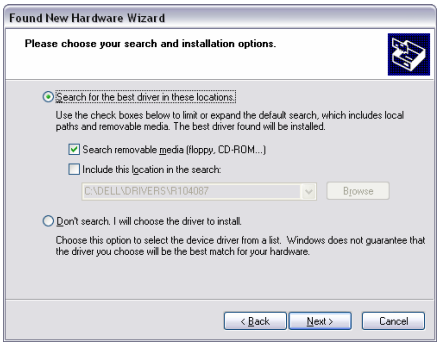
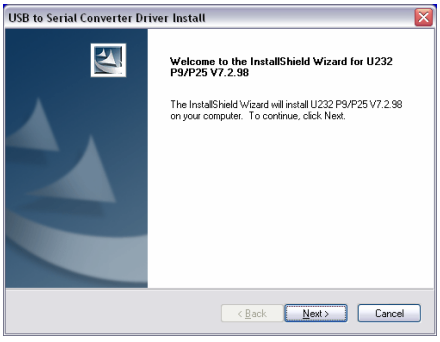
The Zip file must be unpacked and put into a folder. The top file (HardiExeUploadWinvxxx.exe) is the upgrade program. The two other files (xxx.bin) are the software for the controller and the Jobcom. This example show HC5500 software file “HardiV316.bin” with software version is 3.16. The Jobcom reads “HardiJCV1.11.bin” with software version 1.11. Note: It is very important that these three files are in the same folder at all time otherwise will the upgrade program not work.	
When the program is activated, a dialogue box will come up on the screen. In the dialogue box, the software version for both the controller and the Jobcom can be seen before the software is uploaded. How to use the Hardi upgrade program is described in section “Software upload HC5500” and “Software upload Jobcom”.	

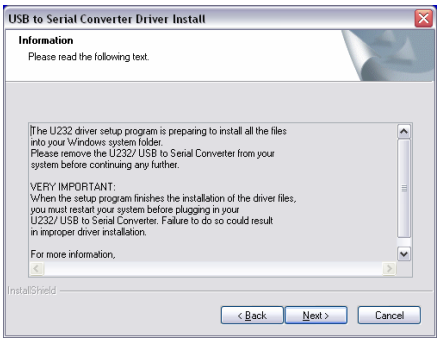
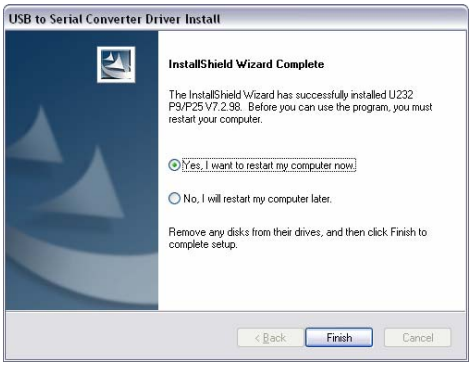
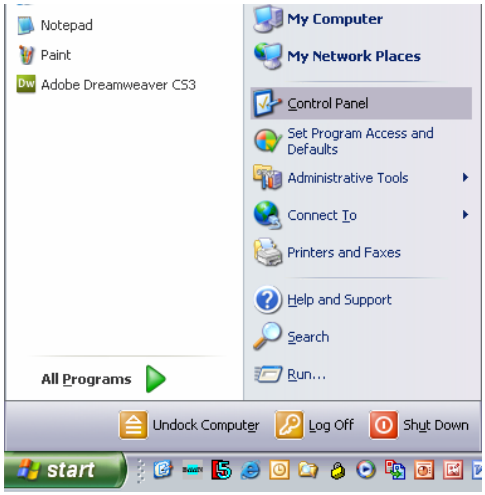
The “Info” button shows the version information of the Hardi PC Uploader and software in the connected controllers.	

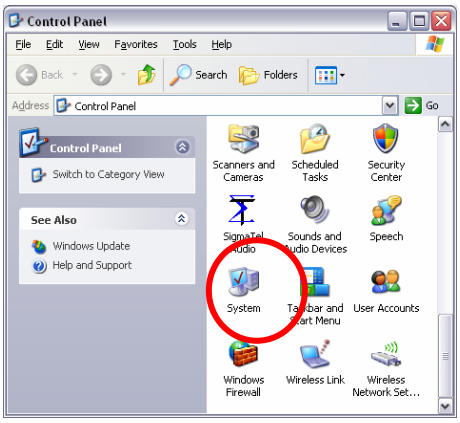
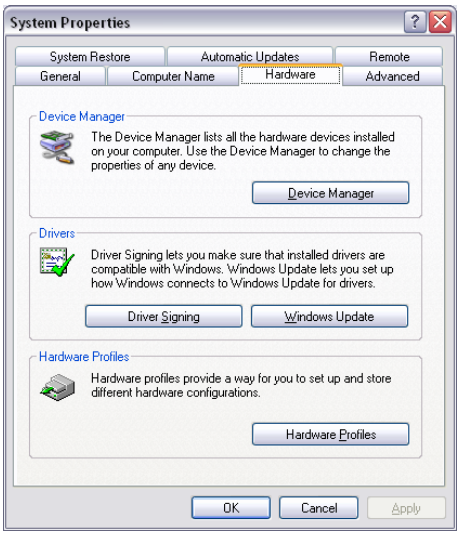
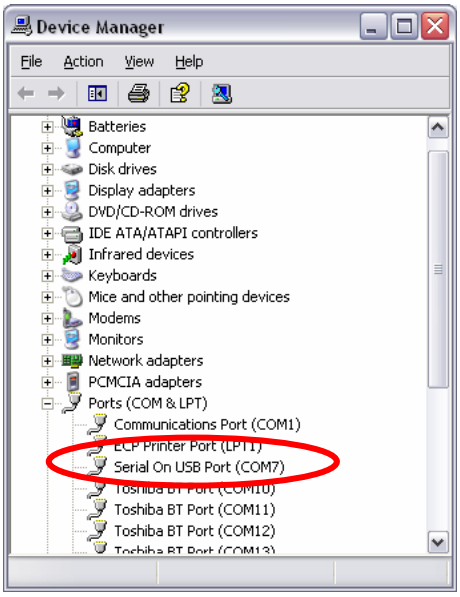
Communication cable

The connection from the PC to the controller is made with HARDI cable P/N 72271600. The cable has a short circuit in one of the connector, normally where the label is. For software update this means HC5500	
Loop in communication cable. Port 1 (Com 1) is used as communication port on the HC5500.	
The cable is marked with “Hardware halt” at the end with the loop. The mark is on the cable or with a yellow sticker on the connector. If the cable is turned the wrong way, the software transfer procedure may not be possible. The communication cable is shown on the spare part CD, pages M302. Part number for the cable is 72271600 and can be ordered as a normal spare part.	

USB to RS232 Converter

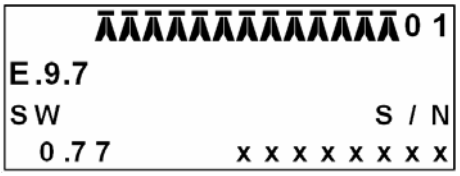
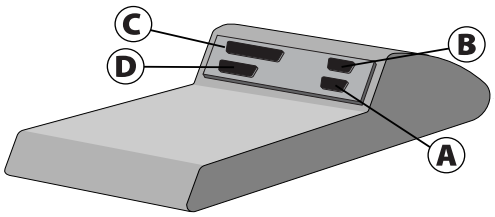
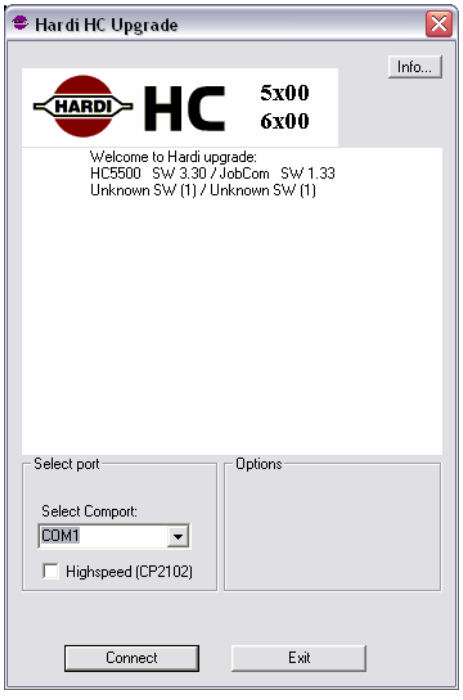
If there is no RS232 port, or problems with the Com port on the computer, use a converter from USB to RS232. The systems requirement to use a converter is: A computer with Windows XP or later. USB to RS232 serial converter, Hardi P/N 26025900. Serial NULL-modem cable, or Hardi "Communication cable" P/N 72271600.	
Install the USB to RS232 serial converter using the instructions and driver, which should be included with the USB to RS232 serial converter. NOTE: Do not plug the USB-RS232 converter into the system before the driver is finished installing	
Insert the CD-Rom with the driver in the drive. Select "Search for the best driver in these locations"and "Search remoable media floppy, CD-ROM" and select Next>	
At this screen select "Next>"	

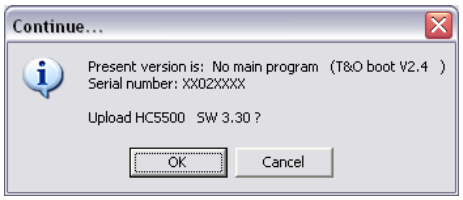
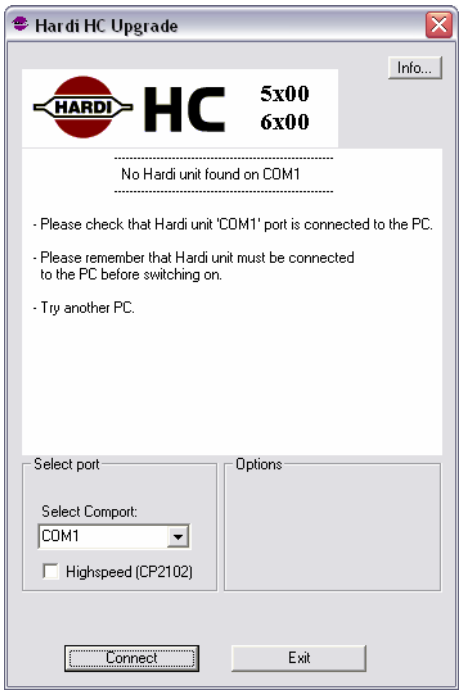
Accept the “Information” window by pushing the “Next>” button	
Select if you want to restart the computer now or later. Push the “Finish” button. After a restart of the computer the adaptor is ready to use.	
Verify comport number. Before you can start upgrading your Hardi controller, you need to find the number of the USB-serial Converter. Click on the Windows “start” button and select “Control panel”.	

