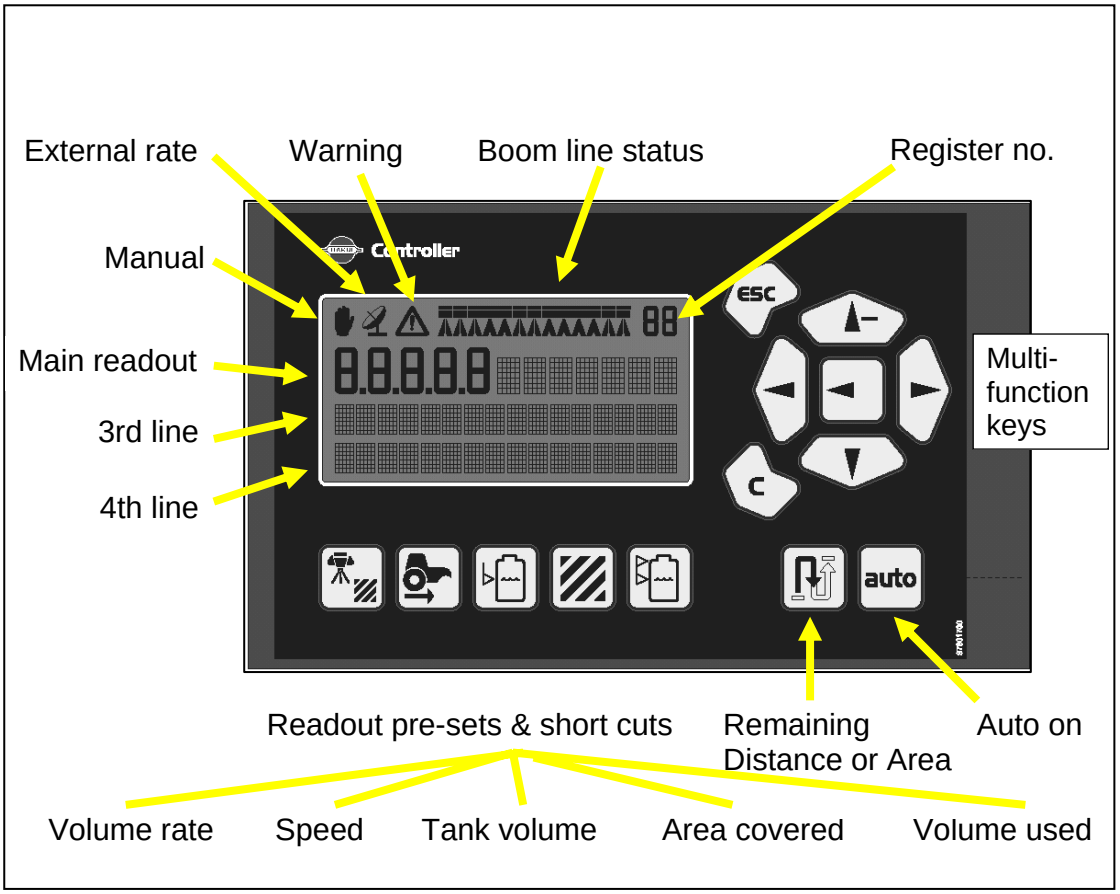
Service Manual HC5500

Revision 4

Contents:

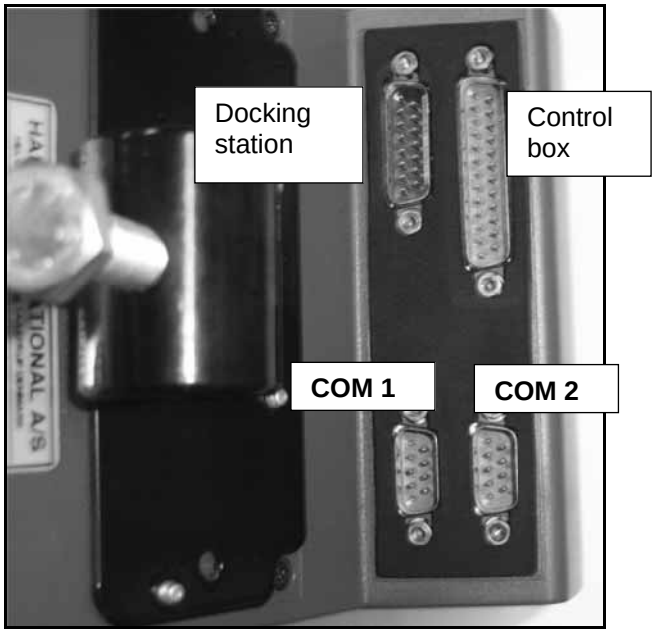
The hardware on the HC5500

The Display



Connectors at the back of the HC5500

Picture 1 names the four sockets.



Picture 1: Sockets on the back of the HC5500

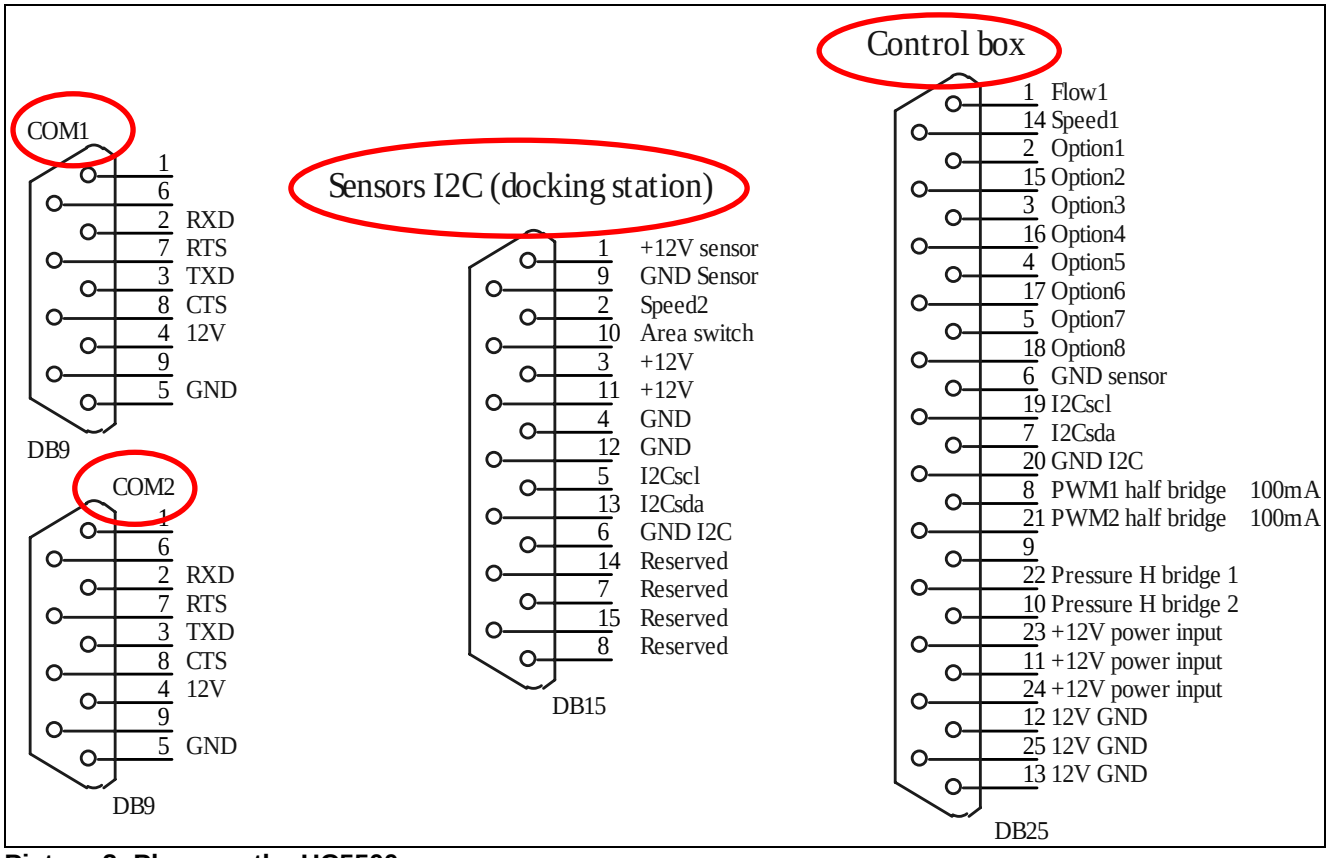
The socket functions are:

Docking station: This is used if the HC5500 is connected to the tractor speed sensor or if the foot pedal is attached. The foot pedal is described on pages 10 in the section “Optional extras for the HC5500”. A closer look on the socket can be seen on Picture 2, *docking station*. The pinning is described on this picture.

Control box: This is used for the liquid control box (Spray box 2) and this can also be seen on Picture 2, *Control box*.

COM 1: This can be used for either; dumping data, receiving data-software or it is used for the connection to the printer. See Picture 2, *COM 1*.

COM 2: This has the same function as COM 1 and it can be use for; dumping data, receiving data-software or it is used for the connection to the printer. See Picture 2, *COM 2*.

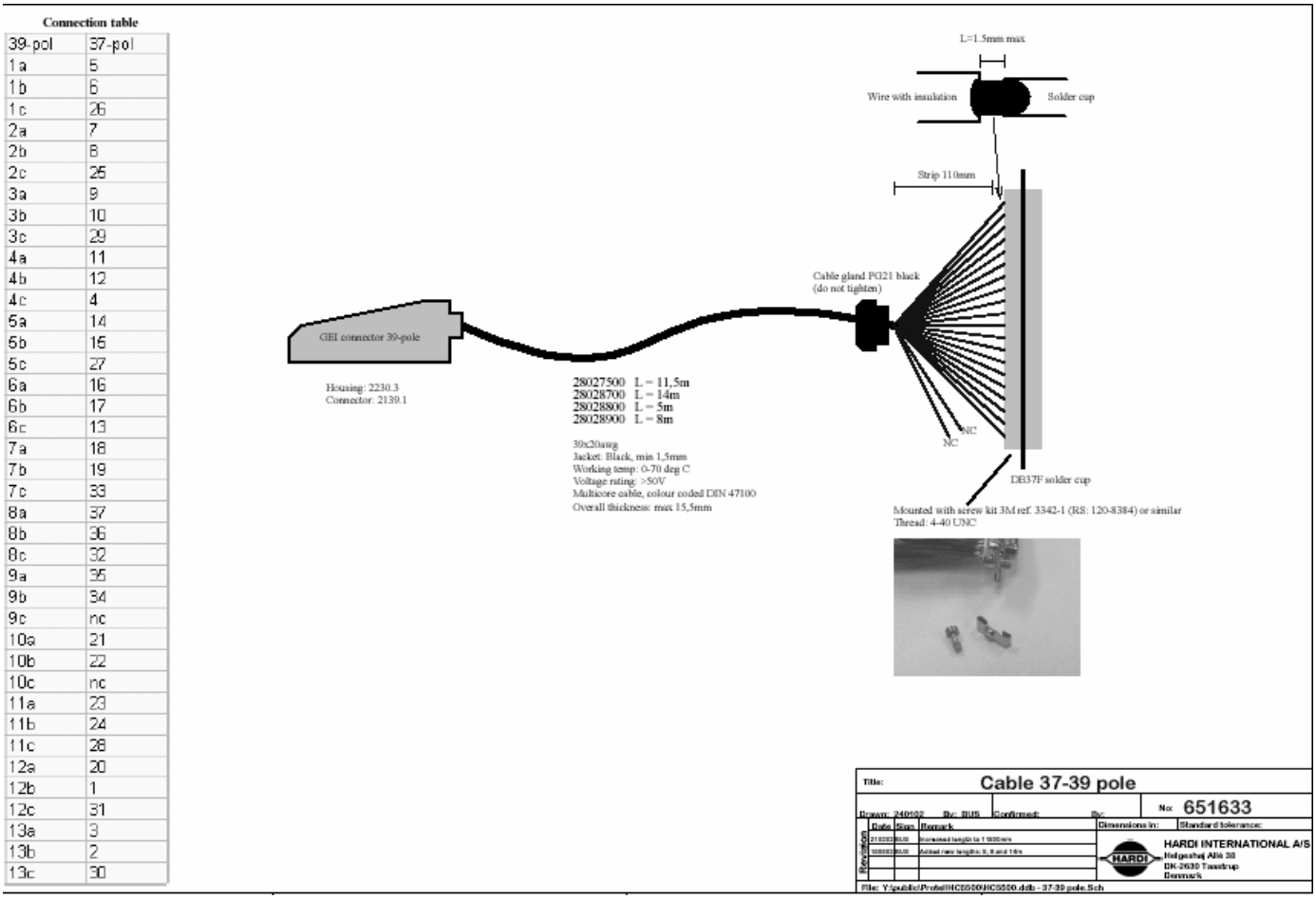


Picture 2: Plugs on the HC5500

Cable between HC5500 and the Jobcom / Breakout Printed Circuit Board (PCB) is shown on Picture 3.

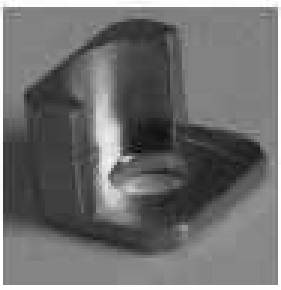
Technical data:

Jacked:	Black, min 1.5 mm
Working temp:	0-70 deg C
Voltage rating:	>50 V
Multi-cable :	colour coded Din 47100
Overall thickness:	max 15.5 mm



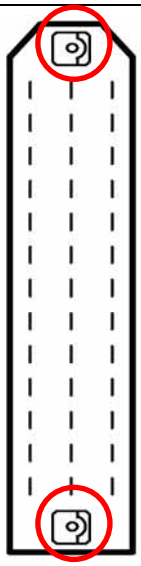
Picture 3: 37 – 39 pole cable

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 shown on Picture 4.

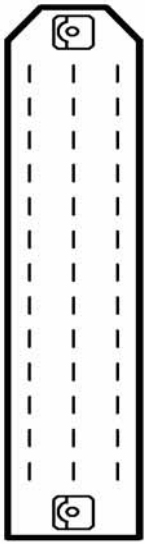


The actual coding of the cable is shown on Figure 1. The dowel is set as when viewed into the plug on the cable. Re-coding the dowel allows switching from liquid to hydraulic and vise-versa.

Picture 4: Dowel



Cable for liquid

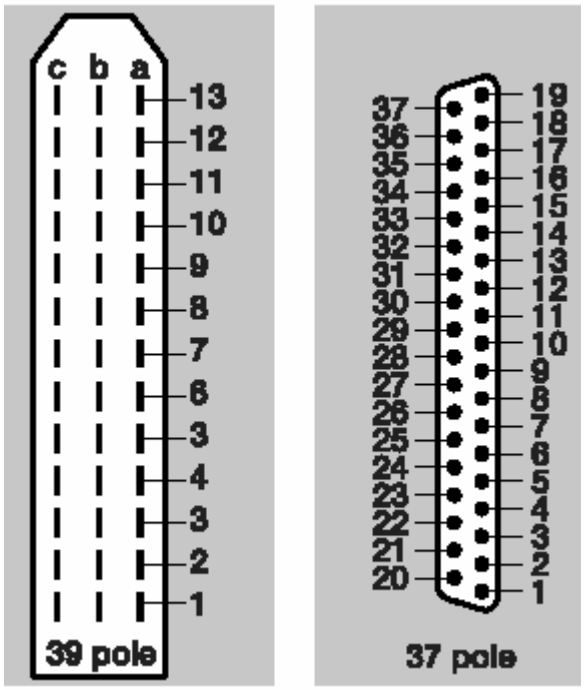


Cable for hydraulic

Figure 1: Coding of 37-39 pole cables

The coding is shown on Picture 5 for the liquid system.

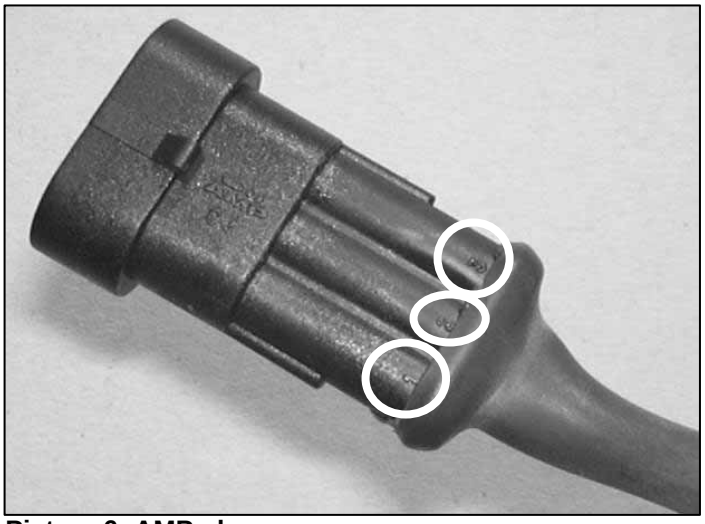
39-pole	37-pole	SPRAY	SPRAY II
1a	5	S1+	S1+
1b	6	S1-	S1-
1c	26	End nozzle L	END NOZ L
2a	7	S2+	S2+
2b	8	S2-	S2-
2c	25	End nozzle R	END NOZ R
3a	9	S3+	S3+
3b	10	S3-	S3-
3c	29	+12V sensor	+12V sensor
4a	11	S4+	S4+
4b	12	S4-	S4-
4c	4	GND1	PWM 1TX
5a	14	S5+	S5+
5b	15	S5-	S5-
5c	27	GND2	GND
6a	16	S6+	S6+
6b	17	S6-	S6-
6c	13	GND3	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	not connected	(Option3)	OPT 3/TANK GAUGE
10a	21	On/off+	On/off+
10b	22	On/off-	On/off-
10c	not connected	(Option4)	PWM 2 OUTPUT OPTION
11a	23	Pressure+	Pressure+
11b	24	Pressure-	Pressure-
11c	28	Flow	Flow
12a	20	FM up	FOAM BLOP 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



Picture 5: Coding of the 39 pole & 37 pole connectors

The AMP plug

On the AMP plug has each of the legs numbered so they are easy to identify, see Picture 6. The numbers are marked with rings and Picture 7 shows how the wires are mounted in the plug and what function the wires have.