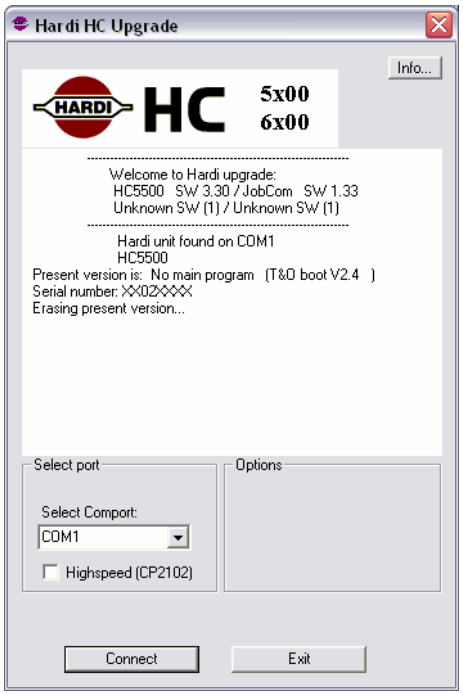
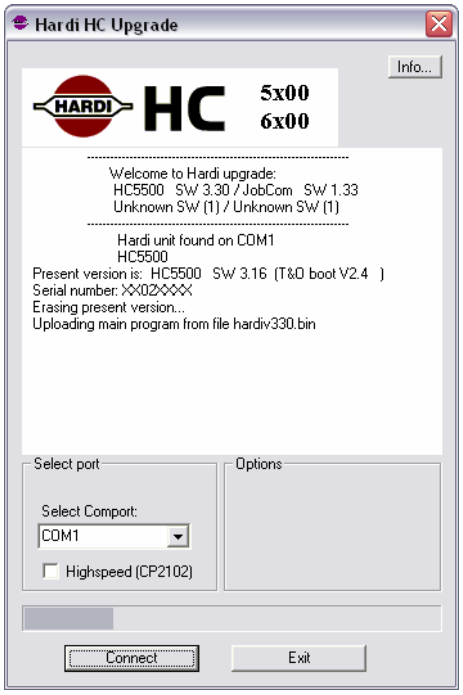
Double-click on the “System” icon.	
Click on the “Hardware” tab. Click on the “Device manager” button	
Find and expand the “Ports” icon by clicking on the ‘+’ left to the icon. Now you will see a screen not so different from the picture above. Here you see that there are many devices using a COM number, This may varies from PC to PC. COM7, the one we need is called “Serial On USB Port (COM7). With that number in mind you can close the Device Manager window, and continue to next step. The number connected to the “Serial On USB Port” is in this case 7. But keep in mind, that this is just a guide, you need to see your self, what number your “Serial On USB Port has been installed on.	

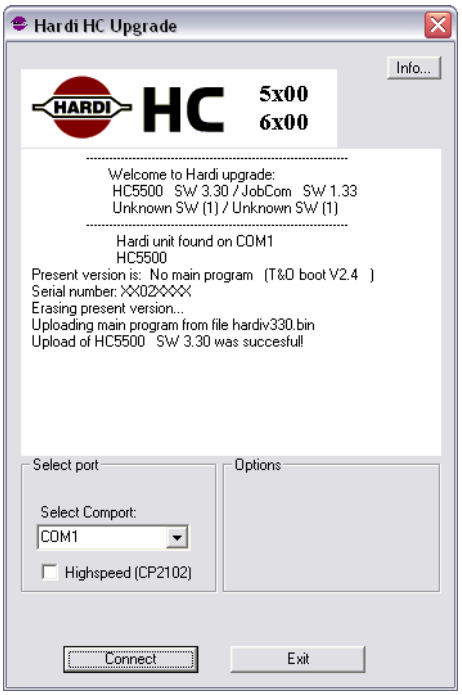
Software upload HC5500

The HC5500 software version is shown every time the controller is switched on.

The Jobcom software version can be seen in Extended Menu E9.7. This menu will show what software version and what serial number the Jobcom has.	
The communication cable without the “Hardware halt” is plugged into the PC. This is done before the computer is powered up. The communication cable with the “Hardware Halt” is attached to the HC5500 in COM 1 (A) port).	
Power ON the PC. Power ON the HC5500 When the HC5500 is ON, the display will write “Hardware halt”. The controller awaits contact to the Hardi HC5500 upgrade software programme.	
On the PC, the upgrading program can be started up and the PC dialogue box should look like this. The dialogue box shows what software version will be uploaded to the HC5500 Controller. Communication port has to be chosen. If you use a USB-Serial converter see section “USB to RS232 Converter” how to find the Com port number. Select “Connect”. Highspeed (CP2102) can only be used with the HC6500 Controller.	

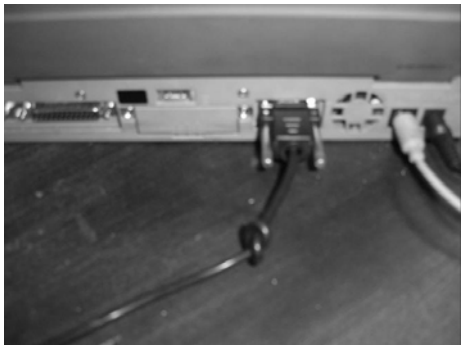
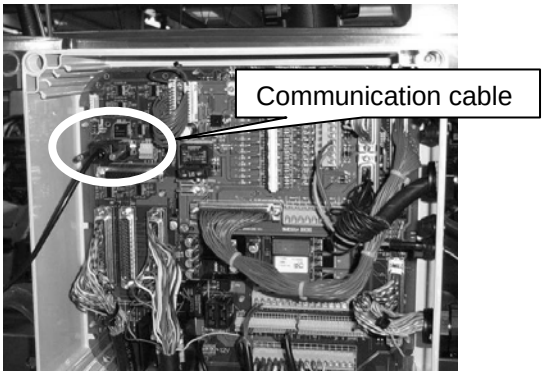
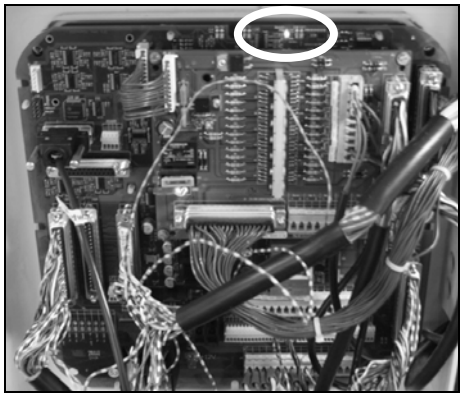
The dialogue box will ask if the software should be uploaded to the selected version. Select “OK”. The display in the HC5500 will change. If the display does not change, something is wrong with the connection.	 
The upgrading program will tell what kind of error there is with the connection and what can be done to solve the problem.	

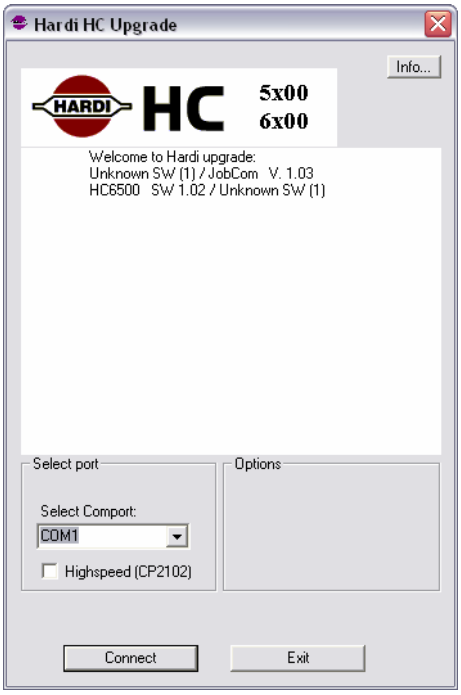
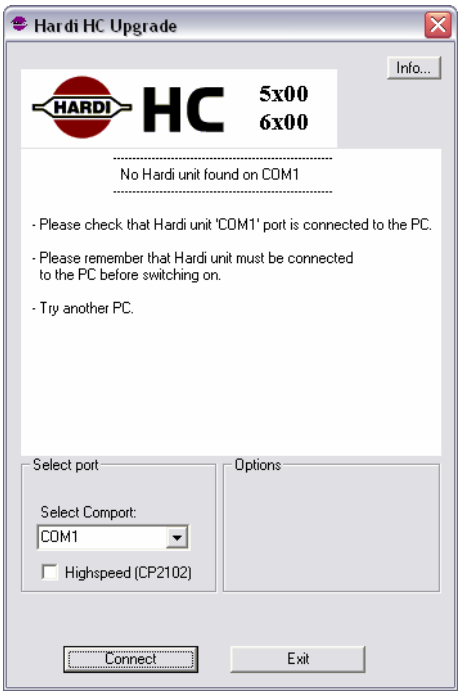
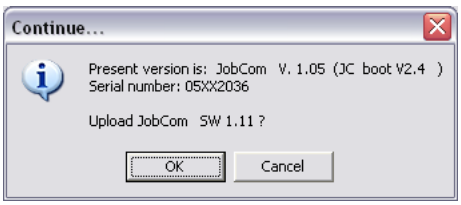
Is there no problem with the connection between HC5500 and the PC, the uploading will start. The upgrading program writes what it is doing.	
The upgrade program starts to erase the software in the HC5500. Then the uploading of the new software start. The bar at the bottom of the dialogue box indicates the upload process. When finished, the program informs if it has been successful or not.	

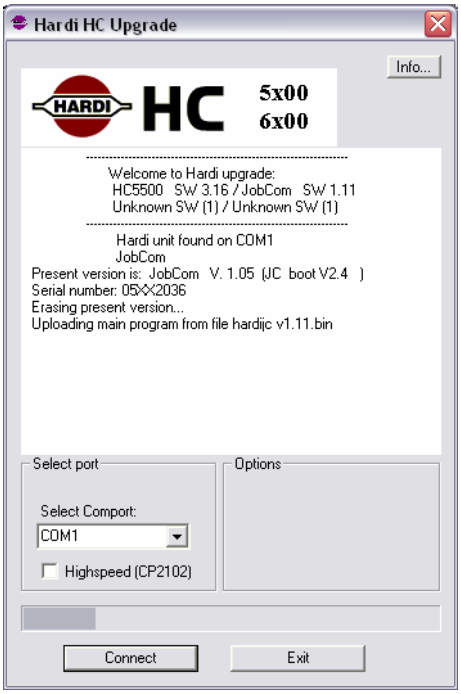
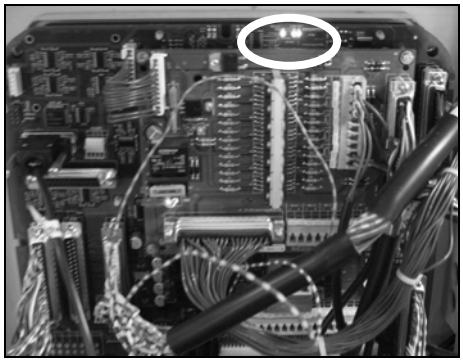
The dialogue box displayed when uploading is finish.	
Master Reset HC5500 To access Extended Menu, press and hold ESC button on HC 5500 and then power ON the controller. A “bip” will indicate Extended Menu is active and it will show E1. With new software in the HC5500, it is necessary to perform a reset. The reset is done in E7.2. The PIN code is 12345. When keyed, press “Enter” and resetting will begin. When done, press “ESC” to exit the menu. After reset, the HC5500 return to default values. Only the total register “0” will not be reset.	

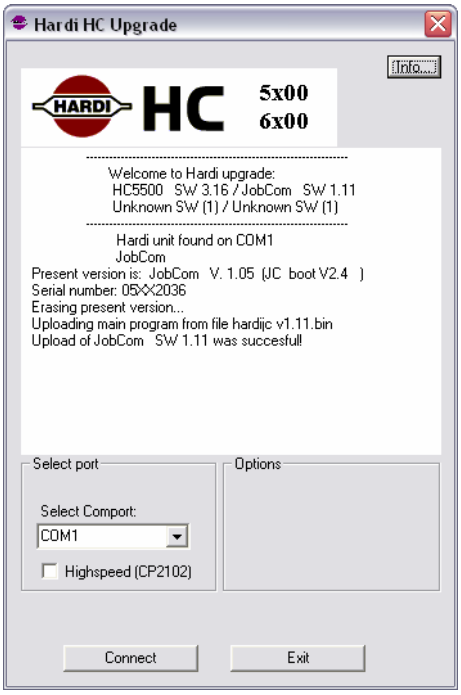
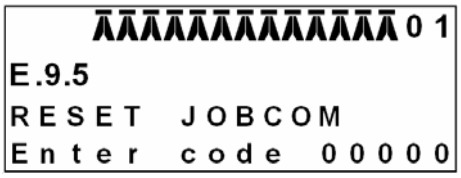
Software upload Jobcom

The connection from the PC to the Jobcom is made with HARDI cable P/N 72271600. The cable has a short circuit in one of the connector, a “Hardware halt”, normally where the label is. This connector should be connected to the device that is receiving data, in this case the Jobcom. The PC needs the software program Hardi upgrade.

The communication cable is plugged into the PC, the plug without the “Hardware halt” (yellow sticker) – this is done before the computer is started up.	
The communication cable is plugged into the Jobcom before it is switched on. The plug that is attached to the Jobcom is the one with the “Hardware halt” (yellow sticker).	
When the Jobcom and PC is connected the PC can be powered up and afterwards the Jobcom. The Jobcom is powered up on Spray box. To be sure that JobCom is ready to be upgraded, ensure that the red LED flashes 5 times and then pause in a loop. Here you notice the green circle which surrounds the red LED on the JobCom. The Jobcom knows that it will receive software as soon as the communication cable is attached and therefore has it started up being ready for receiving data. The red LED can be seen, in the top of the picture, the watchdog is marked.	

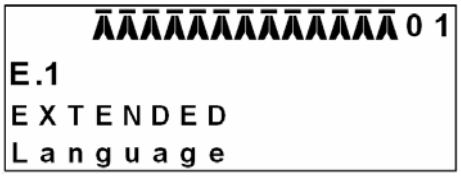
On the PC, the upgrading program can be started up and the PC dialogue box should look like this. The dialogue box shows what software version will be uploaded to the JobCom. Communication port has to be chosen. If you use a USB-Serial converter see section “USB to RS232 Converter” how to find the Com port number. Select “Connect”. Highspeed (CP2102) can only be used to the HC6500 Controller.	
If the upgrade program does not find a connection between the Jobcom and PC, this error message will appear. If this message appears, then see if the cable is attached correctly and there is power on the controller. If this does not help, power down the PC and the controller and start all over.	
When you press “Connect” the upgrade begins, after a little while, you will be prompted with a window. There are two versions of this window, one where you have to upload a new boot and a new application. This looks like the window to the right:	

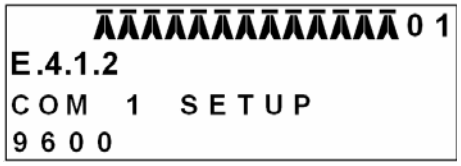
The only difference between the two versions is the “Upload new boot…” line. This is because it isn’t always necessary to upload a new boot, to upload new application software. - Click “OK” to upgrade JobCom. - If JobCom needs to upgrade boot software it will erase the old one, and the “Hardi HC Upgrade” will upload a new version. - If it was necessary to upgrade the boot software (if not, skip this step), you will be prompted with the following window after the boot upload:	
- Turn off and on the power on JobCom and wait until JobCom red LED continues to flash 5 times and then pause in a loop. Then click “OK” to continue upgrading JobCom. - Afterwards “Hardi HC Upgrade” will erase the current application on JobCom and upload the new one. The bottom bar of the display dialogue box indicates how far the uploading has processed.	
When the upload of the new software has started, diode N28 and D27 will start to flash together with the watchdog.	

- At last “Hardi HC Upgrade” will prompt: “Upload of JobCom SW X.XX was successful!” and you are done. If the updating was not successful, try again. Check the power supply to sprayer and PC.	
Reset Jobcom with HC5500 With new software in the Jobcom, it is necessary to perform a reset. To reset Jobcom with a HC5500 enter menu E.9.5. The PIN code is 74650.	

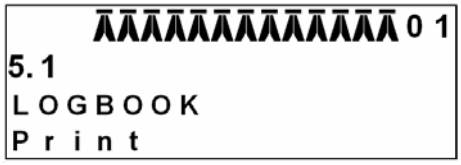
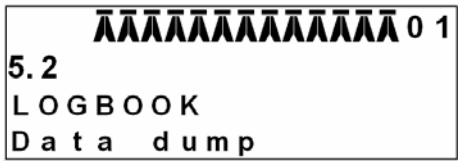
Dump of data from HC5500 Controller

Configuration of HC5500 to dump data

Open the extended menu in the controller by doing following: Switch OFF the Controller Push and hold the “ESC” button on the Controller Switch ON the Controller and release the “ESC” when the E.1 Extended menu is showed.	
Select: E1 Language E2 Unit E3 Sprayer type E4 Data exchange E5 Optional sensors E6 Service interval E7 Factory settings E8 Settings E9 Jobcom	
Select: E.4.1 Data exchange COM 1 SETUP COM 2 Setup	
Select: E.4.1.1 Equipment type E.4.1.2 Baud rate E.4.1.3 Protocol select	
Select: E.4.1.1 Equipment type Printer Dump Printer & dump GSM VRA/remote If “Dump” is chosen: Data will be dumped “raw” and the data from printed data in the controller will not be able to be printed out of the controller, like in Menu 5.1. If “Print & Dump” is chosen:Data can be written out “raw” or the data can be written out from the print menu.	