Picture 6: AMP plug

Pin & Wire connection

AMP Super Seal	Box	GB
2	+	Brown
3	Sig	Blue
1	-	Black

Picture 7: Coding of the AMP plug

Communications cable

The Communication cable is a crossed RS 232 cable pinned 2 to 3, 3 to 2, 5 to 5. “A HARDI communication cable with hardware loop”. See Figure 1

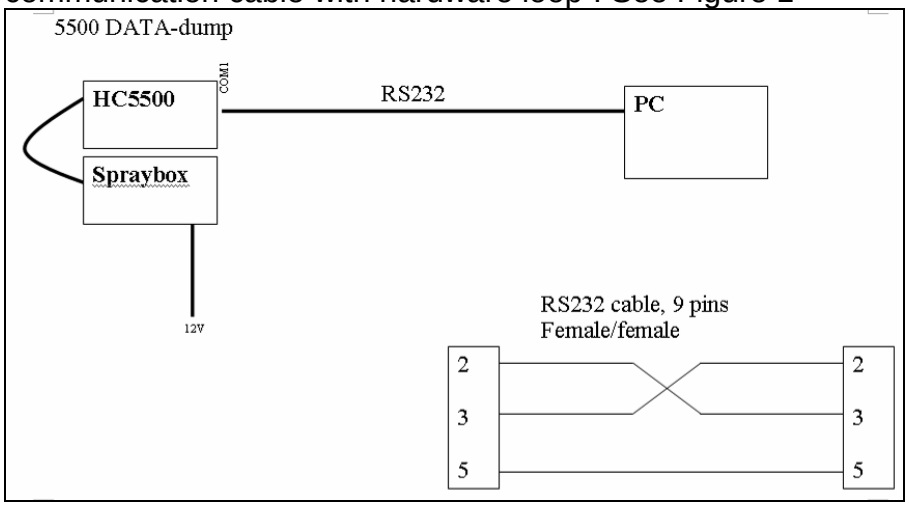
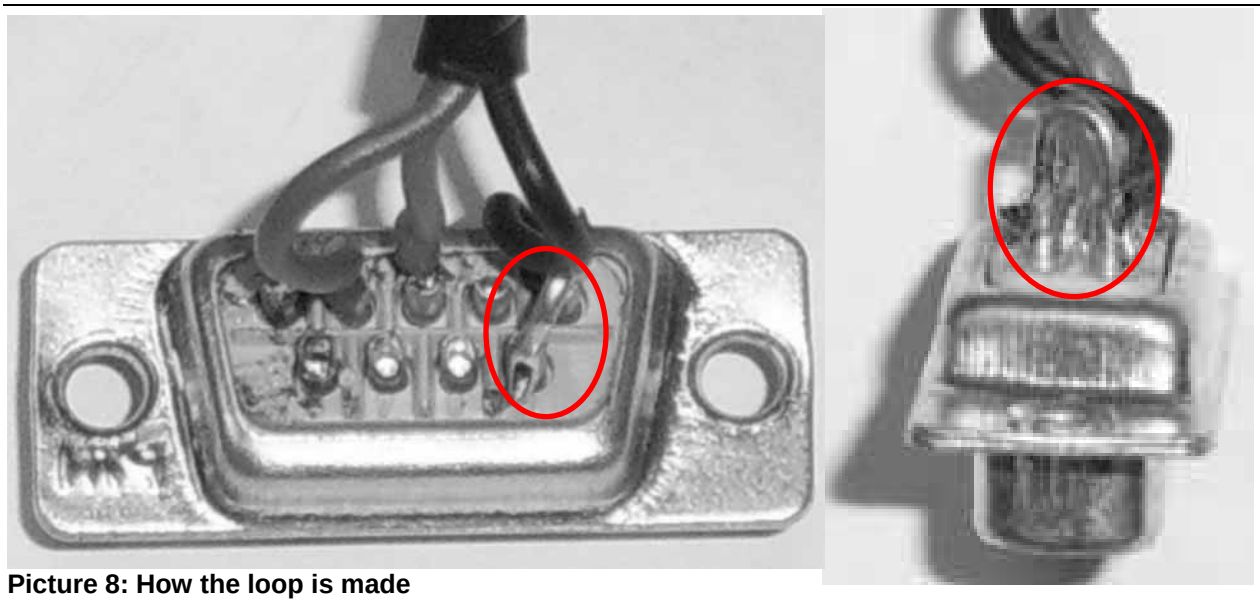


Figure 1: Loop in communication cable. The picture shows how the PC is connected to the HC5500 with the communication cable. Port 1 (Com 1) is used as communication port on the HC5500. The bottom picture shows the loop.

A closer look into the plug shows how it is done see Picture 8

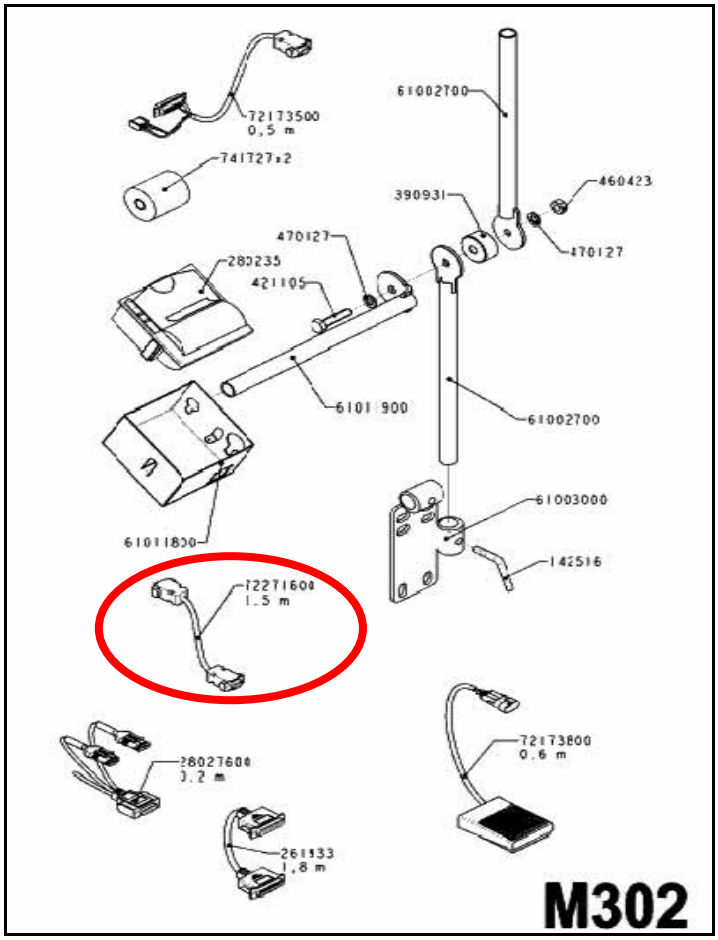


Picture 8: How the loop is made

The loop is made with a piece of wire as shown Picture 8. The blue and brown wire is crossed in the plug in the other end.

The cable is marked with a yellow sticker at the end with the loop. When using the cable, the looped (yellow) end is connected to the unit that will receive software. If the cable is turned the wrong way, will there not be a connection between the two units.

The communication cable between the controller and the PC is shown on the spare part CD, pages M302. See Picture 9.
Part number for the cable is 72271600 and can be ordered as a normal spare part.



Picture 9: Communications cable show non the spare part M302

Optional extras for the HC5500

Printer

A printer can be fitted for the HC5500, as shown on Picture 10.

Picture 10: Printer for the HC5500

The printer can print out several kinds of data from the HC5500.
Picture 11 is an example of a register printed out, and Picture 12 a configuration printout.
The register printout gives the user sprayed area, volume rate that has been used etc.
The configuration printout Picture 12 is the configuration of the HC5500. This print is very useful for giving a quick overview of how the controller is setup and spotting errors.

**********	
HARDI HC5500	
**********	
Serial number	03011211
Register	5 / MOUNT CLAY
Volume applied	1135 L
Area	11.36 ha
Travelled spray distance	5.7 km
Start date	31.07.03
Start time	12:19
Stop date	31.07.03
Stop time	13:27
Time used (spraying time)	01:08
Work rate	9.94 ha/h
Average spray speed	4.9 km/h
Max. spray speed	5.3 km/h
Average volume rate	100 L/ha
Date printed	06.08.03
Time printed	16:18
Notes:	

Picture 11: Print of the register

**********	
Programmed volume rate	0 L/ha
Selected register number	5
Auto ON/OFF, speed threshold	Off
VRA remote ON/OFF	Off
Clock set up	24
Optional sensor 1	Pressure
Optional sensor 2	Revolution
Alarm volume rate	+/- 0 %
Alarm tank contents	0 L
Alarm optional sensor 1	0/ 0
Alarm optional sensor 2	0/ 0
Alarm speed max.	0.0 km/h
Alarm speed min.	0.0 km/h
Alarm sections off	Disable
Audio level	0
Sprayer speed PPU (active)	6.000 PPU
Tractor speed PPU	1.000 PPU
Radar speed PPU	1000.0 PPU
Flow PPU (flow 1)	120.00 PPU
Return flow PPU (flow 2)	0.00 PPU
Boom width	24.0 m
Number of sections	5

Picture 12: Print of the configuration

The connection from the printer to the HC5500 is done through COM 1 or COM 2 (these ports are described in section “Connectors at the back of the HC5500” on page 3).
The printer is powered through the COM port so there is only one plug for the connection of the printer.
For setting up the printer to the HC5500, the COM port must be setup. In the section “Extended menu” / Extended menu 4 “*Data exchange”* page 20, shows where the COM ports on the HC5500 are set up. The printer can be set up to either one of the two ports. 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. This will make the printer work.
If the printer does not work, then check the connection to the COM port and see if it is the correct one. 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 13 and Picture 14. The wire harness is plugged into the docking station socket. See Picture 2 or Picture 1 on page 3.

Picture 13: Foot pedal for the HC5500

Picture 14: Wire harness for the HC5500

The setup of the foot pedal to the HC5500 is done in the “Extended menu” E8.5.1. The menu tree can be seen in section “Extended menu 8” on page 24. 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 14.
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 area, so there is no problem with the connecting of these. The signal from the tractors can however change a lot from brand to brand.
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 read in the instruction book. The speed sensor is also described in the section “speed transducer for tractor”.

Pressure sensor

The pressure sensor can be fitted to the liquid system as an optional extra. It informs the present pressure is in the liquid system. The sensor normally does not have any automatic regulation function on the liquid system. The pressure sensor can be set for a minimum

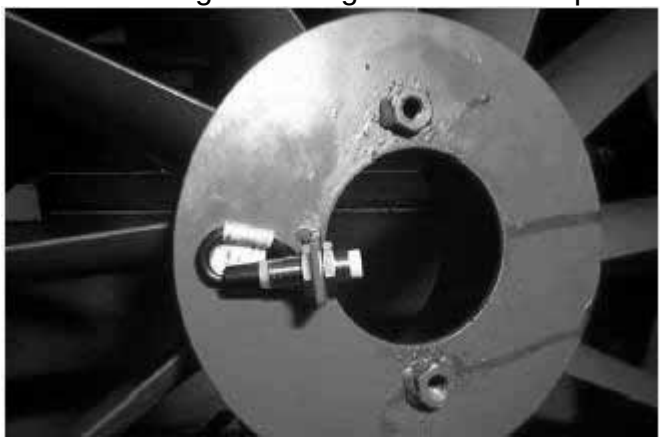
pressure in the liquid system, so if the pressure drops below minimum, the pressure regulation stops.
The HC5500 has min and max pressure alarm that will be shown in the HC5500 display.

Picture 15 Pressure sensor

The pressure sensor 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 66.
When the pressure sensor is mounted on the sprayer, the HC5500 is setup to the sensor. In section “Extended menu” / “Extended menu 55” on pages 21, the setup is shown.
The pressure sensor has a fixed measuring range in Bar. In Menu E5.1 is the minimum bar typed in, and in menu E5.2 is the maximum bar typed in. The measuring range is written on the pressure transducer. Our standard is 0 to 10 bar.
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 are the setting that have to be done in the Extended menu.
For a Display reading on the HC5500, the pressure sensor must be setup for the display. In Menu 2.1 Display readout / Optional sensor Menu 2.1.3, the pressure sensor is chosen so the actual pressure in the liquid system can be seen.
Further information about the display readout is described in the Instruction book for HC5500.

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 Picture 16 shows.
For connecting the wiring from the Fan speed sensor see section “PCB’s” on pages 66.



Picture 16 Fan speed sensor

When the Fan speed sensor is mounted and the wires are connected, the HC5500 must be setup for the sensor. In Extended menu 5.1, page 21, the Extended menu is shown. In

menu E5.2 is the PPU value set. The PPU value can be seen in the menu tree on page 21. These are all the setting that need to be done in the extended menu.
For getting 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.
Further information about the display readout is this described in the Instruction book for HC5500.

Tank gauge

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

Picture 17 Tank gauge sensor

Technical specification for the sensor

Model:	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 membrane

Ordering the tank gauge:

Order number for the tank gauge kit:	72373300
Order number for 10K ohms resistance:	261202

Mounting of the Tank gauge

Wire between Jobcom and 26007300

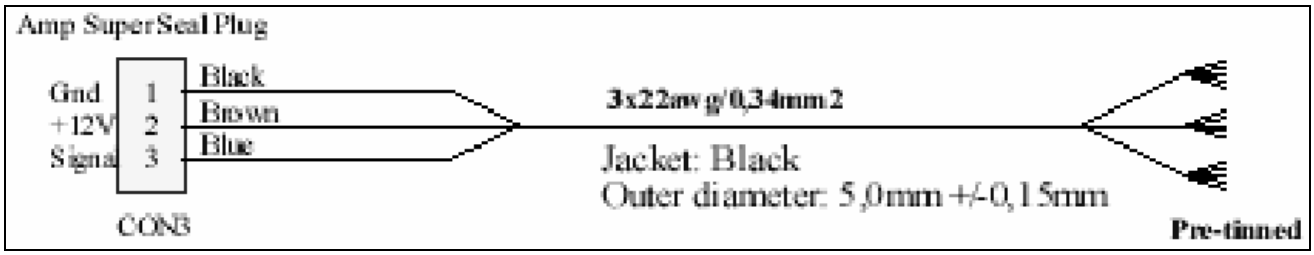


Figure 2 Wire for connection between Jobcom and tank gauge

The wire, see Figure 2, is mounted with an AMP plug and three lose wires at the other end. The wire is attached to the Jobcom in the section where the connection tank gauge is

marked. Furthermore, the 10Kohm resistance is mounted into the same connection in Jobcom. Figure 3 shows how the resistance must be mounted. Wire colours are also shown.

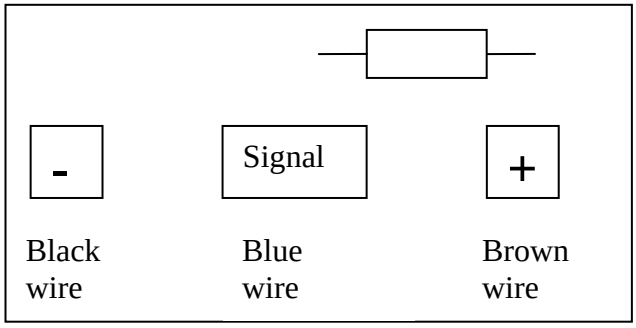
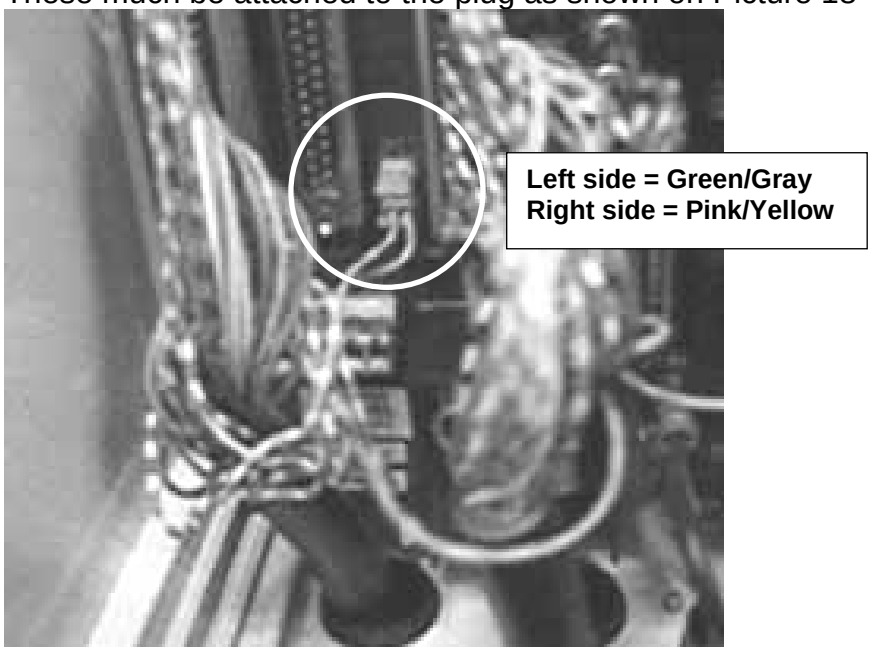


Figure 3 Mounting of the 10 K ohm resistance in the Jobcom

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 18



Picture 18 Connection of the two wires from Spray box cable

The sensor is mounted on the back side of the sump of the tank; see Appendix 1: Hole for Tank Gauge on page 78.

Settings in the HC5500

"Extended menu" / "Extended menu 5 Optional sensors" pages 21 is the setup. In Menu E5.3 Tank gauge, there are two settings. They have to be as follows:

Menu		Options	choose
1	Type	3	Hardi
2	PPU		calibration

For testing the tank gauge is reading a frequency, go to the user Menu 4.5.3.3, Tank Gauge, as the frequency will be shown here if setup correctly.
The frequency readout shall be between 100 and 200 Hz.

How does it work?

The Tank gauge 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.
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 Tank gauge is described in the instruction book.

When the Tank gauge 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 Tank gauge. 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 67. 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 19 The End Nozzle kit

Software for HC5500

The software on the HC5500 can be upgraded. Examples for this are improvements for better performance of the SafeTrack and LookAhead systems and of course bug fixes.

When the software for the HC5500 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. See Picture 21. Uploading new software to the HC5500 will normally not have any visible effects in the display and will not delete the setting / memory of the HC5500.
A Master reset can delete the setting and memory in HC5500. After a Master reset all settings in the HC5500 must be set again.
Normally is a Master reset not necessary when new software is uploaded. If there are problems with the unit after uploading software, then a Master reset may help.

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. See Picture 20. This menu will show what software version and what serial number the Jobcom has.

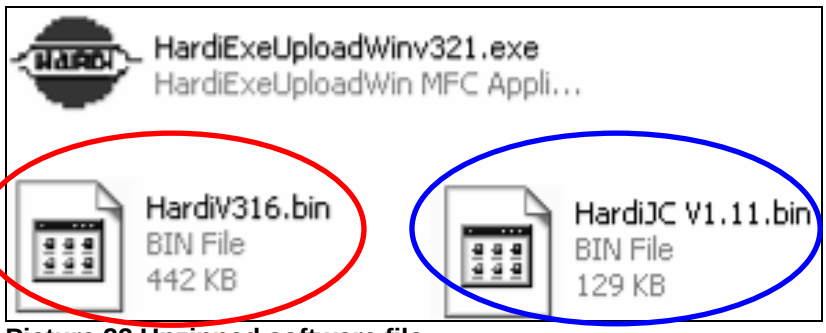
Picture 20 Software version on the Jobcom

Software program for HC5500

The software can be sent on a mail as Picture 21 shows.

Picture 21 Zipped software

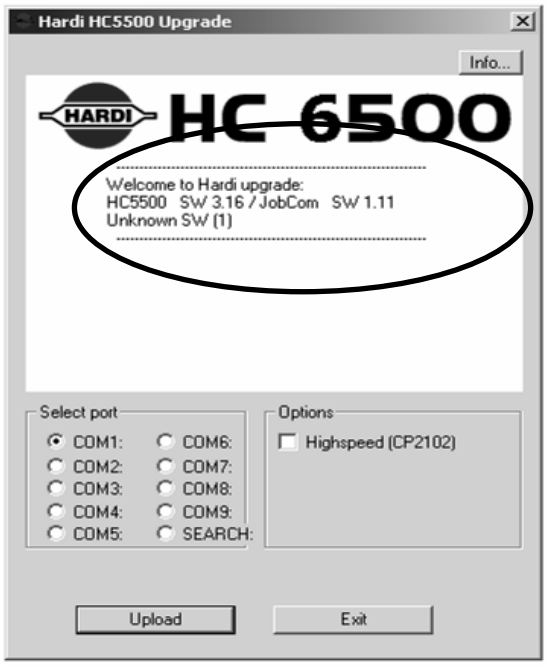
When the Zip file is unpacked, a folder will show up as in Picture 22. The top of the picture shows the upgrading program. The two other files are Bin files. These files are the software versions for the HC5500 and the Jobcom.
The red circles are for HC5500 and the software version is written in the name (316 the same as version 3.16)
The other circle, the blue one, is the software for the Jobcom and also here the software version shown is 1.11.



Picture 22 Unzipped software file

Note: It is very important that these three files are in the same folder at all time otherwise the upgrade program will not work.

When the upgrade program is activated, a dialogue will come up on the screen as Picture 23.



Picture 23 Display from the upgrade program

In the dialogue box, the software version for both the HC5500 and the Jobcom can be seen before the software is uploaded. See Picture 23.

How to use the Hardi HC5500 upgrade program is described in section “Upload new software to Jobcom / HC5500” on page 42.

If there is trouble with the uploading of the software or error codes appear, the error codes can be seen in section “

Error code on the HC5500” on page 76.

Extended menu

Extended menu 1 is where the language in the HC5500 is chosen. There are standard languages but there is also place for two local languages that can be uploaded to the HC5500 by a service man. In section “Language transfer” page 64, instructions for how to translate a language file and how to transfer the file to the HC550 is explained.

Extended menu 2 is for what kind of measuring unit the controller shall use.

Extended menu 3 is 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 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 HC 5500.

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]**

See “Description 1 EVC compared to EFC” on page 29

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 new COMMANDER.

Circulation = System where liquid constantly circulates in the boom lines

E3.1.2 Dual Line

E3.1.2.1 **[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	**[Pressure, Speed]**
					If a pressure transducer is fitted, pressure is used to trigger the line change.
				E3.1.2.3	**[1.0 Second]**
					Default is 1.0 sec.
					System lag prevents oscillation when spray lines change.
				E3.1.2.4	**[1.5 Seconds]**
					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

Extended menu 4 is where all communicates settings are set up. The HC5500 can be attached to other units like a PC, printers, GPS or remote control. The communication between the HC5500 and the optional unit has to be set up correctly otherwise will there not be a connection between the two units. Section Optional extras for the HC5500 on page 10 and in section Communication port on page 54, there is information of set up.

E4.1	COM 1 setup	**E4.1.1**	Equipment type	**[Printer, Dump, Printer & dump, GSM, VRA/remote]**	See “Printer” on page 10

					Dump is for data transfer to a PC via for example Microsoft HyperTerminal. *GSM is not used.* *Variable Rate Application/remote is dosage from an external source.*	
E4	Data exchange		**E4.1.2**	Baud rate	**[9600, 2400, 1200]** *9600 is ok for HARDI 12 volt printer.*	
			E4.1.3	Protocol select	**[HARDI GPS protocol]** *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 dosage from an external source.*	See “Printer” on page 10
			E4.2.2	Baud rate	**[9600, 2400, 1200]** *9600 is ok for HARDI 12 volt printer.*	
			E4.2.3	Protocol select	**[HARDI GPS protocol]** *Only one protocol available at the moment.*	

Extended menu 5 Optional sensors

Extended menu 5 is for optional sensors that can be fitted. It is typically the Pressure, fan speed and Tank gauge.

E5	Optional sensor	**E5.1** Pressure *Connected to section valve PCB.*	**E5.1.1**	Minimum value	**[00.0]** *4 -20 mAmp sensor. See sensor for minimum value.*	See “Pressure sensor” on page 11
			E5.1.2	Maximum value	**[00.0]**	

				See sensor specifications for maximum value.		
E5.2	Fan speed	**E5.2.1**	Optional sensor	**[PPU]**		
	Connected to section valve PCB.			*Digital input. One pulse per revolution = 1.00 PPU.*		See “Fan speed” on page 12
E5.3	Tank gauge	**E5.3.1**	Type	**[Not present, Fillmeter, ME Tank Control, Hardi]**		
	For sprayers with Breakout PCB or Jobcom.	**E5.3.2**	PPU	**[000.000 PPU]**		
				Connect to Breakout PCB or Jobcom.		See “Tank gauge” on page 13
				Hardi has the Tank Gauge 0-250mbar pressure transducer fitted to sump.		
E5.X	Sensor x				Unit	Defaults
	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	RH	**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.*
			Disabled in 3.16	**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.*
			Disabled in 3.16	**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

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 6% +/- 1%* See “Description 2 Min. duty cycle” on page 30
			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]** *Default = No. Regulation valve must have position feedback transducer and Boom sensor must be fitted.* See “LookAhead” on page 38
			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 seconds is recommended.* *For many boom sections and or small liquid flow, 1 or 2 seconds is recommended.*

E8.2	Tank	**E8.2.1**	Tank size	**[1000 L]** *Value set if a Tank gauge is not fitted.* *Maximum fill: CM 3200=3500, CM 4400=4900, CM 6600=7000*
		E8.2.2	(Future use)	
		E8.2.3	Data points	**[0000]** *Calibration values for HARDI Tank gauge.*
E8.3	(Future use)			
E8.4	Track	**E8.4.1**	Enable	**[No, Yes]** *To enable track function.*
		E8.4.2	Sensor test	**E8.4.2.1 Front sensor** *Approx. 2.50 V when straight.* **E8.4.2.2 Rear sensor** *Approx. 2.50 V when straight.* **E8.4.2.3 Boom 1 sensor** *0.8 V when unfolded and 5.0 V when folded.* *Less then 0.5 V = not connected* **E8.4.2.4 Boom 2 sensor** *0.8 V when unfolded and 5.0 V when folded* *Less then 0.5 V = not connected.* **E8.4.2.5 Lock sensor** *0.8 V when locked and 5.0 V when unlocked.* *Less then 0.5 V = not connected.*
		E8.4.3	Chassis	**[CM05 S, CM05 M, CM05 L]** *Use S for 3200, M for 4400 & L for 6600.*
		E8.4.4	Sprayer drawbar	**[100 cm]** *Length from drawbar eye to anchor bolt for drawbar.* *Caters for long or short trailer drawbars.*
		E8.4.5	Manual angling	**[0%]** *To set steering speed when operated manually.* *Note + and - can be changed by toggling.*

				Use steps of 10% as a guide.	
		E8.4.6	Boom sensors	**[1, 2]**	
				Default: 1. This is the number of boom fold sensors present.	
		E8.4.7	Error print	**[Yes]**	
				Prints last 3 hazardous situations and shows Alteration log changes.	
		E8.4.8	Minimum radius	**[6.0 m]**	
				Minimum turning radius allowed for the trailer. Default = 6.0 m.	
				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	Max speed	**[18 km/h]**	
				Maximum speed when the tracking function is active.	
				Beyond max speed max angling of sprayer is 10 degrees only.	
		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]**	
				Classification of boom type. Light, Medium or Heavy. Default: M	
				Not active in sw 3.16	
E8.5	Misc.	**E8.5.1**	Foot switch	**[Disable, toggle, pulse]** *For remote ON/OFF of main switch, it allows the use of other switch systems.*	See “Foot pedal” on page 11
		E8.5.2	Rate deviation	**[XX %, 3-step]**	
				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]**			
		E9.2	Communication	**[ACK; NACK; ID: Timeout]** *ACK=acknowledged message, NACK= not acknowledged,* *ID= identification where "0" is Jobcom, Timeout=No answer from Jobcom.*			
		E9.3	ComLog *9 latest communication errors*	**E9.3.1**	*Date and time for error, ID of hardware with fault, M = Message No., E = Error*		
				E9.3.X	*As above*		
				E9.3.9	*As above*		
		E9.4	Input test *Shows actual sensor reading.*	**E9.4.1**	Frequency	**E9.4.1.1**	Speed hz
						E9.4.1.2	Flow1 hz
						E9.4.1.3	Flow2 hz
						E9.4.1.4	Flow3 hz
						E9.4.1.5	Tank gauge 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 hi/lo
						E9.4.2.4	Filter S hi/lo
						E9.4.2.5	Filter P hi/lo

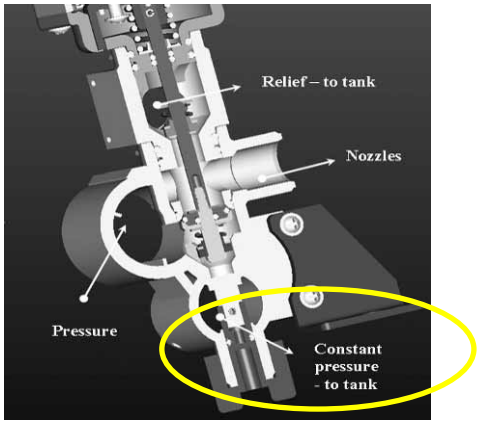
		E9.4.3	Analogue	**E9.4.3.1**	Slant	Volts	
				E9.4.3.2	Boom height	Volts	
				E9.4.3.3	Tilt L	Volts	
				E9.4.3.4	Tilt R	Volts	
				E9.4.3.5	Foam blop dist	Volts	
				E9.4.3.6	Twin angle	Volts	
				E9.4.3.7	Twin fan speed	Volts	
				E9.4.3.8	Distance L	Volts	
				E9.4.3.9	Distance R	Volts	
				E9.4.3.10	Distance centre	Volts	
				E9.4.3.11	Extra 3	Volts	
				E9.4.3.12	Extra 4	Volts	
				E9.4.3.13	Air temperature	Volts	
				E9.4.3.14	Relative humid	Volts	
				E9.4.3.15	Wind direction	Volts	
				E9.4.3.16	SV1 setpoint	Volts	*SV = Smart Valve*
				E9.4.3.17	SV2 setpoint	Volts	
E9.5	Reset Jobcom	*Reset of Jobcom.*					
	PIN needed.						
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 24 shows the EVC section valve, the yellow circle being the equalisation valve. This is the clearest difference between the EVC and the EFC when looking at the section valves.

Picture 25 shows the EFC. Here there are no equalisation adjustment valves.



Picture 24 EVC with the equalization system on the valve

Picture 25 EFC without the equalization on the valve

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

Figure 4 Pressure regulation valve with its duty circle

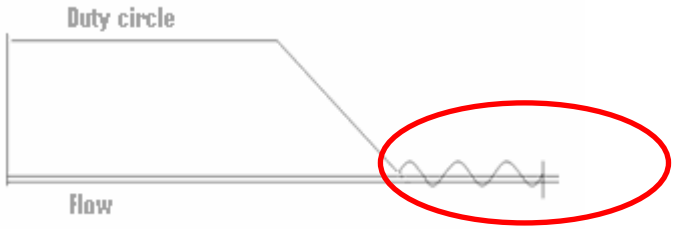


Figure 5 Duty circle for the pressure regulation

Menu: E 8.1.2
Minimum duty cycle (or PWM) is for adjusting the minimum/maximum adjust 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 5 in the circle. The red circle 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.

SafeTrack settings

There is no standard setting for the SafeTrack set up. The SafeTrack can be adjusted for different kinds of spraying.

For example; for spraying done at high speed (20 to 25 km/h), the SafeTrack must be set up so it reacts slowly and the dead zone could be set higher then the standard setting. Another example; spraying with relatively low speed (7 to10 km/h) in a crop where the precision must be high, the dead zone reduced for more precision.

The best settings for the sprayer can only be taught by trying different setting of the SafeTrack for the different spraying jobs.
"Table 1 Setting for the SafeTrack" are all the parameters for adjusting the SafeTrack. Each adjust is described with what happens if the setting is changed and what effect will it have on the sprayer.

Settings for SafeTrack					
	Factory setting	**Effect on tracking system**	**Reaction time**	**Steady driving**	**Precision on tracking**
Track wide Menu 3.6.1	180 cm	Precision in curve			
Decrease		Should be set as the real track width on the sprayer.			
Increase					
Tractor drawbar Menu 3.6.2	80 cm	Overshoot/ taking corners			
Shorter			Faster		Overshooting
Longer			Slower		Taking corners
Dead zone Menu 3.6.3	5 cm	Filter for track deviation. Over 15 cm not recommended.			
Decrease		Reacting on small deviations. Tendency to oscillate. May damage the boom.	Small corrections all the time	More unstable.	High precision
Increase		No oscillation but tendency to take curve in large straight lines	Less corrections	Very steady	Low precision

Damping Menu 3.6.4	80 %	How to react to a track deviation.			
Little 0% No damping		More aggressive. May damage the boom.	high	Very unsteady.	High precision
High 100 %Full damping		Less aggressive	slow	Very steady	Low precision

Alignment offset Menu 3.6.5	0%	Following the tractors track			
Negative setting	Sprayer moves to the left from the track		Must follow the tractor in all situations, on effect of having the sprayer driving in offset line from the tractor. If the value is over 10 cm, it is recommended to manually adjust the front angle sensor.		
Positive setting	Sprayer moves to the right from the track				

Sensitivity Menu 3.6.6		The sprayer must be adjusted in a practical situation to the individual tractor. Preferably in the field.

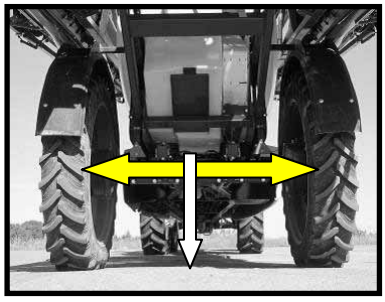
Minimum radius Menu E 8.4.8	6 m	6 metre radius smallest radius the sprayer can take
Max speed Menu E 8.4.9	18 km/h	!8 km/h is high and the sprayer can tip over at this speed. Sow careful driving.

Safety Factor Menu E 8.4.10	80%	Safety factor can be set to 0% (OFF). At this setting will the sprayer react on max speed and minimum radius. **When the safety factor is 0%, for example when doing a demonstration, the following setting must be undertaken. The rinsing tank is full, minimum track width 180 cm, big tyres, boom must be carried low and the main tank to be no more that 50% full**.

Table 1 Setting for the SafeTrack

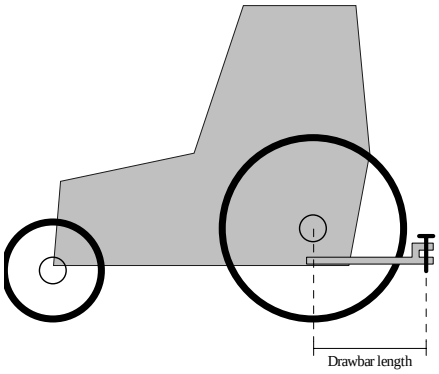
For a better understanding of the how the adjustment parameters work, some of the menus are described with figures in the following sections.

Menu: 3.6.1 Track width



The track is measured from centre to centre of the wheels.
It is important that the right track width is entered.
The HC5500 will calculate the speed to the centre of machine, and not the speed of the wheel.
If the track width is incorrect, will it have influence on the SafeTrack precision and Safety factor.

Menu: 3.6.2 Tractor drawbar



The tractor drawbar is measured from the rear axle to the drawbar bolt.
This has to be adjusted every time a new tractor is hooked on to the sprayer.
At the same time, check the rigidness of the tractor drawbar mounts. There should be no sideways movement.