Select: E.4.1.2 Com 1 setup Baud rate 9600	
Select: E.4.1.2 Baud rate 1200 2400 4800 9600 19200	
Leave the extended menu by switching off the controller	

Dump data from HC5500

Switch ON the controller and open the normal menu by pushing the Menu button	
Select: 5 MAIN MENU Logbook	
Select 5.1 LOGBOOK Print	
Select one of following options: 5.1.1 Print register number 5.1.2 Print all registers 5.1.3 Print configuration	
Select 5.2 LOGBOOK Data dump	
Select: 5.2.1 Data dump raw data 5.2.2 Data dump with header 5.2.3 Data dump Configuration	

Configuration of HyperTerminal

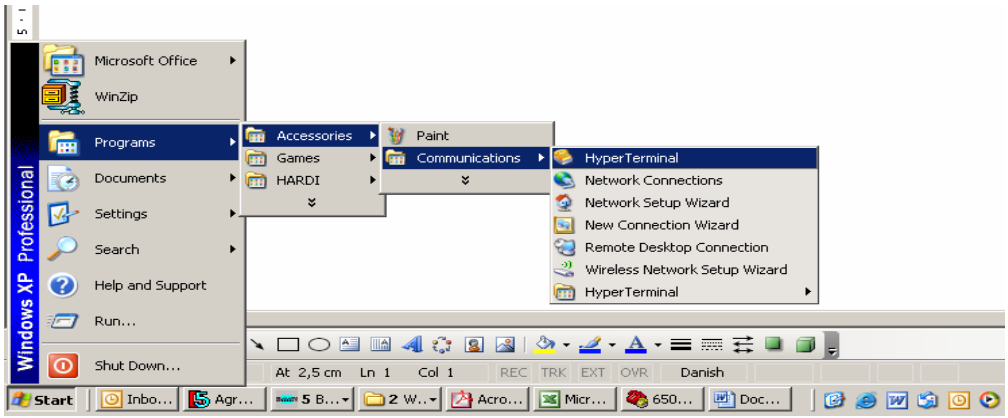
It is possible to transmit and receive data to and from the HC5500/6500 through the com port on the controller and the computer.
Use HyperTerminal on the PC to transmit or receive data from the Controller.
The connection from the PC to the controller is made with HARDI cable P/N 72271600. The cable has a short circuit in one of the connector, normally where the label is. This connector should be connected to the device that is receiving data.
See appendix for drawing of the cable.

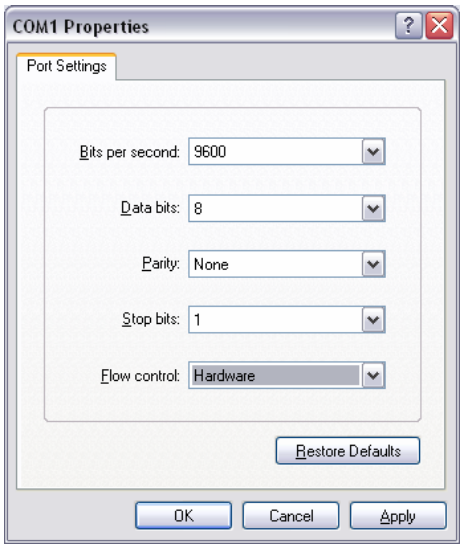
The data read in HyperTerminal can be exported to a spreadsheet or a word processing, see section “Handling the data”.

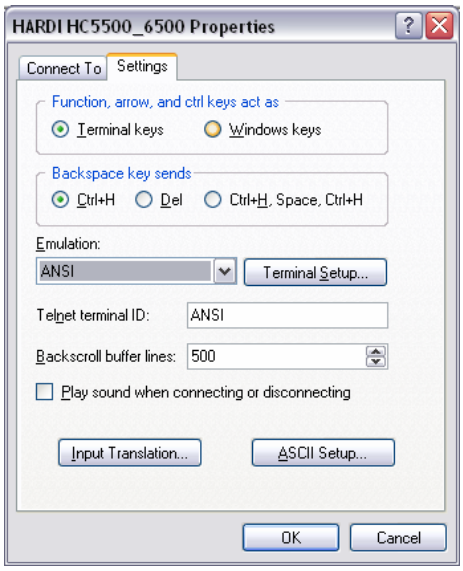
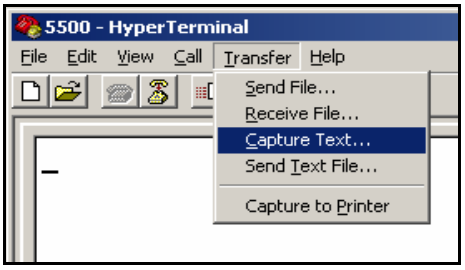
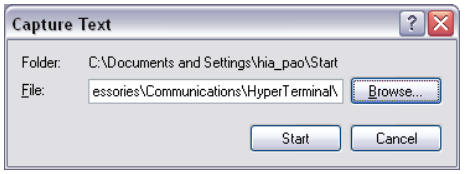
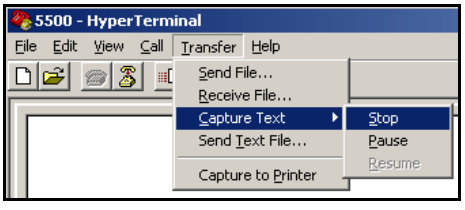
Configuration of the HyperTerminal:

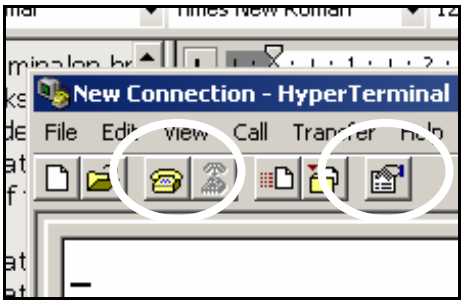
Baud rate	9600
Data bit	8
Parity	None
Stop bit	1
Flow control	Hardware
Emulation	ANSI

The HyperTerminal is normally installed in the “Start” menu in Windows:



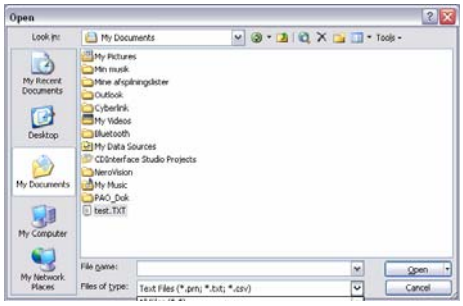
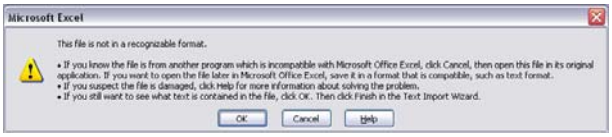
Open HyperTerminal and enter a name	
Select COM1 or another available COM port on the PC	
Add the port setting data and select “Apply” and “OK”.	

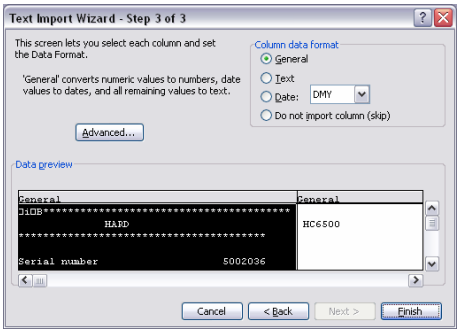
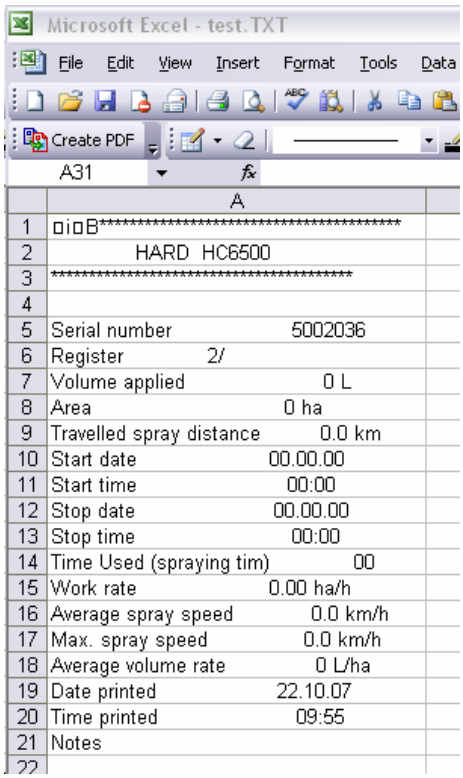
To set up the Emulation in HyperTerminal select in the File menu: Properties and then Settings	
If the data should be saved in a file the “Capture Text” need to be activated	
When the “Capture Text” is activated select a place to save the file	
When the controller is finished to transmit data select “Stop” or “Pause” in the menu	

If the terminal is open with wrong settings do following:	
The terminal can be connected or disconnected. It is not possible to change settings in the Connection and Port settings if the terminal is connected. Push the “phone” button to connect/disconnect. To change settings, push the “Properties” button in the menu.	

Handling data from HyperTerminal

The dumped data can be used in different ways. If the data is used for analyse later on, the data must be saved. If not necessary to save the data, the data will be shown on the PC screen and lost when the file is closed.
If the dumped data is to be opened with a spreadsheet after the transfer, the data must be saved on the PC. The data is saved as a Notepad data file. These files can also be opened in a spreadsheet (e.g. Excel) but it has to be done the right way.

Open the data file in Excel Open Excel and select “Open” fil. Select “Files of type *.txt.”. Select the file to open, e.g. Test.TXT.	
Select OK in this warning window.	
Select “Delimited” as data type in the next window.	

Mark “Other:” with an “|” (press AltGr+|).	
Select “Finish”	
And Excel will open the file:	

Local Language maintenance

The HC5500 has UK, F, D, DK, SF and HU as standard languages. It can also store 2 local languages. This allows you to write and download a local language to the controller.

How to translate a language file

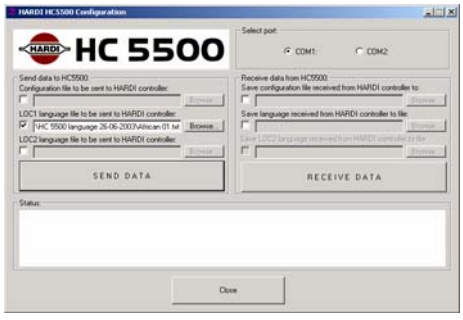
Select a file with a known language, e.g. English.
Open the file with Notepad, re-name it, and overwrite the text. Note that “MaxLength”, refers to the maximum number of letters that can be used. The spacebar also counts for a letter.
When finished, save it. Now it can be transfered to the HC5500 from a PC.
If you do not have the language file is it possible to dowload it from the controller. See section “Download language file from HC5500 to PC”.

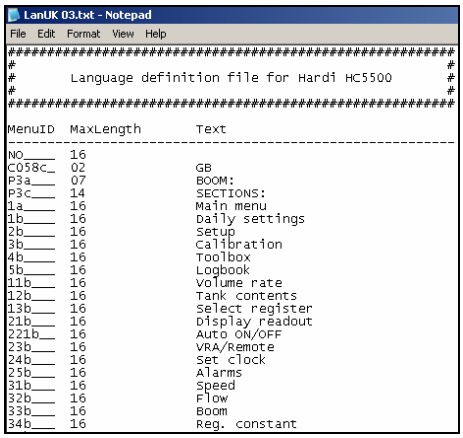
New software and local language

When the software in HC5500 is updated will the language file be deleted. Follow the next seven step to maintenance the local language.

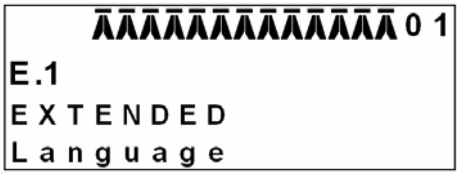
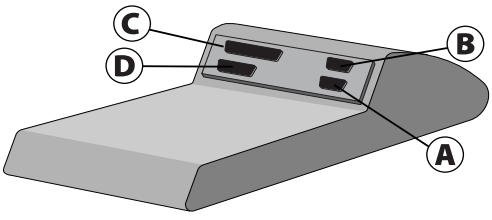
1. Transfere local language file from controller to the PC
2. Upload the new software to the controller
3. Upload the same local language file to the controller again
4. If the new software has new menu lines, will these lines be in English
5. Transfere the local language file to the PC again
6. Translate the English menu lines to the current local language
7. Upload the local language file to the controller again

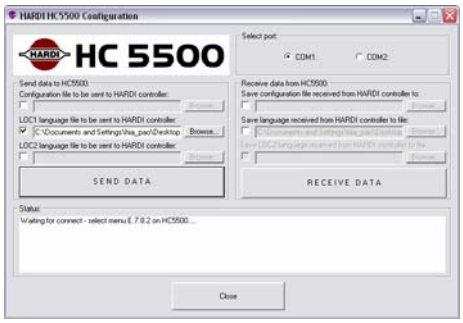
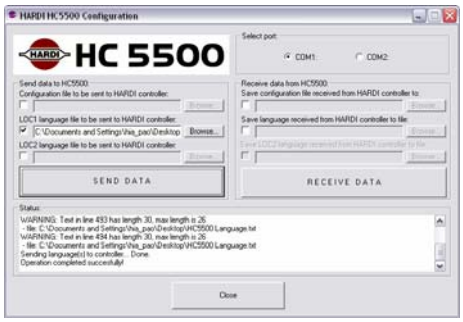
Begin with step two if you have the local language file on the.

Configuration program for the HC5500. For transferring files from the PC to the HC5500 or to the PC a Configuration HC5500 program is needed. If you don’t have this program, Customer Service/Technical Service can supply it.	

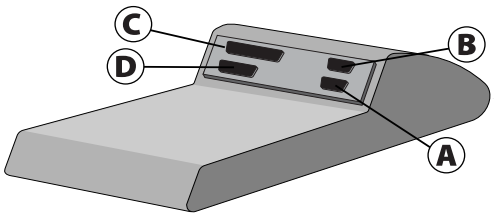
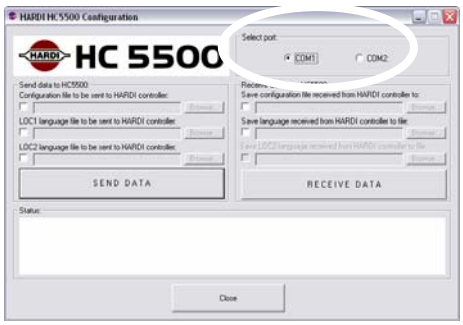
Standard language files Language file opened in Notepad	

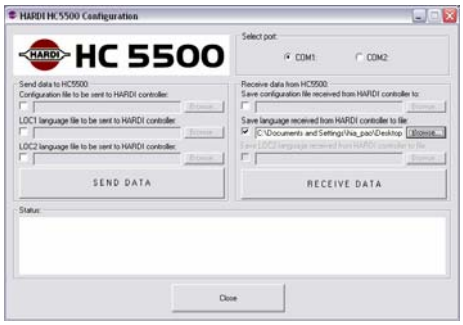
Transfer the language file from PC to HC5500

Power ON HC5500 in Extended Menu mode.	
Select E.7.8 Factory	
Select E.7.8.2 PC to box Push the “Enter” button	
Connect RS232 cable to HC5500 COM 1 (A) port. If using the HARDI communication cable P/N 72271600, connect the “Hardware halt” end of the cable to the PC.	
Open Language configuration program on the PC Select COM port for PC.	

Click “LOC 1” or “LOC 2” on left hand side and select your local language file to be sent with the browser function. Click “Send data” and follow instructions in the “Status” box. Push the “Enter” button on controller.	
Various messages will be showed in the display! Wait until the display show that it has send and received data and show “Hardware halt. Wait for connect” second time.	  
HC5500 software will show following box: Operation completed successfully!	

Download language file from HC5500 to PC:

Power ON HC5500 in Extended Menu mode.	
Select E.7.7 Factory Send language	
Select E.7.7.2 Send language Box to PC Push the “Enter” button	
Connect RS232 cable to HC5500 COM 1 (A) port. If using the HARDI communication cable P/N 72271600, connect the “Hardware halt” end of the cable to the PC.	
Open Language configuration program on the PC Select COM port for PC.	

Click “Save language received from HARDI controller to file:” on right hand side. Click “Receive data” and follow instructions in the “Status” box. Select language to download: UK, D, Dk, F, SF, HU, Local 1 or Local 2. Push the “Enter” button on controller. Open the file with Notepad	

PCB's

There is several different kinds of PCB's (Printed Circuit Board) on the sprayers. The PCB's can be divided into two main groups "Leaded components on PCB" and "Surface Mounted Devices on PCB" (SMD)
The group with the "Leaded components on PCB" covers the PCB's:

1. Breakout PCB
2. PCB for section valves
3. Hydraulic PCB

Characteristic for these PCB's are that there is no intelligence "computer" in these PCB's. The components on these PCB are soldered on. This PCB can be repaired of a person that can solder new components onto the PCB.

The group with the 'Surface Mounted Devices on PCB are:

1. Jobcom

On this PCB, there is intelligence, "a computer", on the PCB. The PCB is a SMD print. The components are soldered only to the surface of the print, not through holes like a normal print. The SMD print is very difficult to repair if it breaks down, so the Jobcom is to be sent back to Hardi in Denmark for repair.

Common for all the PCB's are that all the connectors have a description for what function on the sprayer is connected to the particular connector. Furthermore, a description of where the wires that comes from the sensor or function must be mounted "+ / - or signal". Picture 16 show a PCB example.

PCB for Liquid

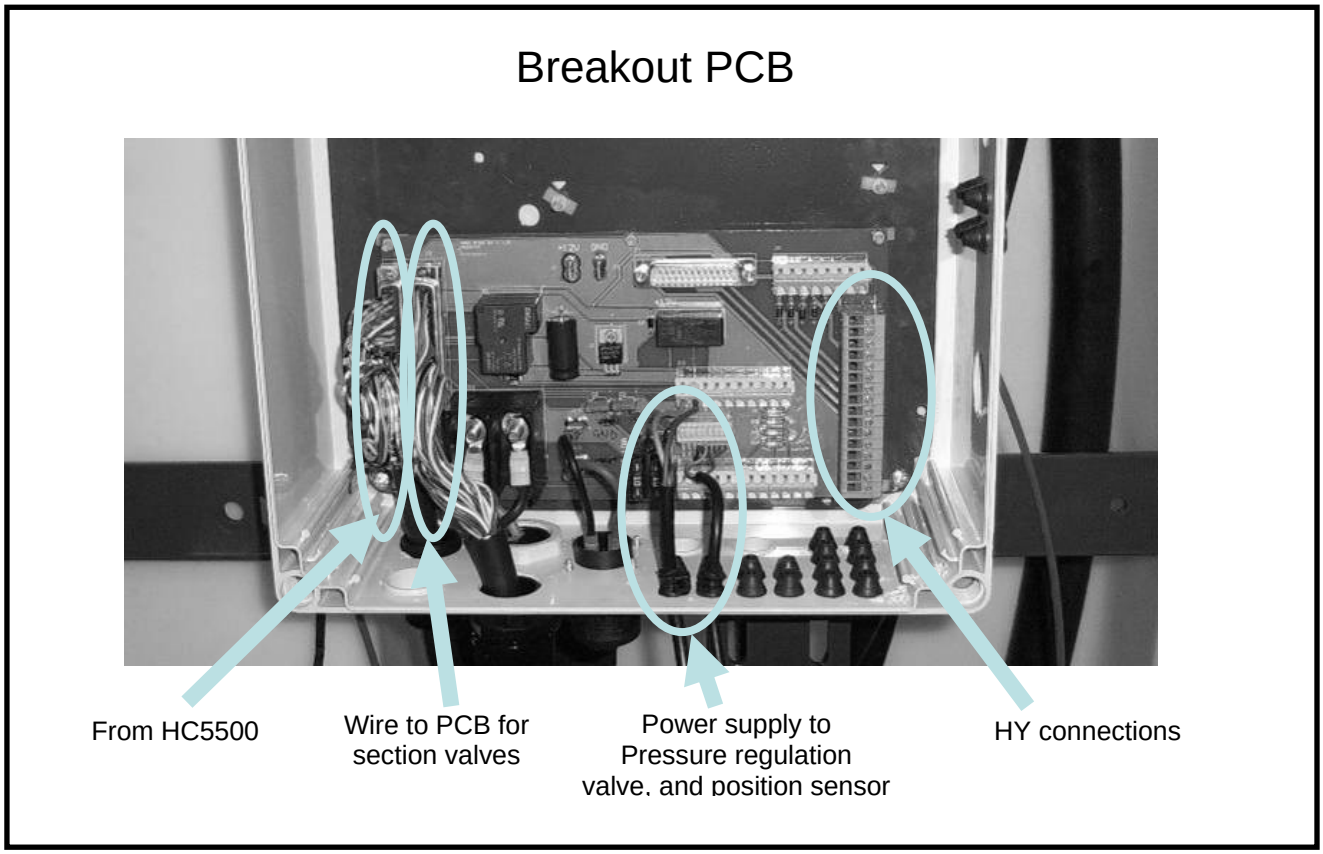
There are four different types of PCB for liquid control;