Menu: 3.6.3 Dead zone

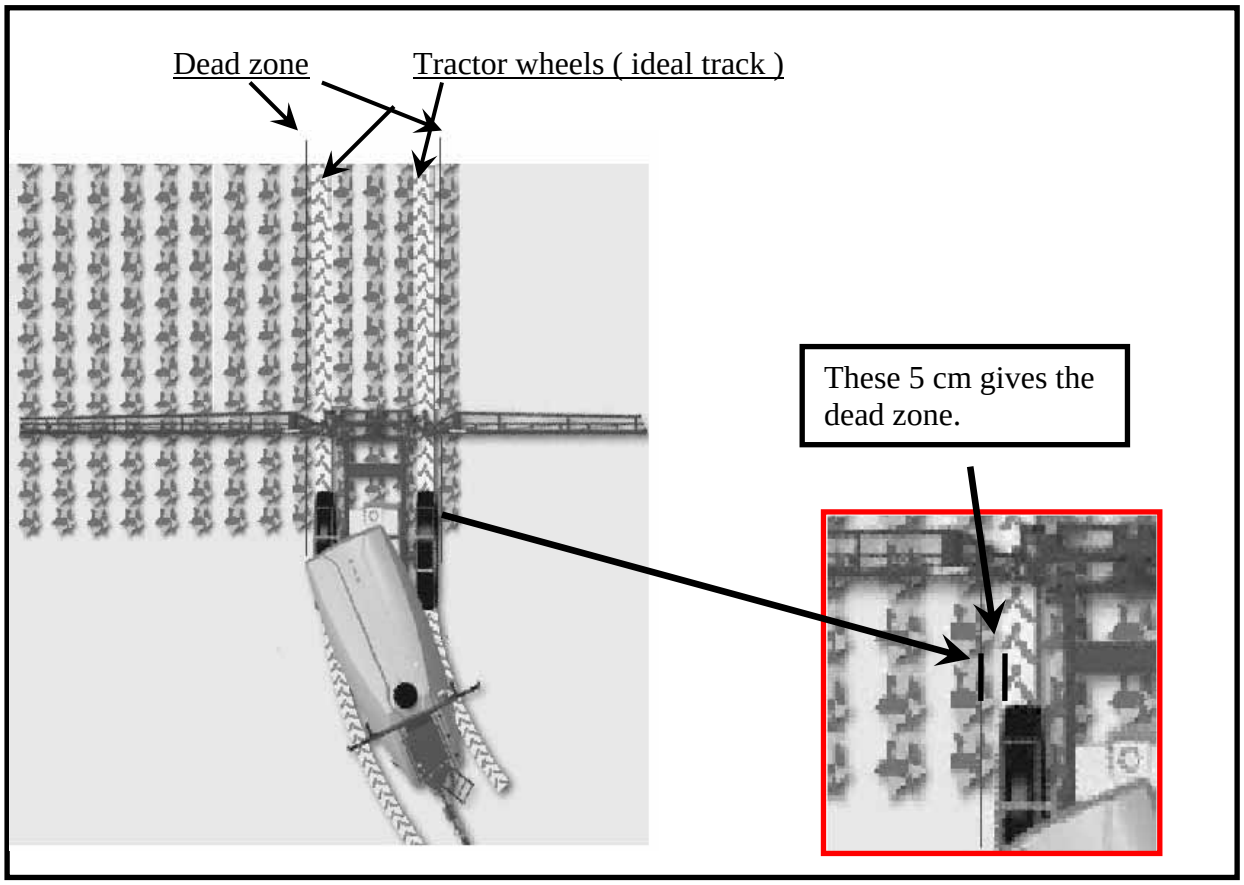


Figure 6 Dead zone

How big must the dead zone be? Default is 5 cm.

High speed: **Increase dead zone**
High precision: **Decrease dead zone**

What is the dead zone?
The dead zone is how far away the SafeTrack can be from the ideal track before the SafeTrack will adjust its course.

The tractor track is the ideal track for the sprayer and the sprayer will therefore try to follow this track as close as possible.

To prevent excessive steering adjustments, the dead zone will prevent the SafeTrack to react on to small corrections when it is active. This will also prevent excessive wear or damage to the boom yaw mechanism.

When the dead zone is set to 5 cm, the SafeTrack will not react before it is 5 cm away from the ideal track. On Figure 6 is the dead zone shown and described with drawings.

Menu: 3.6.4 Damping

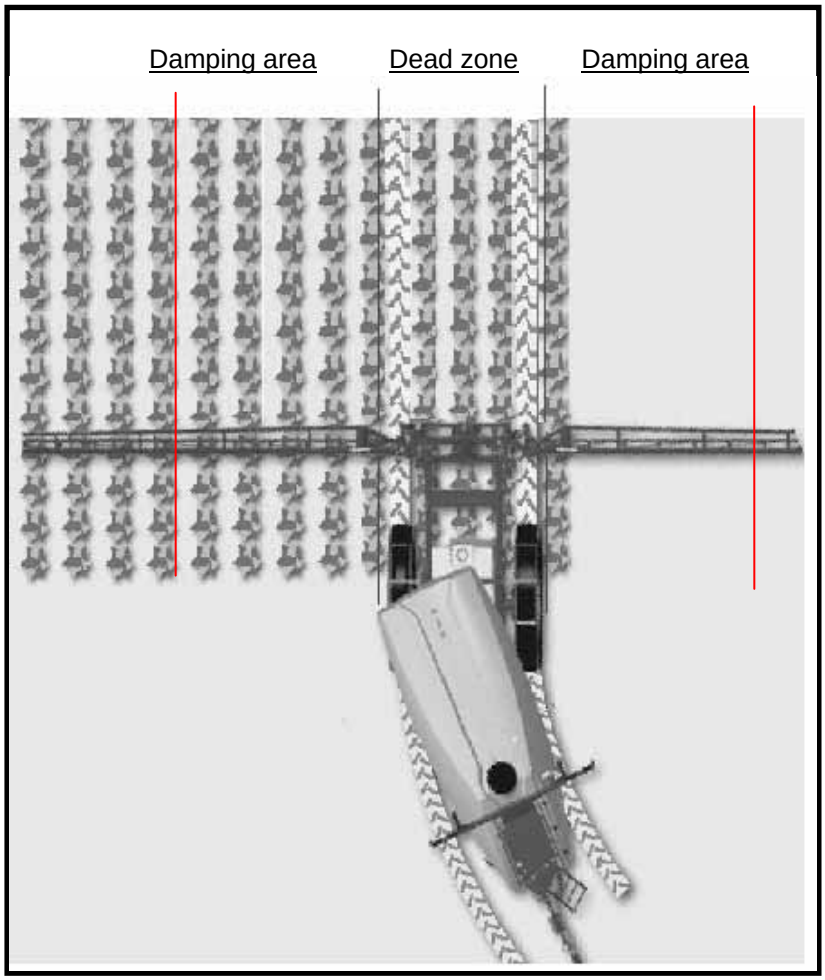
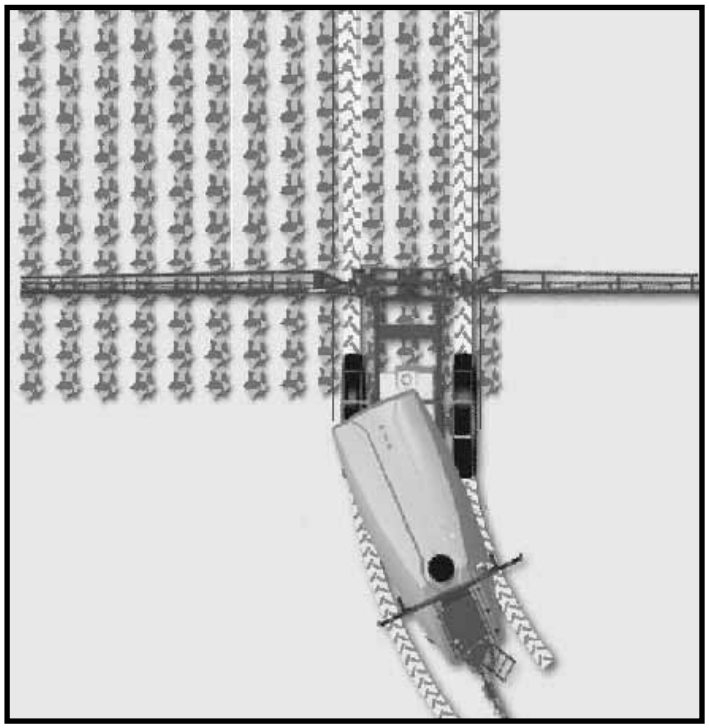


Figure 7 Damping area

When the sprayer is outside the dead zone, the SafeTrack will try to get back to the ideal track.
If the damping is low, the reaction is fast. Fast reaction on the SafeTrack can result in abrupt boom movements which may not be good for the boom.
If the damping is high, the reaction will be smooth but will also result in lower precision.
So the adjustment of the damping must be done when the sprayer is taken out and driven in the field.

High speed: **High damping**
High precision: **Low damping**

Menu 3.6.5 Alignment Offset



This setting is for an electronic adjustment of the front potentiometer from the HC5500. If the sprayer is a little bit out of track, the sprayer can be adjusted back to the ideal track from this menu.

Moving the sprayer right +
Moving the sprayer left -

Extended menu: E 8.4.3 Chassis

There are three different chassis in the HC5500 on for each size tank.

Chassis Setting

Commander 3200: **S**

Commander 4400: **M**

Commander 6000: **L**

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

Extended menu: E 8.4.4 Sprayer drawbar

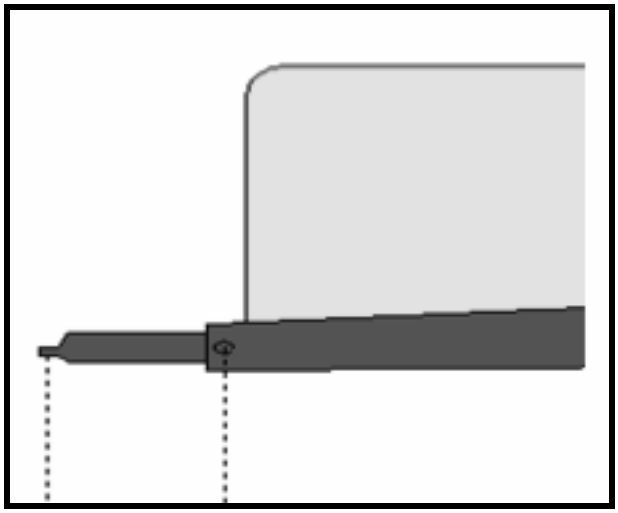


Figure 8 Sprayer drawbar

The sprayer drawbar is measured from the bolt hole, (for tractor pin) to the middle of the first bolt that holds the drawbar on the sprayer. See Figure 8

Extended menu: E 8. 4.10 Safety factor

The Safety factor is a setting that shall prevent the sprayer for tipping over when turning.
The safety factor is a combination of 3 parameters.

1. Speed
2. Track wide
3. Angle of the front potentiometer

The safety factor prevents the sprayer from tipping by restricting the SafeTrack angle.
If the speed is too high, SafeTrack will reduce the angle (e.g. 50%) so the sprayer will not follow the tractor 100% but the sprayer will not tip over.
OnFigure 9 is there a drawing of 3 positions of the SafeTrack.
If there is no risk of tipping the sprayer over, there are no restrictions from the Safety factor and the SafeTrack will go to position 1 on drawing.
If the speed too high in a turn, the Safety Factor will reduce the angling (see Position 2).
Is the sprayer is over speeding, the Safety factor will give an alarm and begin to straighten up the sprayer to position 3. The alarm can be accepted by pushing “Enter” on the HC5500 and the SafeTrack will operate normally again once the SafeTrack is set to “Manual” and back to “Auto” on the Hydraulic control box.

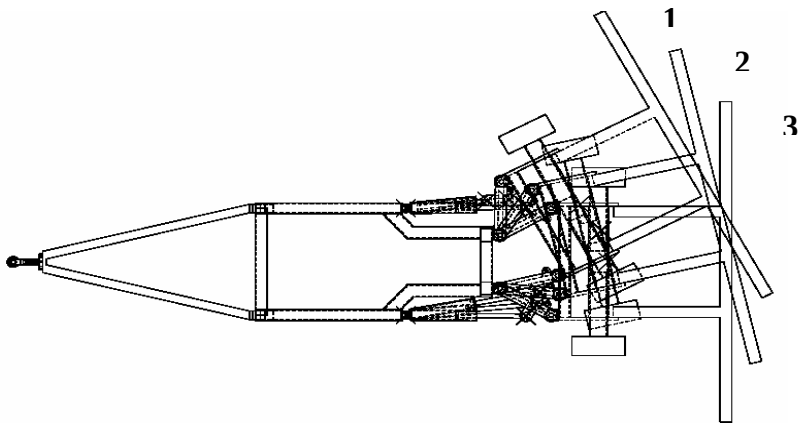


Figure 9 Safety factor reducing angle

LookAhead

The LookAhead can be activated in the extended menu E8.1.5.
There are no adjustments for the system, it can only be activated or disabled.
In section “Extended menu 8” on page 24, 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, 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 40.

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.

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

Figure 10 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.

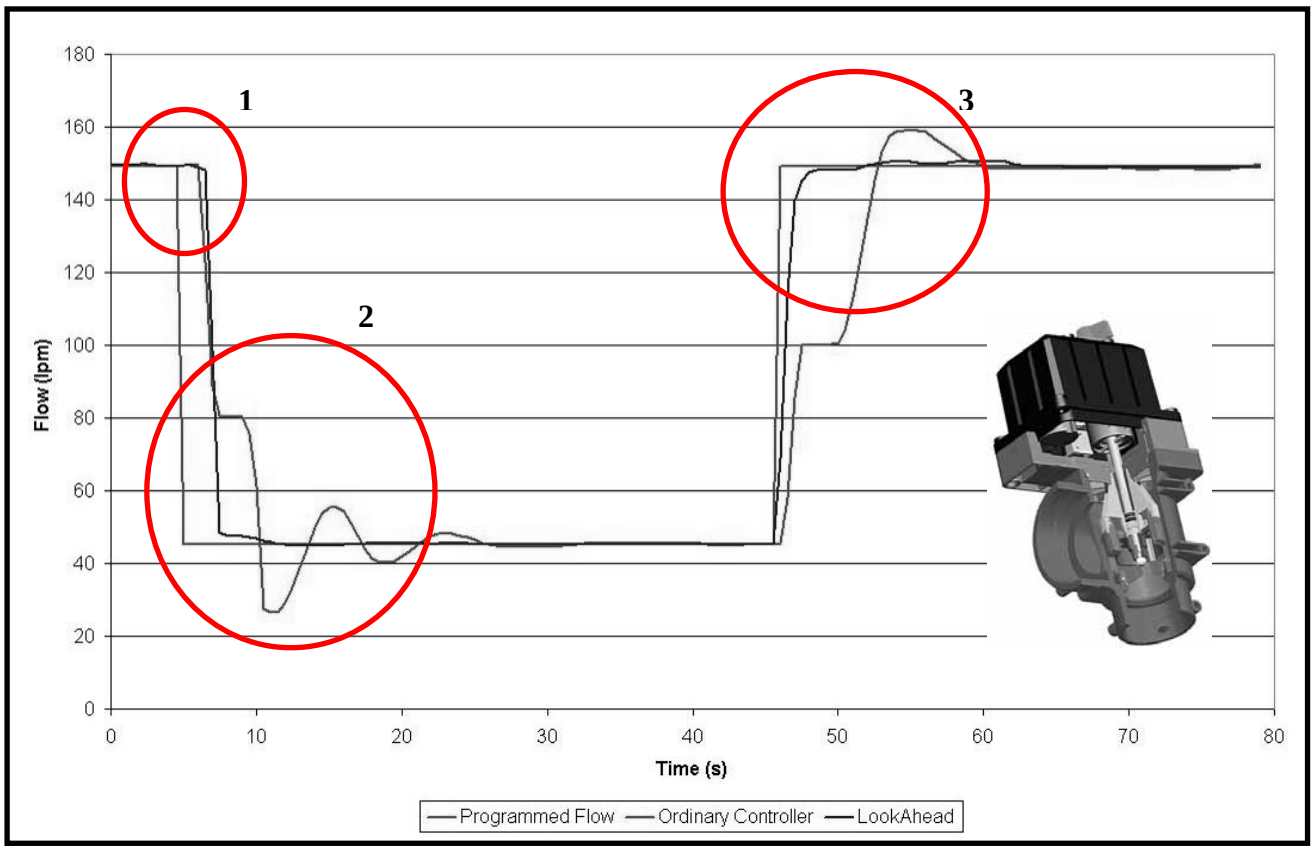


Figure 10 LookAhead system compared to the old pressure regulation valve.

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: The old pressure regulation valve drops down to 80 l/min and has to make a calculation of how far the flow has dropped. Look Ahead knows where to go, so it is not necessary to calculateate before the flow is very close to the wanted flow. The LookAhead makes a little fine adjustment on the pressure regulation valve and finds the right flow very fast. The old pressure regulation valve has to make several adjustments before the right position is found and uses also a lot more time.
Circle 3: When the flow is increase to 150 l/min is the same happing 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 increasing the rpm on the engine, PTO 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. The larger flow house (diameter 20 mm) is fitted when the smaller one (diameter 13.5mm) could have been used.
4. A combination of all the above.