1. Breakout PCB — Picture 15 on pages 66
2. 9 section's PCB — Picture 16 on pages 67
3. 13 section's PCB — Picture 17 on pages 68
4. Jobcom PCB — Picture 20 on pages 71

The Breakout or Jobcom PCB is mounted in front of the sprayer in a grey box.
The 9 or 13 section PCB is mounted at the rear of the sprayer.

Breakout PCB

The Breakout PCB is used when the CM05 is without Track. The Breakout PCB will split up the cable from the HC5500. The wires for the pressure regulation valve will be taken out here and the rest of the cable from the HC5500 will go on to the PCB for section valves.



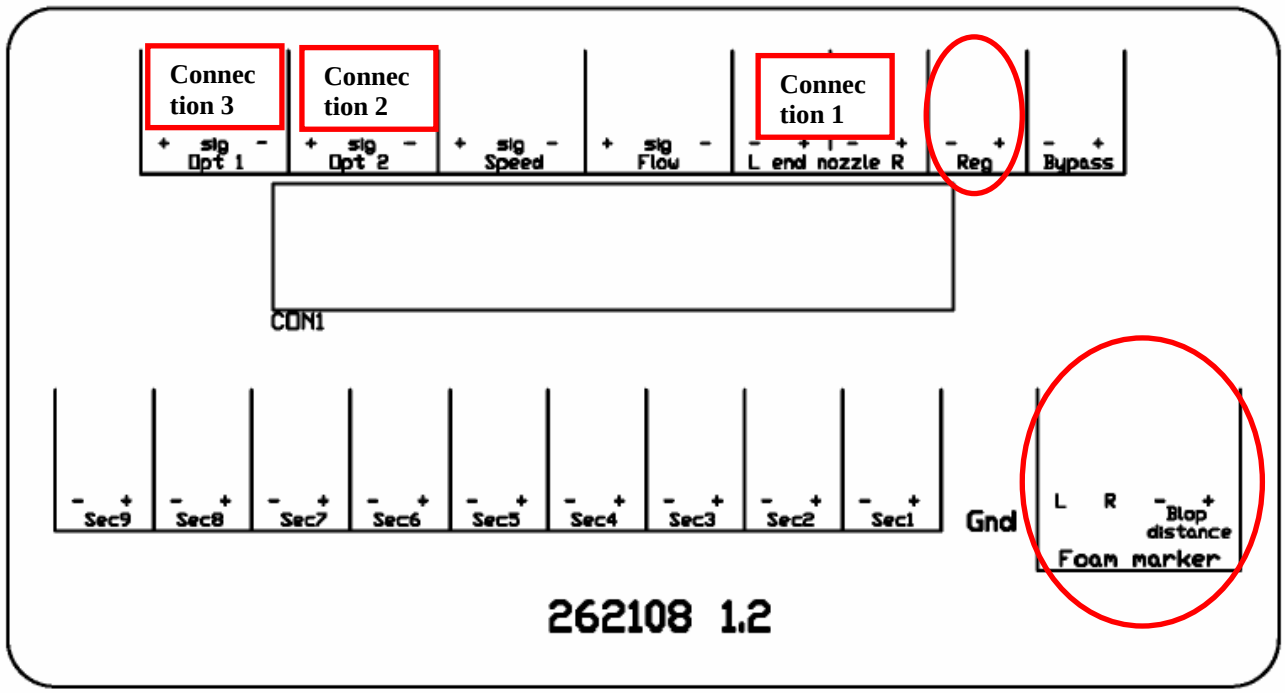
Picture 15 Breakout PCB

PCB for section valves, 9 sections

The difference between the 9 and 13 section PCB is the connection for the pressure regulation valve.
9 section: Connection for the pressure regulations valve, see Picture 16, is shown in the small circle.
13 section: No connection for the pressure regulation valve, see Picture 17 on pages 68.

This means that it is not possible to connect the HC5500/Spray box II direct to the 13 section PCB. There has to be a Breakout PCB or Jobcom in between.

The 9 section PCB will be used on a MASTER, MEGA, RANGER and NAVIGATOR sprayer where all the section valves and the pressure regulation are mounted at the same place on the sprayer. The cable from the HC5500 is connected directly to the 9 section PCB.
The wiring for the two PCB's is not the same, so they can not replace each other.



Picture 16 PCB for sections valves (9 section's PCB)

Part number for the 9 sections PCB is 72173900

Connection of optional sensors:

Pressure sensor:

The wires from the Pressure sensor are attached to "Connection 3" on the PCB. See Picture 16.

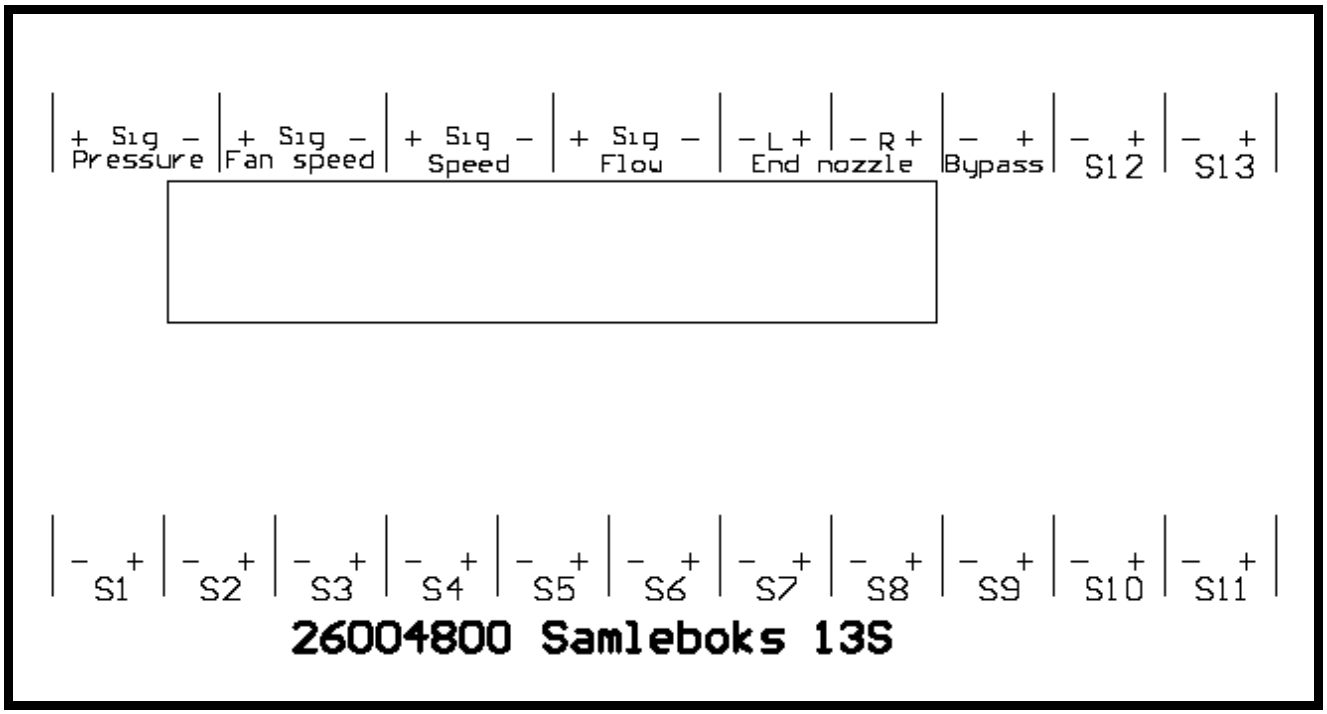
TWIN:

The wires from the Fan speed sensor are connected to "Connection 2". Picture 16.

End nozzle kit:

The wires from the End nozzle kit are connected to "Connection 1" on the PCB, on Picture 16.