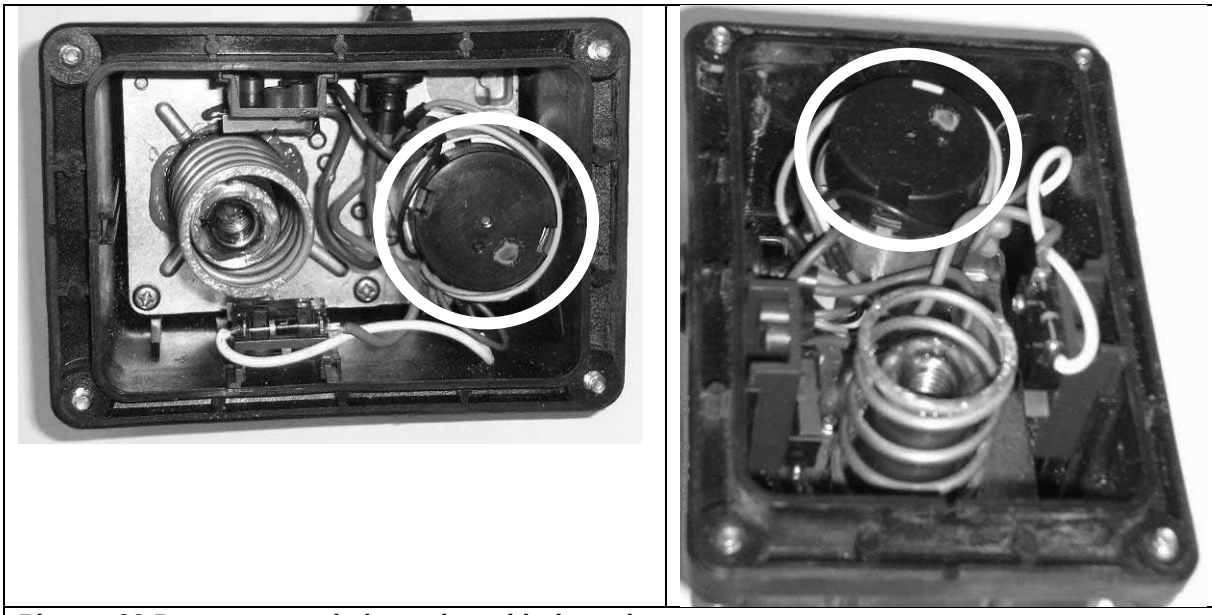
Recommendation is as follows:

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.
A higher PWM value (e.g. 8%) will result in the pressure regulation valve initially turns the wrong way.

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 26.
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.



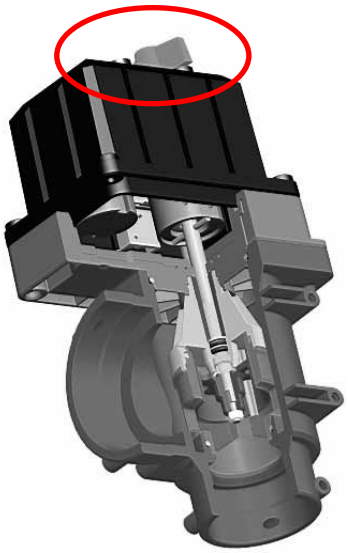
Picture 26 Pressure regulation valve with the pulse generator

There are two versions of the pressure regulation valve with the knob colour-coded Blue and Yellow.
The differences between these two valves are the gearing from the motor to the valve. On Picture 26, the gearing can not be seen without removing the gearbox assembly from the synthetic housing.

Normally is it the yellow pressure regulation valve that is use for LookAhead.

1. The yellow valve ratio is 1 to 150. (one turn on valve gives 150 turns on the motor)

2. The blue valve ratio is 1 to 80. (turns faster then the yellow)



Upload new software to Jobcom / HC5500

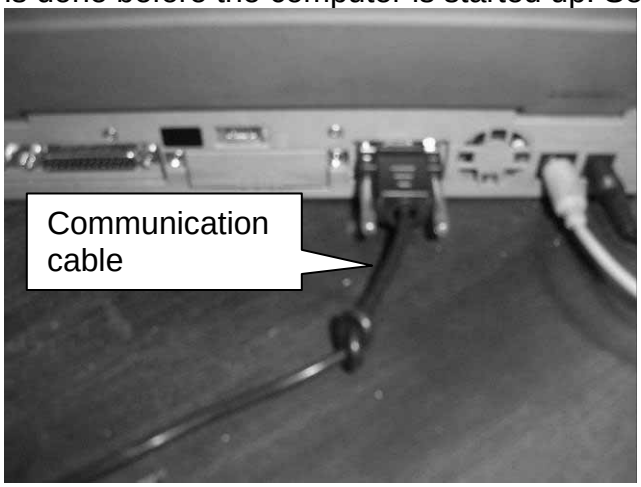
What you need

For uploading new software to the Jobcom, the communication cable is necessary. In section "*Communications cable"* on page 8, the cable is described and how to use it.

The PC needs the software program Hardi upgrade HC5500. This program is described in the section "Software for HC5500" on page 16.

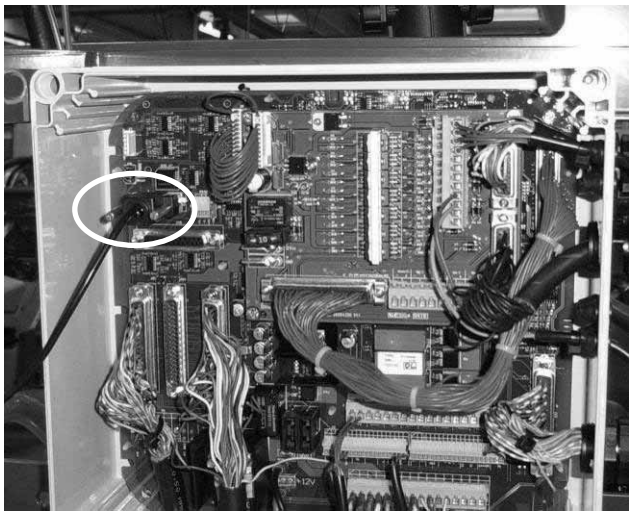
Instructions for uploading new Jobcom software

The communication cable is plugged into the PC, the plug without the "Hardware halt" – this is done before the computer is started up. See Picture 27.



Picture 27 Communication cable attached to PC

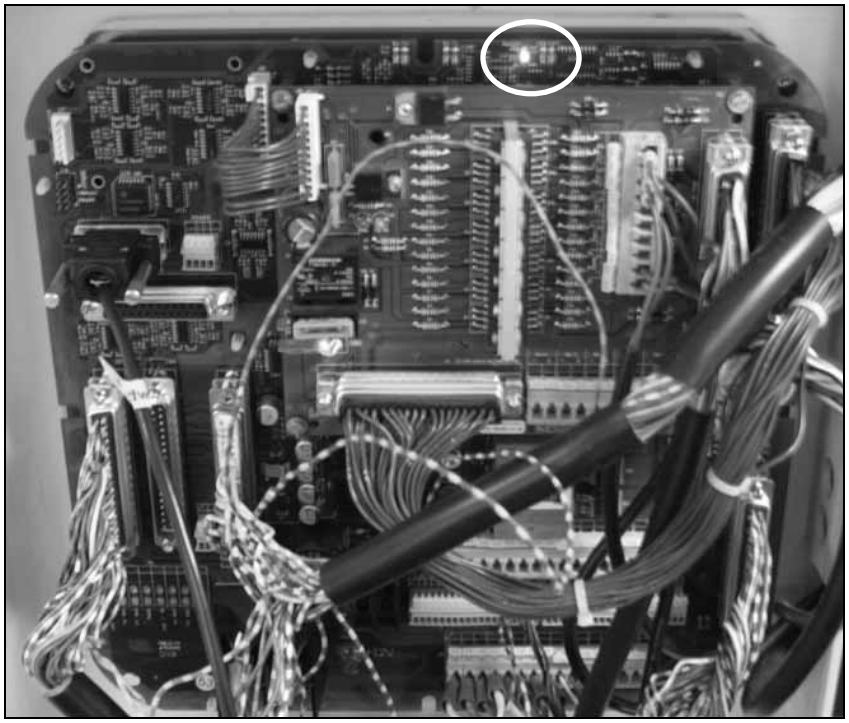
The communication cable is plugged into the Jobcom before it is switched on. The plug that is attached to the Jobcom is the one with the "halt".



Picture 28 Communication cable attached to Jobcom

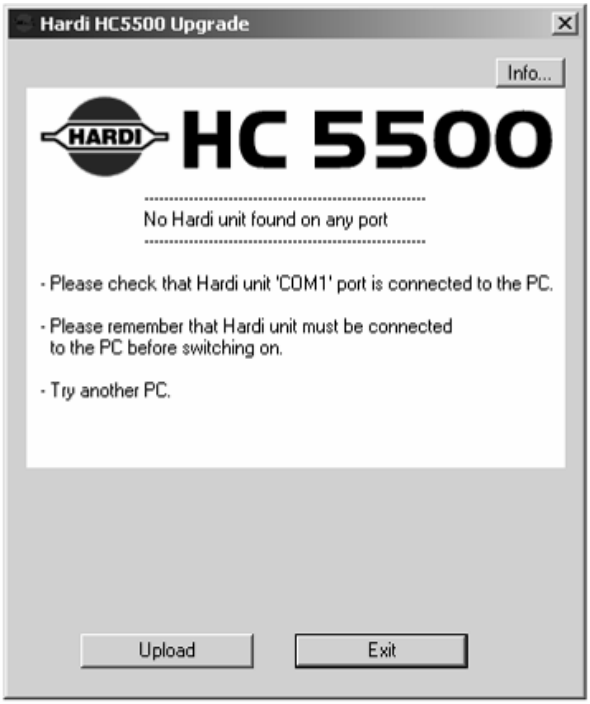
When the Jobcom and PC is connected can the PC be powered up and afterwards the Jobcom.
The Jobcom is powered up on Spray box.
When the Jobcom is powered up, it will start up in another mode. The red light (watchdog LED) will light up and HC 5500 will alarm that there is no communication to the Jobcom.

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 see on Picture 29, in the top of the picture, the watchdog is marked.



Picture 29 Jobcom ready for receiving software

Next step is to start up the Hardi upgrade software program on the PC.
The software program will find out whether it is a Jobcom or a HC5500 display.
If the upgrade program does not find a connection between the Jobcom and PC, Picture 30 will appear.



Picture 30 Error message from upgrading program

If this message appears, then see if the cable is attached correctly and there is power on the HC5500 display. If this does not help, power down the PC and the HC5500 and start all over. See Picture 27, page 42

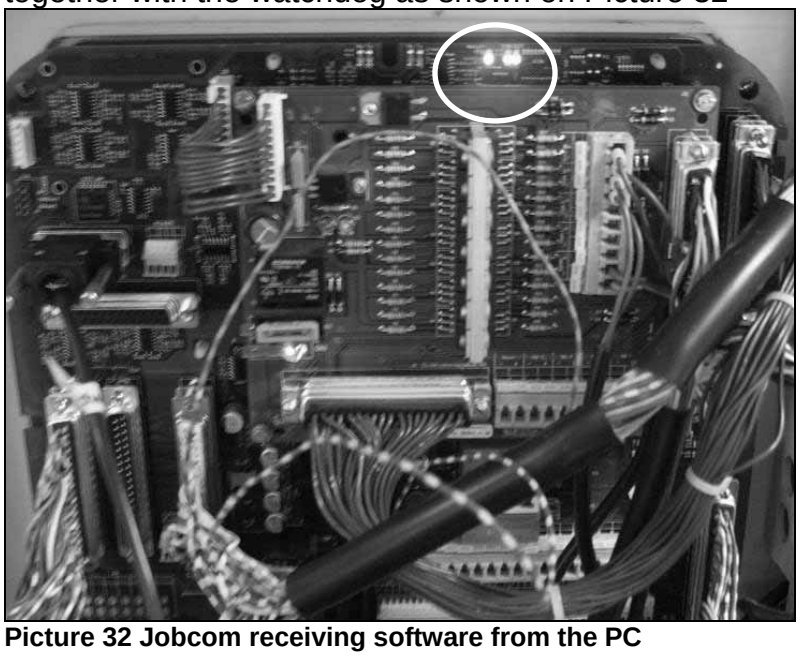
PC display should display the following screen seen on Picture 31.

The upgrading program writes what it is doing during the uploading and it shows how far the process.
In line 1 of Picture 31, present software version is noted before the upload starts.
In line 3, the software is being erased.
In line 4, uploading of the new software has started. The bottom bar of the display dialogue box indicates how far the uploading has processed.

The same program is used for both HC 5500 and HC 6500

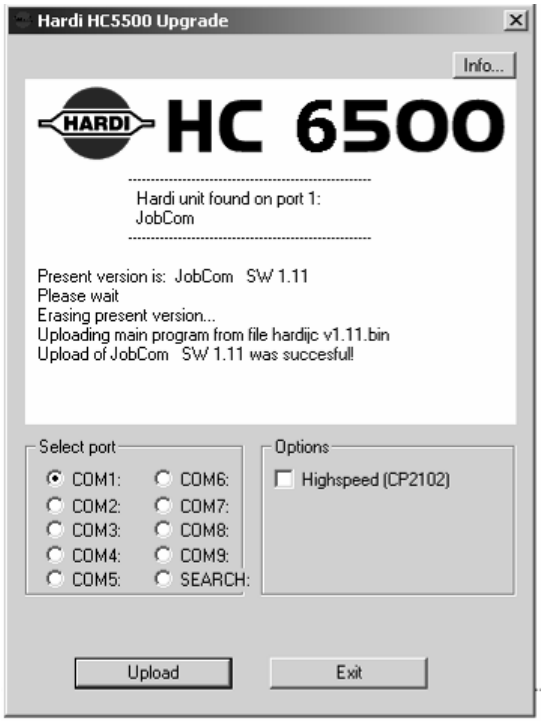
Picture 31 Uploading software to the Jobcom

When the uploading of the new software has started, diode N28 and D27 will start to flash together with the watchdog as shown on Picture 32



Picture 32 Jobcom receiving software from the PC

When finished, the upgrading program will write a line that tells if it has been successfully uploading or not. See Picture 33.



Picture 33 Display message when the uploading is finish

If the updating was not successful, try again and check possibly the power supply to sprayer and PC.

Reset Jobcom

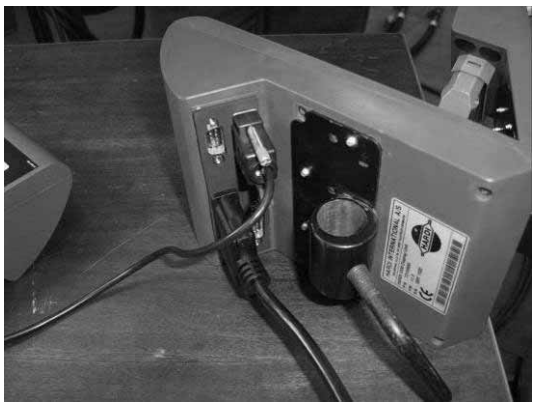
With new software in the Jobcom, it is necessary to perform a reset. The reset is done in E9.5 and a code for entry is needed. The code is 74650.

Picture 34 Master reset of the Jobcom

Instructions for uploading new software to the HC5500

The communication cable is plugged into the PC, the plug without the “Hardware halt” – this is done before the computer is powered up. See Picture 27, page 42

The communication cable is attached to the HC5500 in port 1 (Com 1) the plug with the “halt”. See Picture 35.

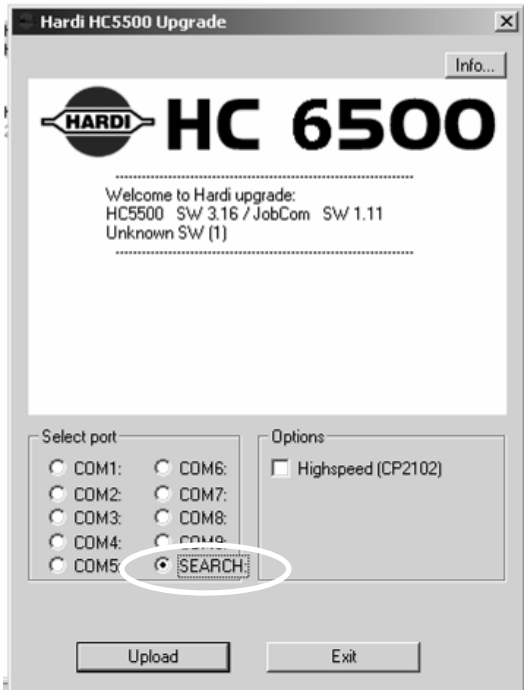


Picture 35 Communication cable attached to the HC5500

The PC is now ready to be powered on. As soon the PC is running, the HC5500 can be switched on as well. When the HC5500 is on, the display will write HARDWARE HALT. See Picture 36. The HC5500 is waiting for contact to the Hardi HC5500 upgrade software programme.

Picture 36 Connecting HC5500 to PC

On the PC, the upgrading program can be started up and the PC dialogue box should look like Picture 37.

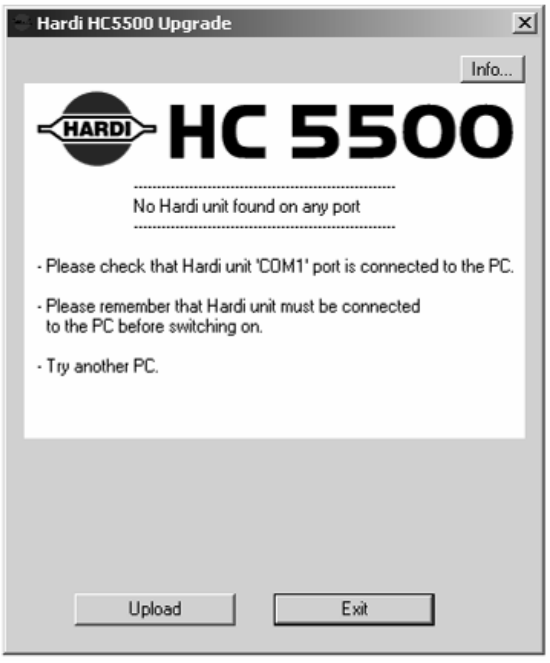


Picture 37 Ready for uploading

The dialogue box shows what software version will be uploaded to the HC5500 and a communication port has to be chosen, 1 to 9. The computer can also search for the com port. See Picture 37 the yellow circle.
Click “Upload” to start the uploading. The display in the HC5500 will change. See Picture 38.

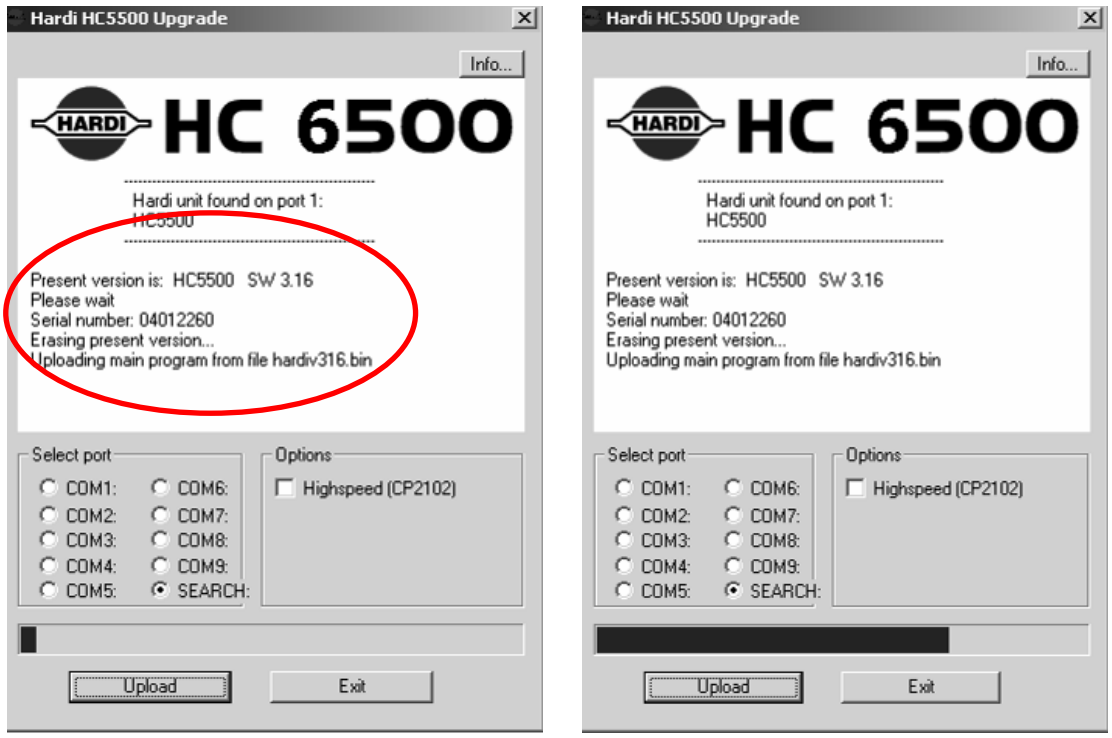
Picture 38 Display on HC5500 when uploading

If the display doesn’t 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. See Picture 39.



Picture 39 Error message from upgrading program

Is there no problem with the connection between HC5500 and the PC, the uploading will start. The upgrading program writes what it is doing. See Picture 40.



Picture 40 Display in software program when uploading

In the first line of Picture 40, (red circle), the present software version is shown.
In line 4, the upgrading program starts to erase the software in the HC5500.
In line 5, the uploading of the new software has started.
The bar at the bottom of the dialogue box indicates the uploading is in process.
When finished, the upgrading program writes a line that tells if it has been successfully uploading or not. See Picture 41.

Picture 41 Display when uploading is finish

Master Reset HC5500

To access Extended menu, press and hold ESC button on HC 5500 and then power up Spray box. A “bip” will indicate Extended menu is active and it will show E1.

With new software in the HC 5500, it is necessary to perform a reset. The reset is done in E7.2 and a code for entry is needed. The code is 12345. See Picture 42. When keyed, press “Enter” and the resetting will begin. When done, press “ESC” to exit the menu.

Picture 42 Master reset code

After reset, the HC5500 return to default values. Only the total register will not be reset.

Short cut for resetting the HC 5500: Press buttons “Arrow left”, “Enter”, “Arrow right”, “Distance remaining” and then switch on the Spray box at the same time. The display will then write “RESET”.

Picture 43 Shortcut for Master Reset

Start up the HC5500 and check the SW version when the HC5500 starts up.
When the display starts up it will write SET CLOCK – press ENTER if you want to ignore it.

HyperTerminal

This is a programme found in Microsoft Office under “Programs, Accessories, Communications”. There are two set ups for the HyperTerminal.
It can be setup with a little program *Simple terminal* that will run through the setting of the terminal very fast. If this little program is not present, HyperTerminal is chosen.

Instruction for setup “Setting up the Simple Terminal” are on page 51.

What can the terminal be used for?

The HyperTerminal is used when data is dumped from a controller to a PC.
The controllers that can dump out data are the following:

- HC 5500
- HC 6500

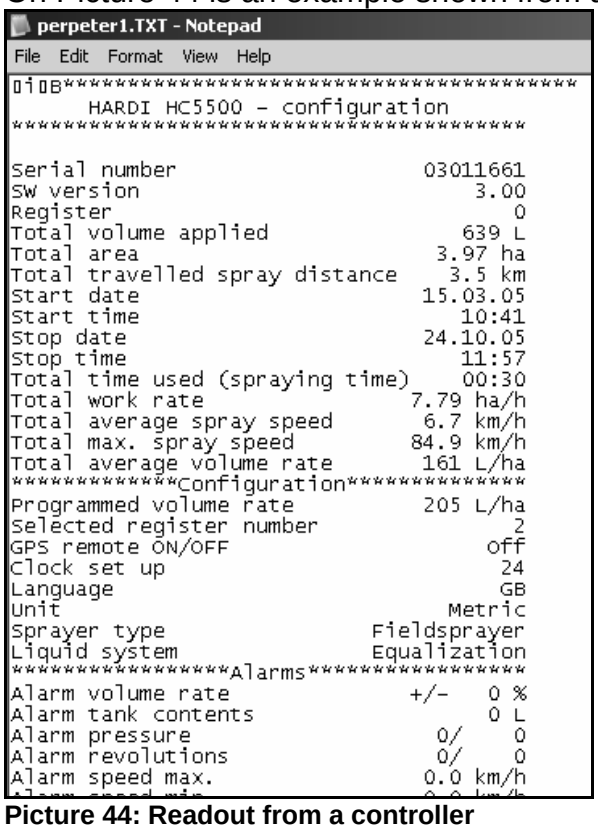
There are different forms of data that can be read out of the controllers:

Where the user can read out the data from the controller:

- Menu: 5.1.3 Read out Configuration
- Menu: 5.1.1 Read out Register
- Menu: 5.1.2 Read out all Registers
- Menu E8.4.7 Error of recent hazardous SafeTrack situations

Readout example

On Picture 44 is an example shown from a controller opened in the program Notepad.


perpeter1.TXT - Notepad

File Edit Format View Help

```
0i0B****************************************
      HARDI HC5500 - configuration
****************************************

Serial number                     03011661
SW version                            3.00
Register                                 0
Total volume applied                   639 L
Total area                            3.97 ha
Total travelled spray distance         3.5 km
Start date                        15.03.05
Start time                            10:41
Stop date                         24.10.05
Stop time                             11:57
Total time used (spraying time)       00:30
Total work rate                  7.79 ha/h
Total average spray speed         6.7 km/h
Total max. spray speed           84.9 km/h
Total average volume rate         161 L/ha
**************Configuration***************
Programmed volume rate            205 L/ha
Selected register number                 2
GPS remote ON/OFF                      Off
Clock set up                            24
Language                                GB
Unit                                Metric
Sprayer type                  Fieldsprayer
Liquid system                 Equalization
*****************Alarms*******************
Alarm volume rate                +/-   0 %
Alarm tank contents                    0 L
Alarm pressure                   0/    0
Alarm revolutions                0/    0
Alarm speed max.                 0.0 km/h
```

Picture 44: Readout from a controller

What you need

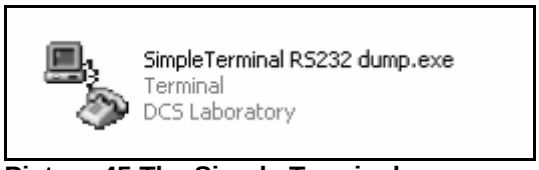
For the data transfer to work, you need the following:

1. Communications cable, (ref. no. 72271600)
2. Notepad (*.txt)"software" on the PC

No more is needed to make a data dump from the HC5500 controller.

Setting up the Simple Terminal

Simple Terminal is the terminal started up by opening the file as shown on Picture 45.

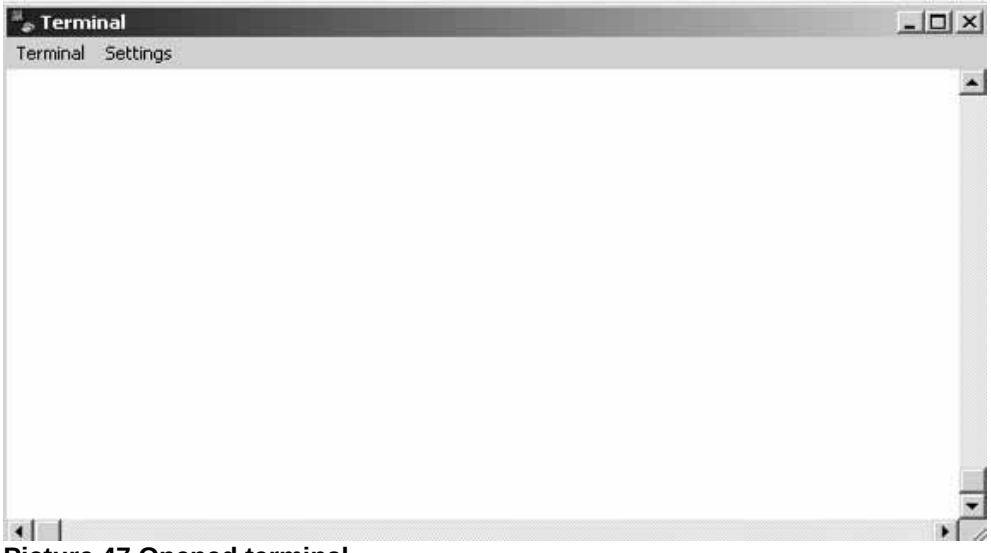


Picture 45 The Simple Terminal

If the terminal cannot contact the communication port on the PC, the terminal will show an error message as Picture 46.

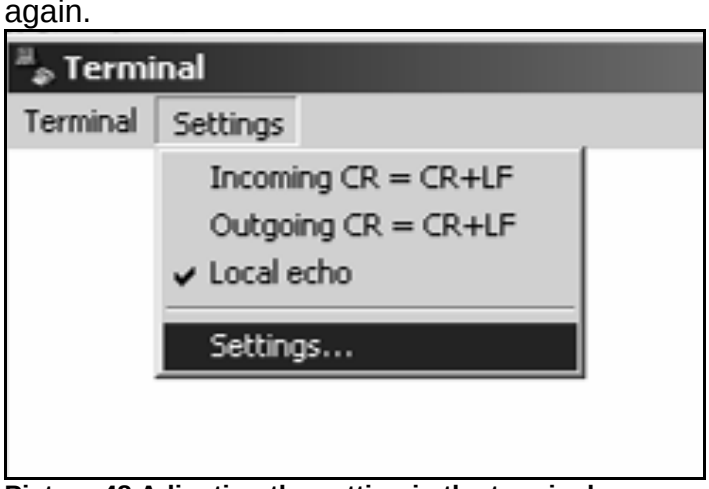
Picture 46 Error message from the terminal

The error message can be changed in the settings of the terminal, so it is not critical. The error message is accepted and the terminal will open up like Picture 47.



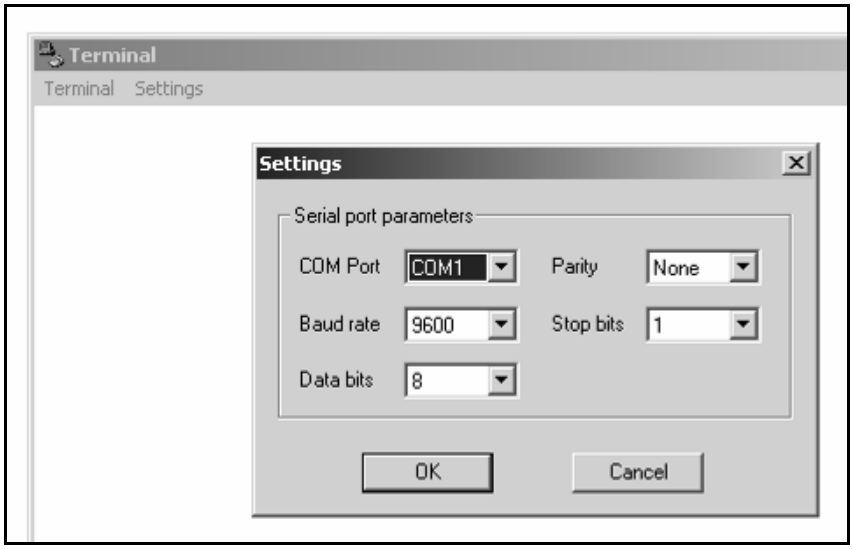
Picture 47 Opened terminal

When the terminal looks like Picture 47, the terminal settings can be changed. For changing the settings click on “Settings” on the menu bar as Picture 48 shows and choose “Settings” again.



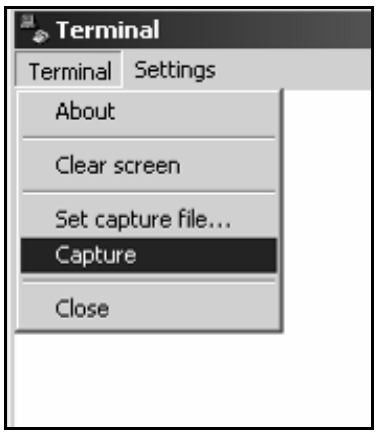
Picture 48 Adjusting the setting in the terminal

A dialogue box will show when “Settings” is chosen and the display should look like Picture 49.



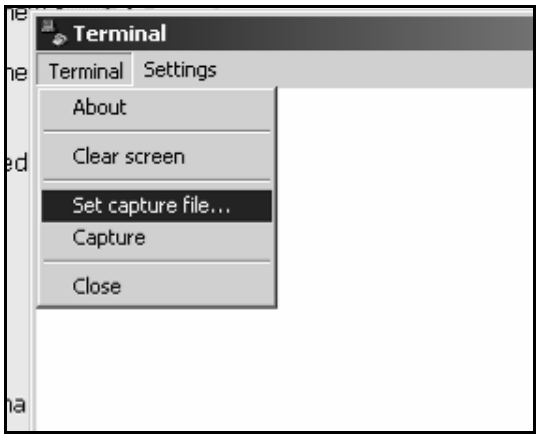
Picture 49 The settings in the terminal

When the settings are like Picture 49, accept on “OK” and the terminal is ready for the data transfer.
If the transferred data needs to be saved on the PC, is it necessary to tell the terminal otherwise the transferred data will not be saved and therefore lost when the terminal is shut down.
For saving the transferred data “Capture” must be activated. See Picture 50.



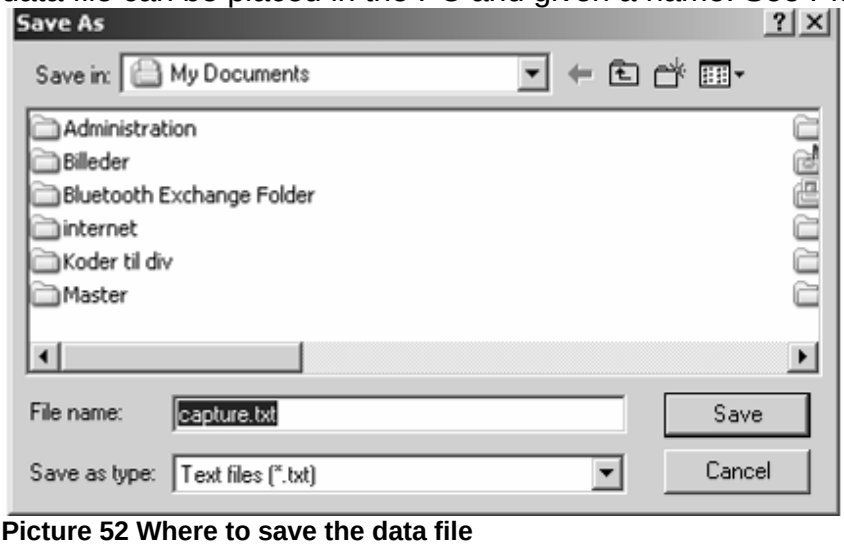
Picture 50 Activate the Capture text

For choosing where to save the data file on PC, there is an option “Set capture file…”. See Picture 51.



Picture 51 Saving the dump data as a data file

When entering this option, the following dialogue box will appear on the screen. Here the data file can be placed in the PC and given a name. See Picture 52.



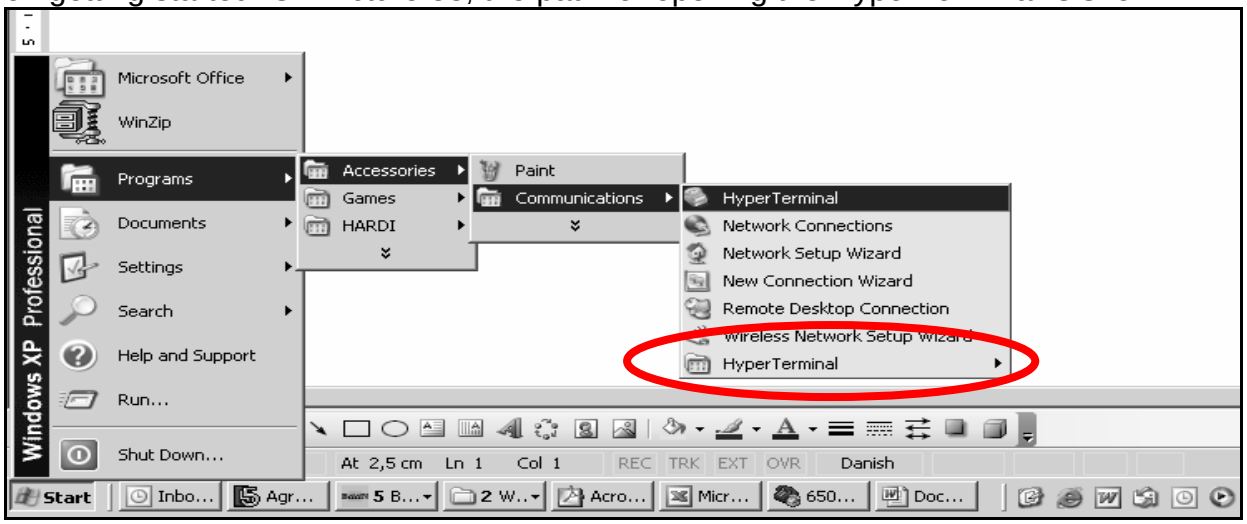
Picture 52 Where to save the data file

After going through this instruction, the terminal should be ready for receiving data from the HC5500.