PCB for section valves 13 sections



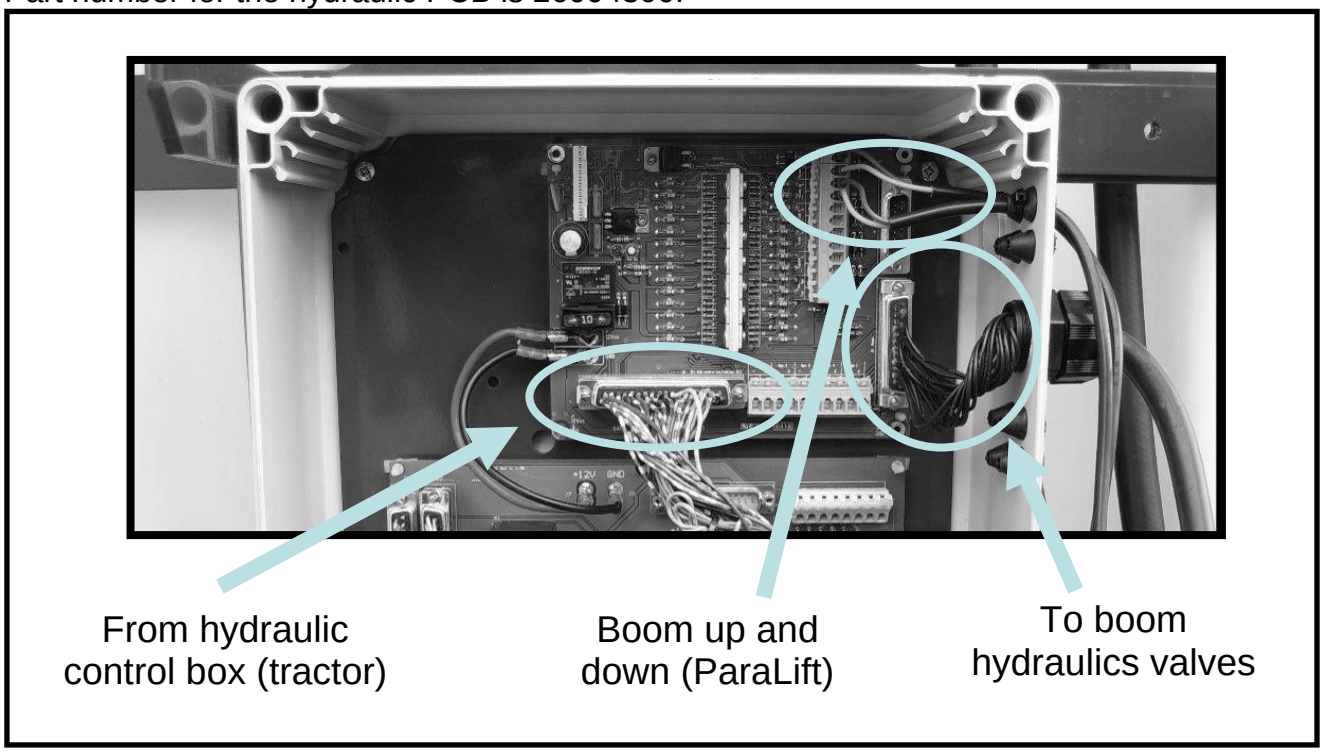
Picture 17 PCB for section valves "New Commander" (13 sections PCB)

On PCB "13 sections", it indicates where the optional sensors must be connected.

For the Pendulum Lock, the End nozzle connection is used for controlling the cylinder.

PCB for hydraulic

The PCB for hydraulic is called DAH (Direct Activated Hydraulic) and can be seen on Picture 18.
The PCB controls the hydraulic system on the sprayer, boom hydraulic and SafeTrack.
If a sprayer is without SafeTrack, the PCB will be mounted as shown on Picture 18.
If it is with SafeTrack, the PCB will be mounted on top of the Jobcom, see Picture 20 on pages 71.
Furthermore the PCB for SafeTrack will also be mounted, see Picture 19.
Part number for the hydraulic PCB is 26004300.



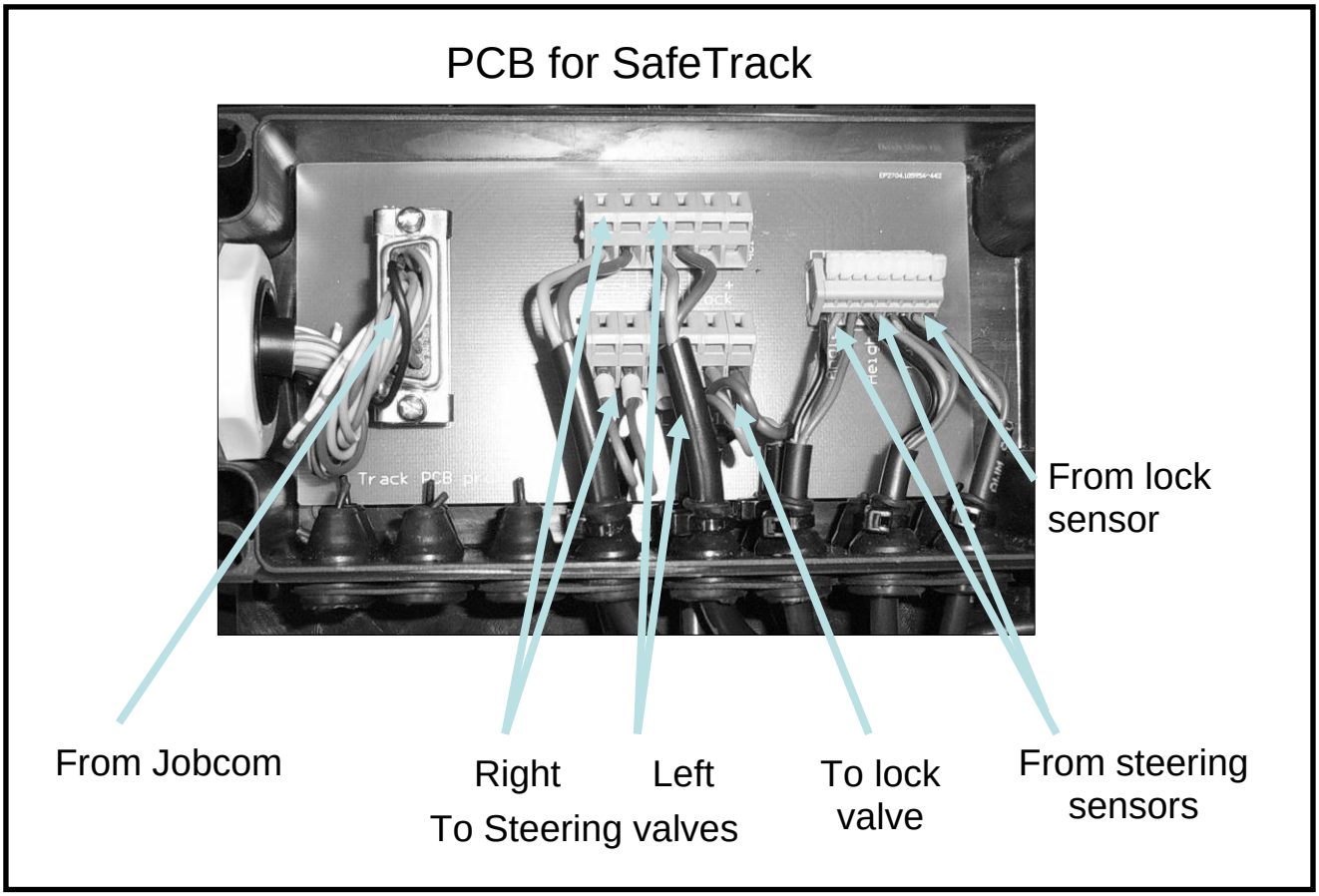
Picture 18 PCB for hydraulic

Sprayer fitted with Y hydraulic

Y hydraulic is the most simple and economic hydraulic system. The sprayer will be without SafeTrack and electric boom controls. Boom folding and lift up and down will be controlled directly from the tractors hydraulic.

PCB for SafeTrack

The PCB for SafeTrack is mounted underneath the sprayer next to the hydraulic block for the SafeTrack. Part number for the PCB is 26007600.