Setting up the terminal

Before using the terminal must it be set up for the HC5500 and if this is already done must it be activated.

If the HyperTerminal has never been used on the PC, it will show the following instruction on getting started. On Picture 53, the path for opening the HyperTerminal is shown.

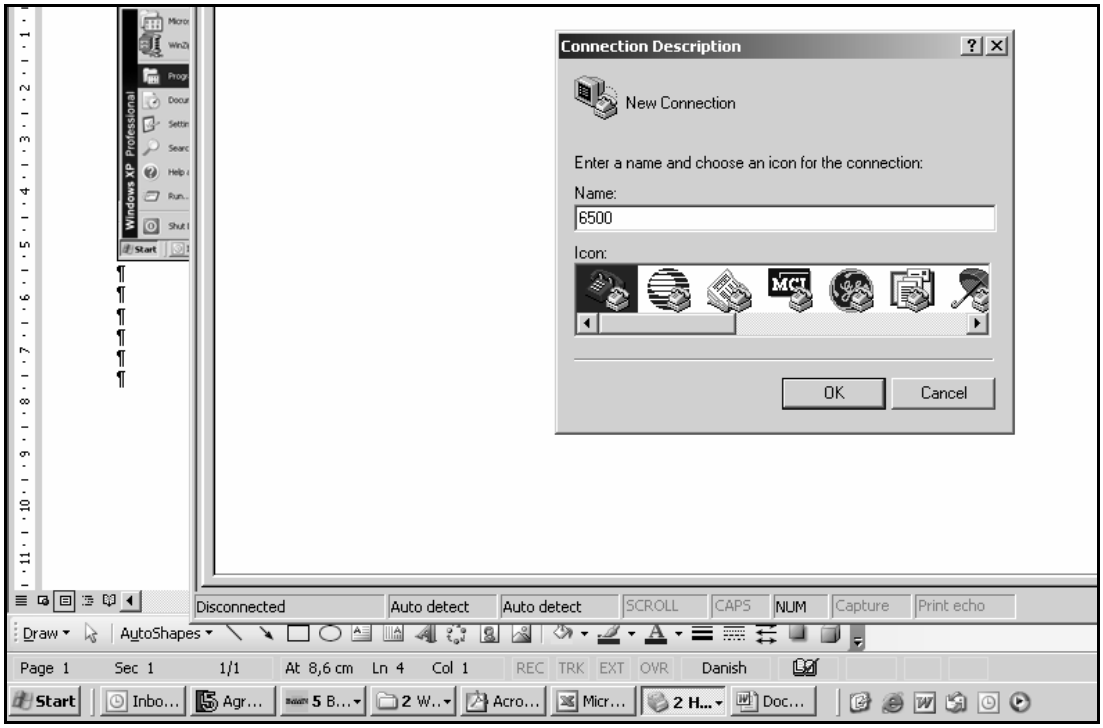


Picture 53 Path to HyperTerminal

If the path has been used before for receiving data from HC5500, a terminal will ready for use, red circle, see Picture 53.

Terminal

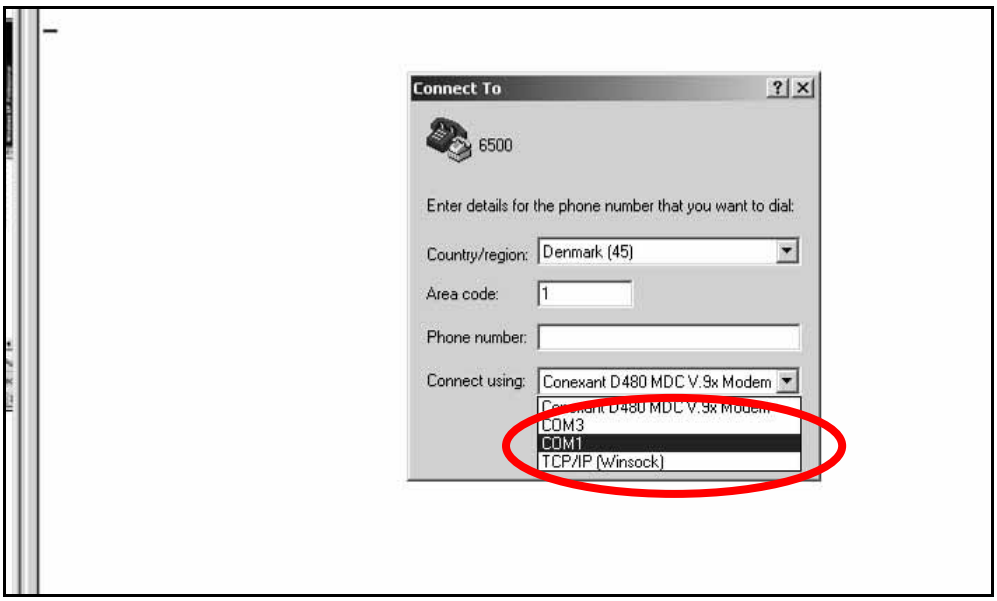
If the terminal is not already available on the PC, then the terminal must have a name. This is done as shown on Picture 54.



Picture 54 Name on terminal.

Communication port

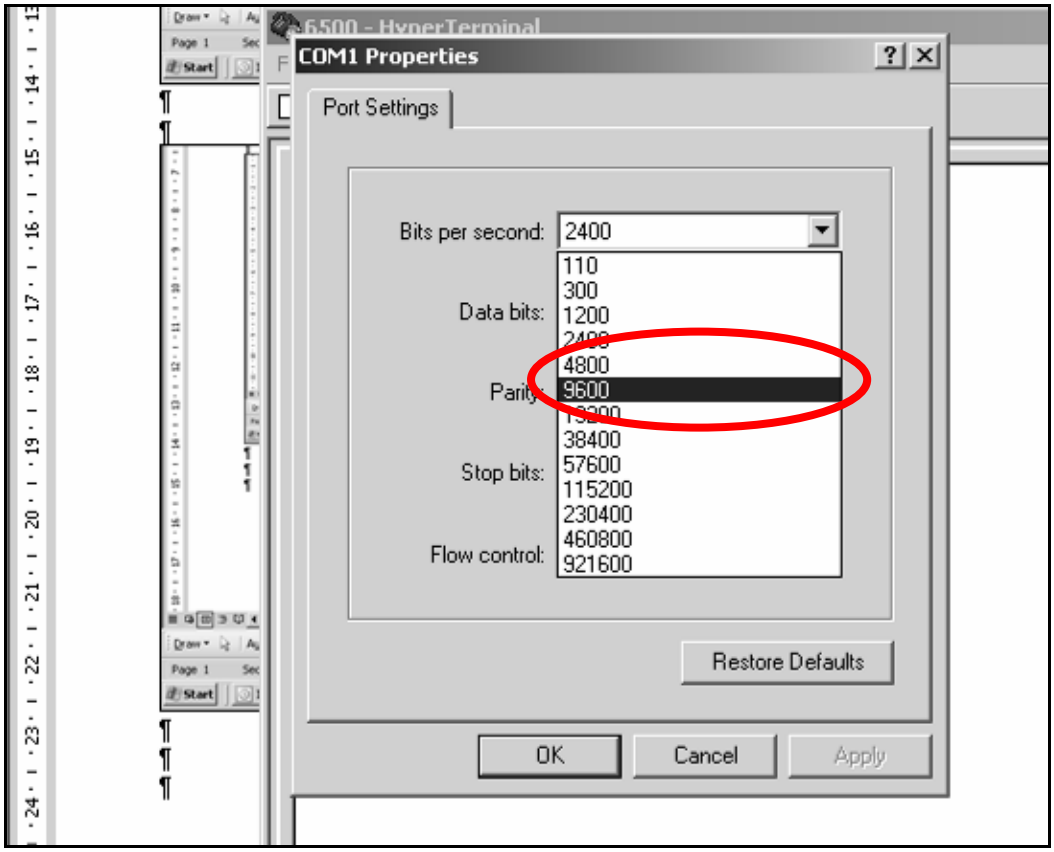
After giving the terminal a name, the communication port is on the PC chosen, as shown on Picture 55, “COM 1”.



Picture 55: Communications port

Communications speed

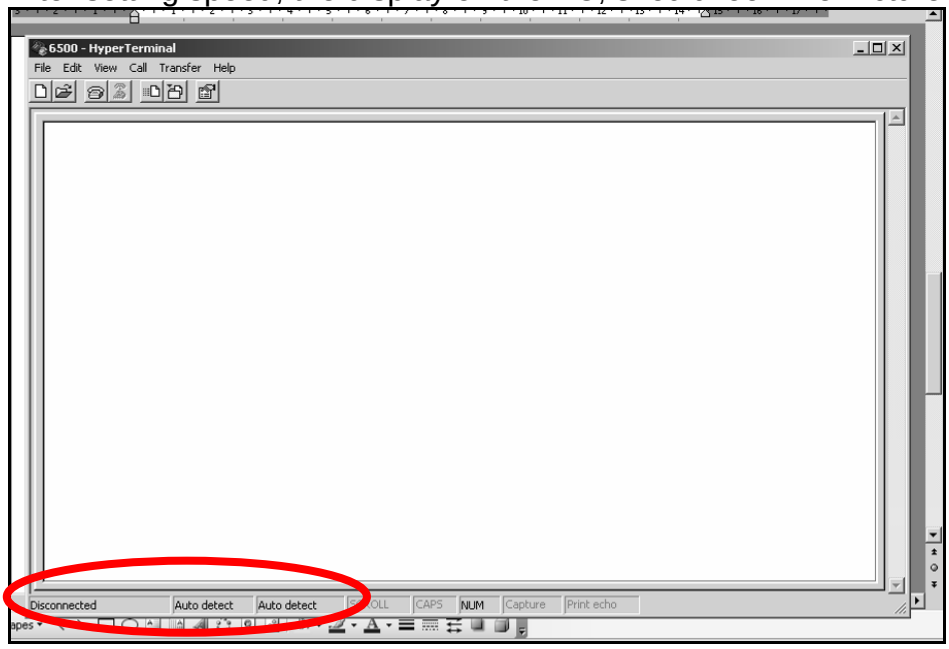
The communication speed between the controller and the PC has to be correct. The HC5500 can handle three different communication speed settings 9600, 2400 and 1200. The recommended setting is 9600. On Picture 56, setting of the communication speed is shown.



Picture 56: Communication speed 9600

Opened HyperTerminal

After setting speed, the display on the PC, should look like Picture 57 and ready for use.

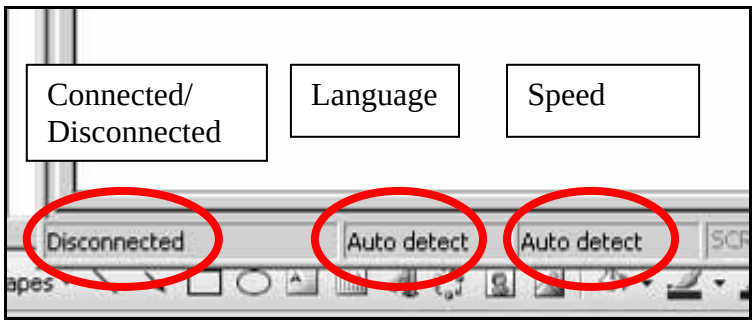


Picture 57: Opened HyperTerminal.

In the red circle on Picture 57, the setting of the terminal is shown; on Picture 58 is there a shaper picture of the information.

Information shown at the bottom of the display is:

1. Connected/Disconnected,
2. What language is used in the terminal
3. What communication speed is the terminal using



Picture 58: Terminal information

If the terminal setup, as shown on Picture 58, with the settings; language on ”Auto detect” and the communication speed on “Auto detect”, Then these setting must be set back to

1. Connected
2. Language - ANSI
3. Speed - 9600

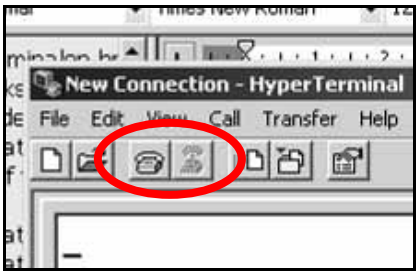
For changing the settings go to: ”Change settings in the terminal”.

Change settings in the terminal

Is the terminal opened with the wrong settings, follow the following description.

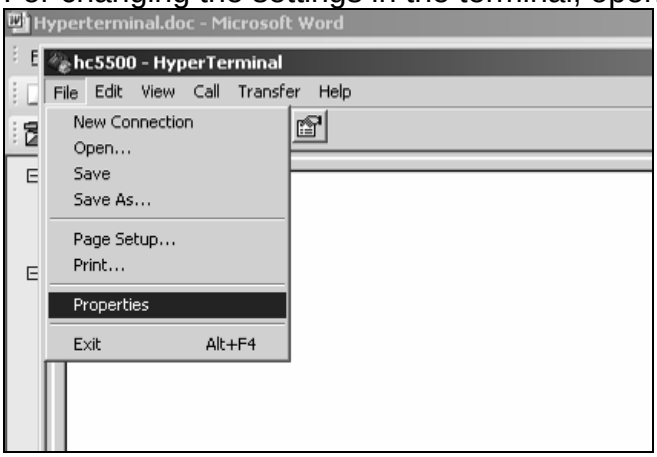
Connected/Disconnected

For changing any setting in an opened terminal, the terminal must be disconnected. This is controlled on the bottoms shown on Picture 59. With this button, the terminal can be Connected or Disconnected.
The terminal must be connected for receiving Data from the controller



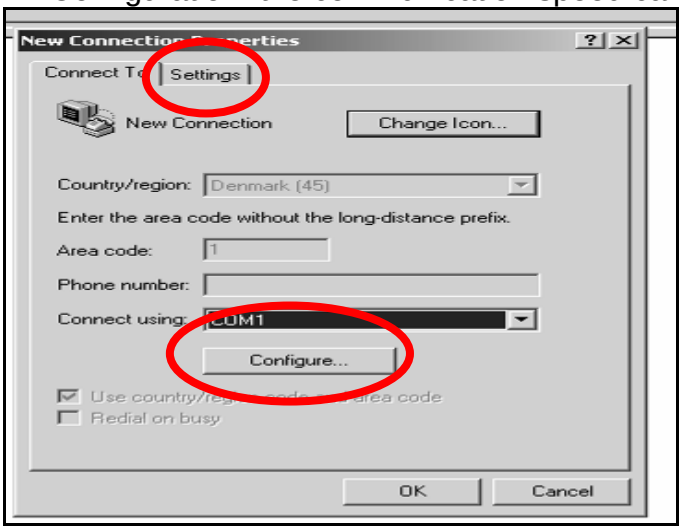
Picture 59: Button for Connected/Disconnected

For changing the settings in the terminal; open “File” and click on “Properties” as shown.



Picture 60: Properties

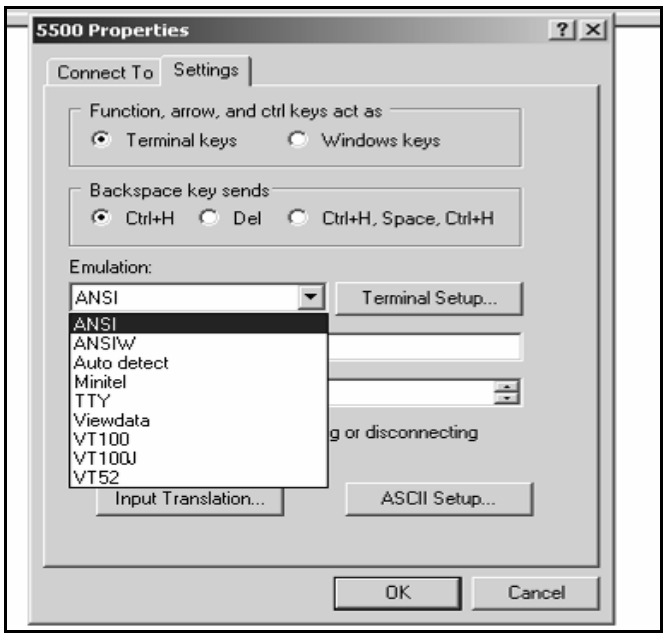
The dialogue box that pops up should look like Picture 61, Properties.
In “Settings” the language can be changed as shown on Picture 62.
In “Configuration” the communication speed can be changed as shown on Picture 56.



Picture 61: Properties/settings

Changing communications language

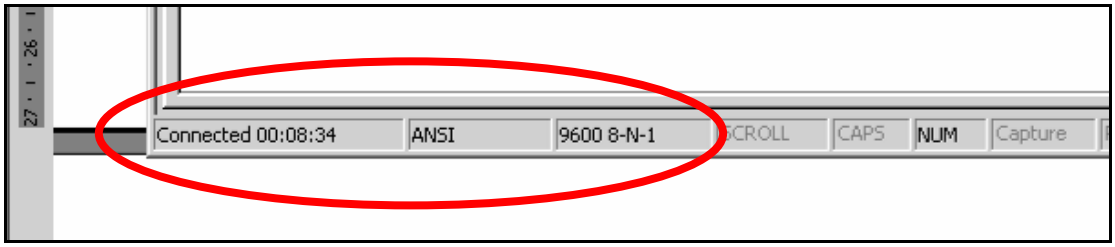
Communications language must be ANSI as shown on Picture 62. “AUTO detect” can also be chosen but will give problems when the data transfer begins. It is therefore recommended that ANSI be chosen as communication language.