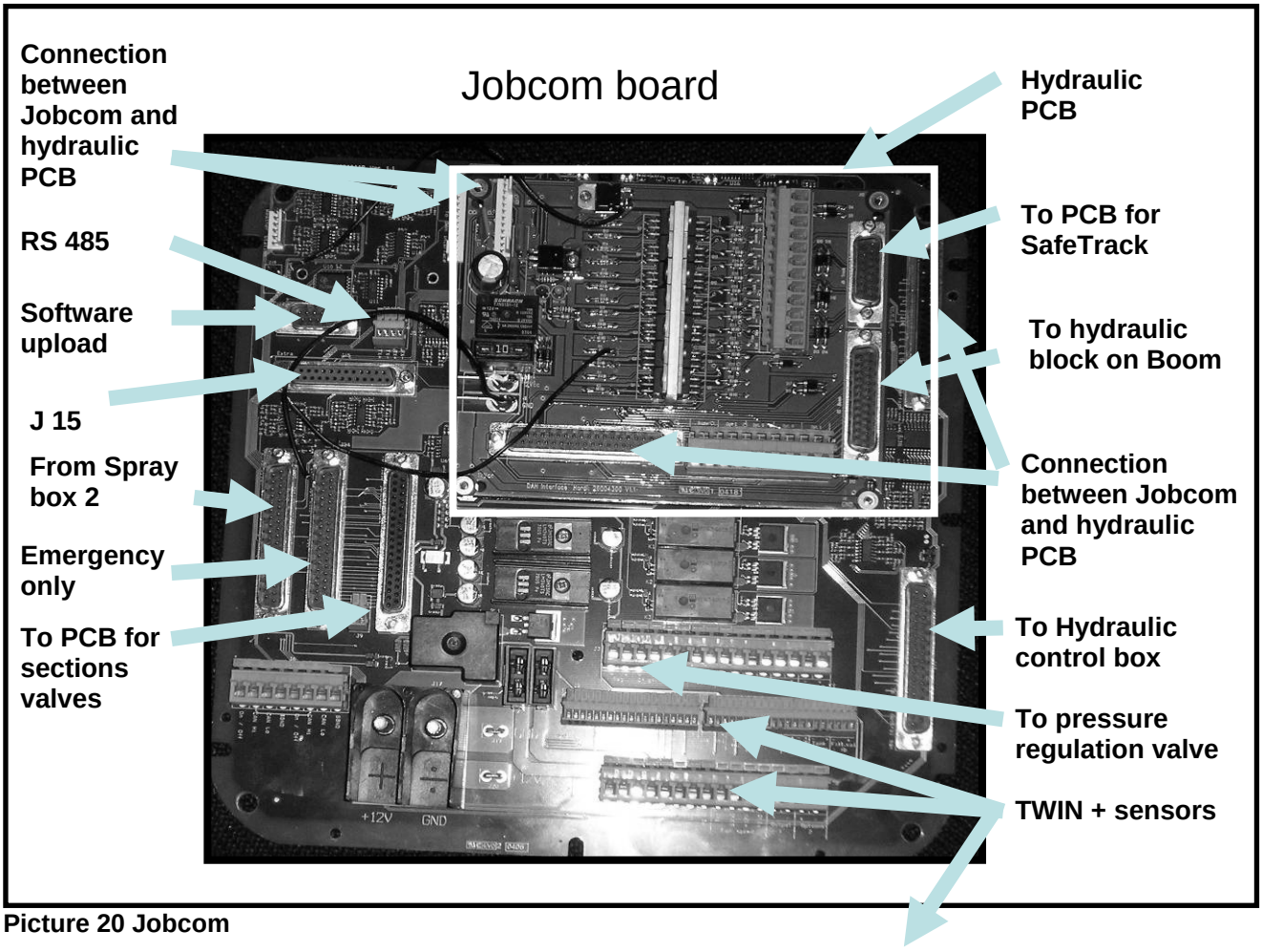
Picture 19 PCB for SafeTrack

PCB for Jobcom

The Jobcom is a computer that handles the Track and AutoSectionControl fuction.

Resetting the Jobcom

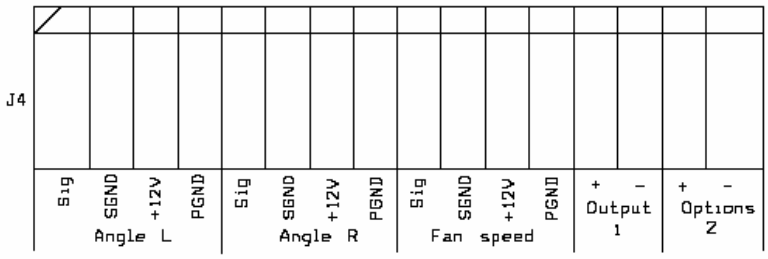
When the Jobcom is reset, all the setting will return to default values including the Track setting. Re-calibration will be necessary.



Picture 20 Jobcom

TWIN actuator connection to Breakout PCB or Jobcom

Wire colour	Connection
Yellow	Sig
Brown	SGND
Green	+12V
White	PGND



Fault finding on HC5500 & Jobcom

Jobcom

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
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
Jobcom not responding or unintended function	Communication error	Check menu E9.2 All cables connections in the Jobcom, Junction box and track assembly box is checked, retighten screw on the cables plugs.
Jobcom not responding!		Check If the 3 green LED´s Rx/Tx are flashing 3-4 times per second and N28/D27 red and green is Flashing 2 times per second it means communication between Jobcom and HC5500 is OK
Will not uploaded Software successfully.	Cable incorrect, or incorrectly fitted, Communication error.	Cable 72271600 has to be used. The plug with the yellow tag has to be mounted in the Jobcom. Use the USB to RS232 converter instead of the PC com port.
Incorrect response from Jobcom. When calibrating sensitivity in menu 3.6.6 the per cent will com above 40% and display FAIL!	The Jobcom does not respond correctly after uploading the newest software. Error under uploading of software. The DAH PCB has to be hardware version 1.2.	Upload the software on more time, and then reset the Jobcom. Use the test procedure for Track / Manual, reset alsothe HC 5500 by pressing arrow left, enter, arrow right and arearemaining.
No response from the hydraulic.	Burned Jobcom PCB. If there is a brown circle on the PCB there has been extreme heat.	Bypass the Jobcom by taking the blue cable from J14 and assemble it with cable from the Hydraulic box J13.

LED´s on Jobcom

PCB	Component	Function	Comments
Rx	D54	Indicates that the jobcom is sending information to HC 5500 display	
Tx	D55	Indicates that there is information from the HC 5500 display through RS485	RS485 for use on HC6500
Rx	D56	Indicates that there is received information from the HC 5500 display	
Tx	D57	Indicates that the jobcom is sending information through RS485	RS485 for use on HC6500
D27	D27	Indicates software version by flashing X number of time under start-up, after this the LED will flash with 2Hz and indicate CPU status.	D27 is working with D28 software version is indicated as X.YY
D28	D28	Indicates software version by flashing YY number of time under start-up, after this the LED will flash with 1Hz and indicate CPU status.	D28 is working with D27 software version is indicated as X.YY
Watchdog	Watchdog	Is lighted constantly to indicate that the jobcom is ready to receive software when the cable 72271600 is connected to the PC. When it's lighted there is now outputs active.	

Software error code on the HC5500

Error codes can be a combination of the below:
E.g. Code 6040: This is a combination of code 6000 and code 40 where 6000 means it could not write to the serial port and 40 means a reply is missing.

Codes indicating the uploader program has gone into a non-existence mode:

555
666
777
888
999

Codes for Send Data () errors:	
1000	Serial port is not open
2000	Could not write to serial port (API-call WriteFile() failure)

Codes for GetData() error:	
5000	Serial port is not open
6000	Could not write to serial port (API-call WriteFile() failure)
7000	Number of bytes read from serial port was less than expected
8000	Checksum fault in the received data

Codes for UploadMain() error:	
10	Could not send 'SN' or 'MR' or 'PM' to the controller
20	No answer from controller on 'SN' or 'MR' commando
1..9	Controller answered 'SNx, 'MRx' or 'PMx' where x = 1..9 (0 expected)
30	Reply from controller not recognized (SN0 or MR0 expected)
40	Could not read the reply from 'PM' from the serial port

Codes for SendProgram() errors:	
100	Unknown controller type (HC5500 or JobCom)
200	Could not write a data-block to serial port
300	Answer from the controller not recognized as block acknowledge
400	Negative block acknowledge from the controller
500	Could not read block acknowledge from serial port
600	Could not send BLKEND to controller
700	Could not read answer on BLKEND from serial port
800	Controller gave illegal answer on BLKEND

Codes for SendProgramExternalFile() errors:

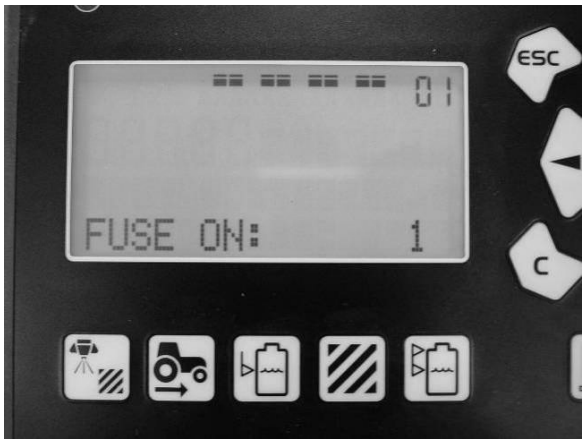
10000 Program file is too small
20000 Unknown controller type (HC5500 or JobCom)
30000 Could not write data-block to serial port
40000 Could not read block acknowledge from serial port
50000 Answer from the controller not recognized as block acknowledge
60000 Negative block acknowledge from the controller
70000 Could not send BLKEND to controller
80000 Could not read answer on BLKEND from serial port
90000 Controller gave illegal answer on BLKEND

Thermal fuses on the HC5500 and Spray box

The Spray box has 3 thermal fuses. If a short-circuit occurs, one or more of these will become active. An error message will appear on the HC 5500 when electrical fuse is “on”. It will flash on the bottom line of the HC 5500.
The number (1, 2 or 3) indicates what area is short-circuited.

1 Left-hand side and centre switch of the section valves
2 Right- hand side of the section valves and main ON/OFF
3 Options and pressure regulation

The thermal fuses protect the system but it must be powered off immediately.
When the problem is resolved, and the fuses have cooled down, the system can be powered on again.



Revision

Service Manual HC5500	P/N 679060-700	rev. 7.00. GB 03.2008

Date	Subject	Section	Pages	Written By
04-09-2006	Error codes on HC5500	Error code on the HC5500	25	PER
25-09-2006 Revision 4	Proof reading of whole document	Error code on the HC5500	78	AF
21-11-2006 Revision 5	Printer paper thread added. Thermal fuses added. TWIN acuator wiring added. TankGauge sensor removed	Printer Fault finding PCB Appendix	11 102 98 77	AF AF AF AF
03-07-2007 Revision 6	Additions for SW 4.00 and NAV Some text revisions	Menu Tree		AF
10-03-08 Revision 7	Overall update to rev.7, S/W 4.XX.	All	75	PAO