Picture 62: Communications language

Terminal is ready for transfer of data

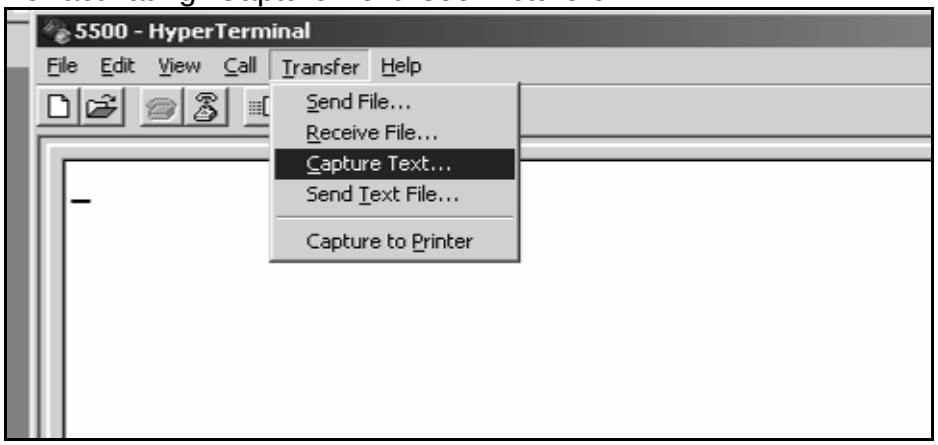
When the terminal is ready for transfer the information in the bottom of the display, must be like Picture 63.



Picture 63: Information on terminal

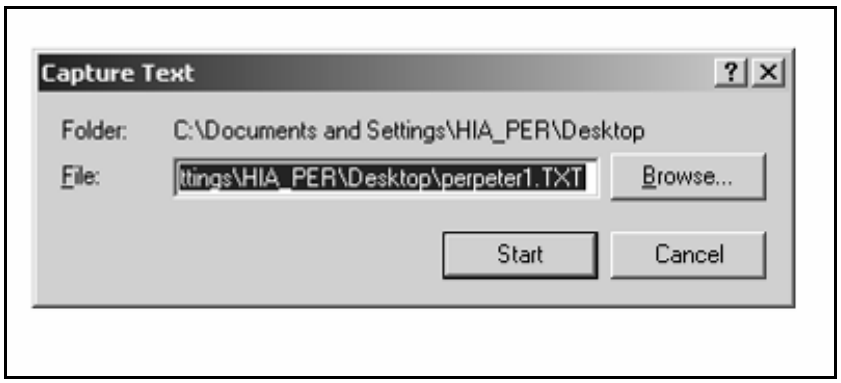
Capture Text

The data that is read out can be used in different ways. The data can be shown on the display or it can be saved as a data file.
If the data is to be saved, the terminal, must be setup to “Capture Text”.
For activating “Capture Text” see Picture 64.



Picture 64: Capture text

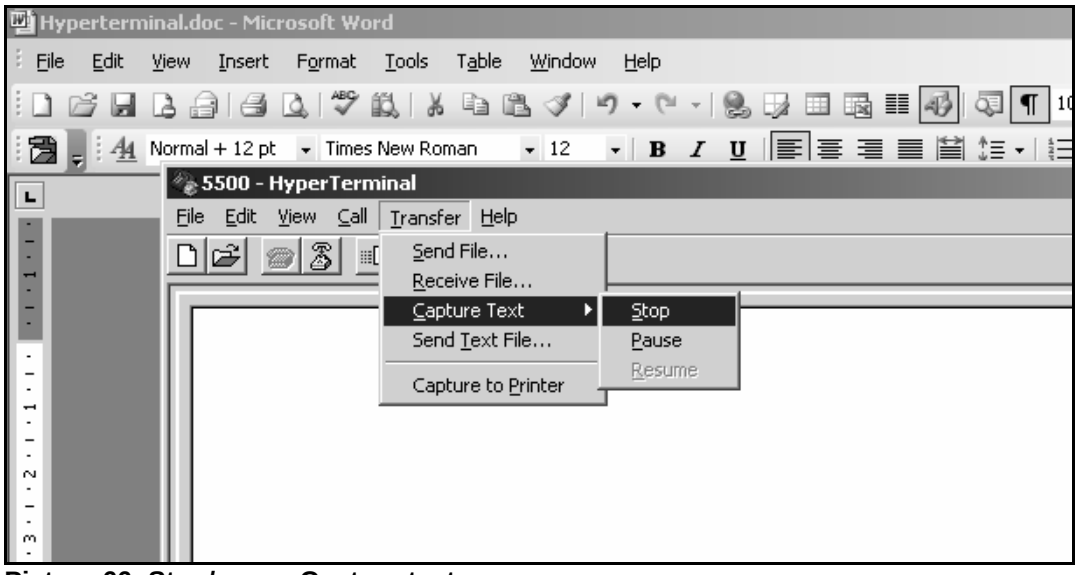
When ”Capture Text” is activated, the terminal will ask where the text file is to be saved on the PC, see Picture 65.



Picture 65: Saving the text file

The terminal will suggest where to save the file on the PC. If you want to place the file another place, then click on ”Browse”. This will give you the opportunity for placing the text file where you want it.

When the transfer it done, click ”Capture Text / Stop”. This will save the text file and end the transfer. If a break in the transfer is needed can a click on “Pause” also seen on Picture 66.



Picture 66: Stop/pause Capture text

Setting up the controller for data transfer

HC5500 & 6500

Before starting the data transfer must the controller be setup.

1. First the communication port must be chosen and setup for the data transfer. This is done in Extended menu ”E.4.1.1, *Equipment type”* and the controller must be set on “*Dump”* or “*Printer & Dump”*:

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 menu 5.1

If “*Print & Dump”* is chosen:
Data can be written out ”raw” or the print data can be written out from the print menu.

2. After having chosen the communication port in extended menu, the controller is ready for the transfer.
   In menu 5.1 or 5.2 all the data that can be written out is chosen:
   1. Register number menu: 5.1.1
   2. All registers menu: 5.1.2
   3. Configuration menu: 5.1.3
   4. Raw data menu: 5.2.1
   5. Raw data with head menu: 5.2.2

As soon as one of these write out menus is chosen, the controller will start the transfer. On the PC display should the transfer be visible.

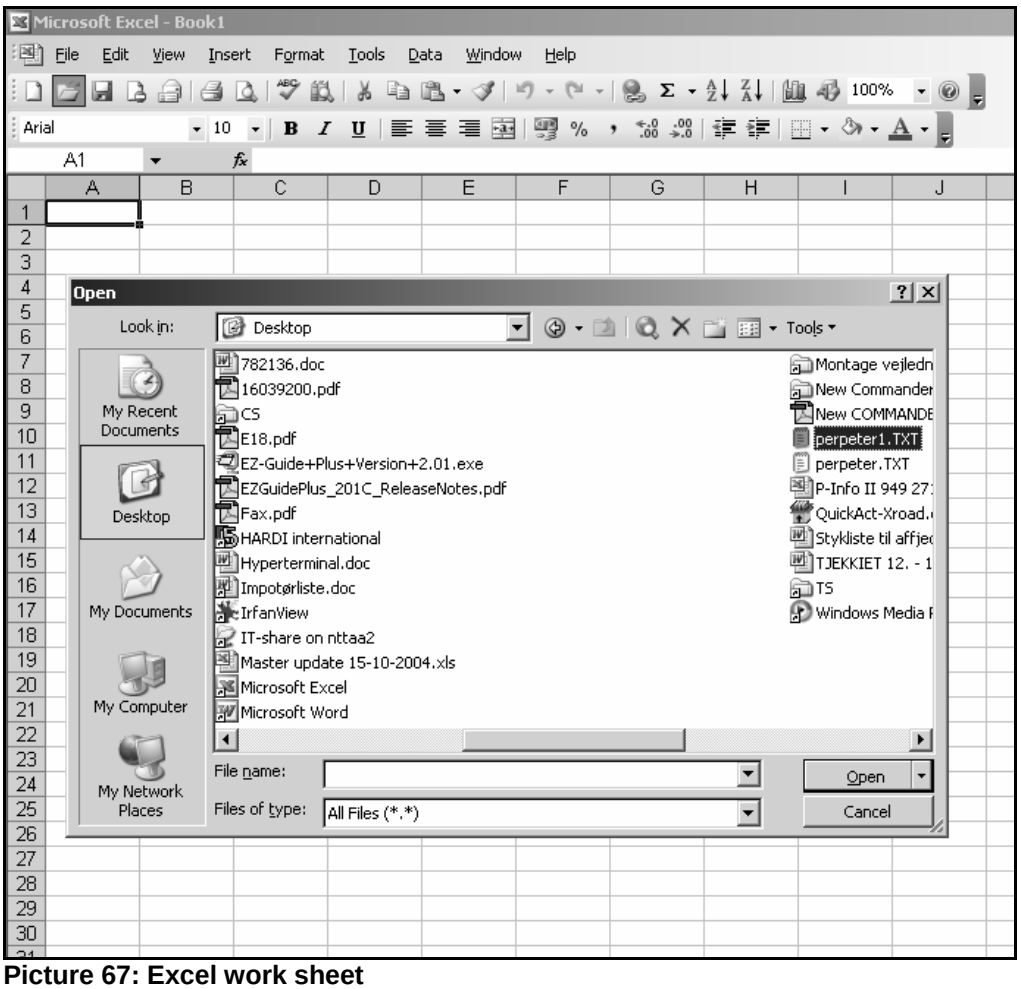
Handling the data

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. How to save the data file is described in ”Capture Text” on page 58.
The data is saved as a Notepad data file. These files can also be opened in a spreadsheet (e.g. Excel) but is has to be done the right way.

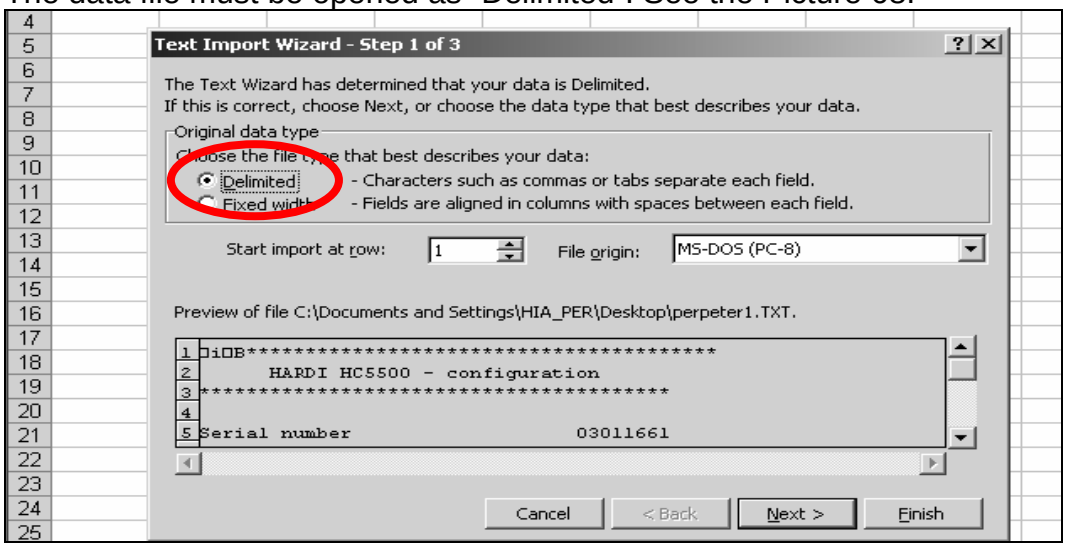
Open the data file in Excel

When the data file is to be opened in Excel, then Excel must be opened before the data file. The data file can’t be opened with the function “Open with” see Picture 67. In Picture 67, the Excel work sheet is opened before the data file and data file is opened from the Excel; it can’t be done the other way around.



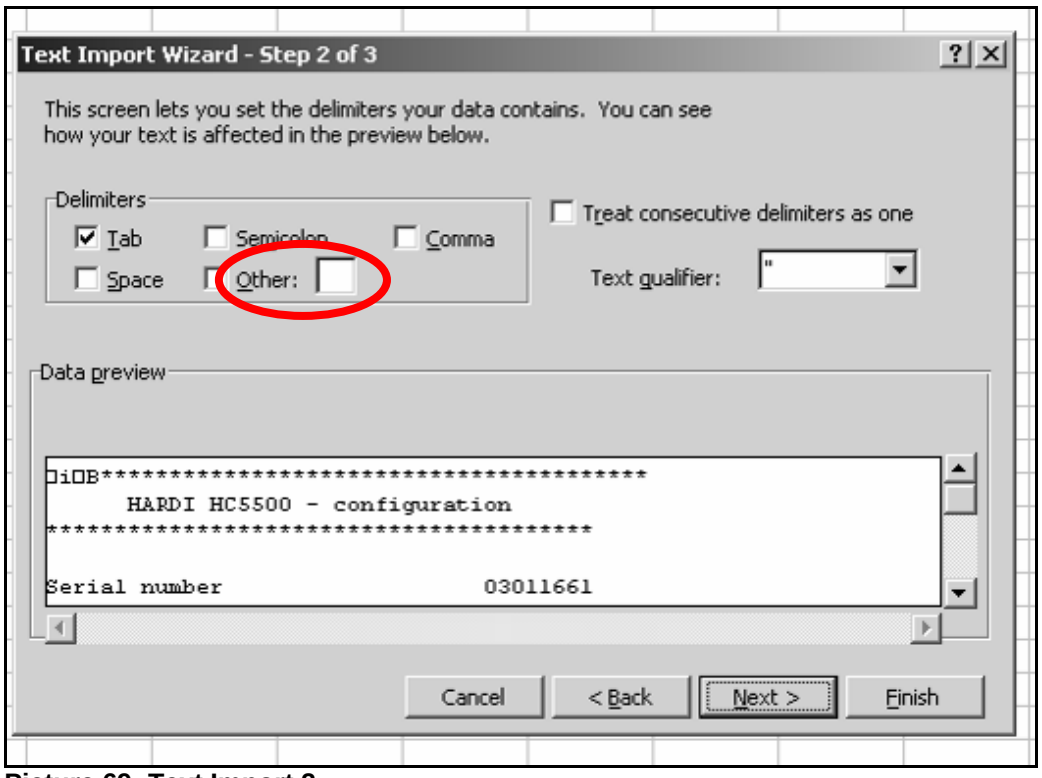
Picture 67: Excel work sheet

When Excel opens the Notepad data file, the following dialogue box will appear. See Picture 68. The spreadsheet asks how the data file must be opened.
The data file must be opened as “Delimited”. See the Picture 68.



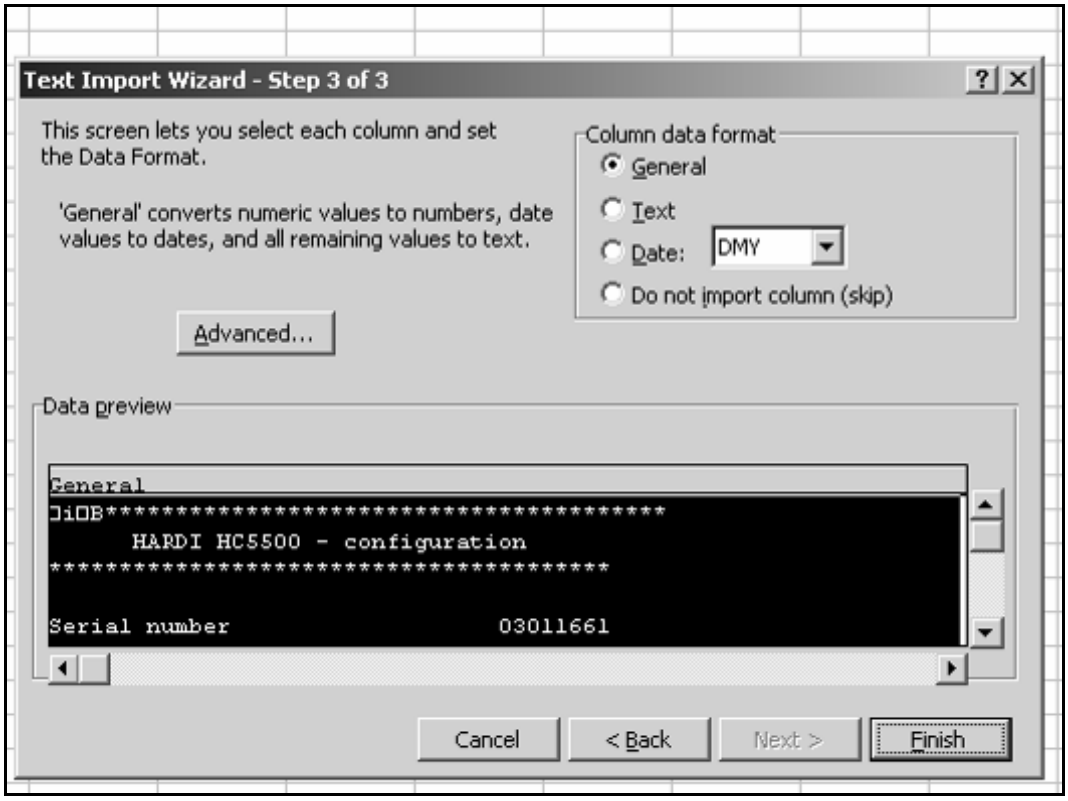
Picture 68: Text import 1

The next display will appear and Excel asks what symbols are used for marking the columns.
There are several places in “Delimiter” that can be ticked. In the field “Other”, the symbol ”|“ can be used. None of the other fields are marked.



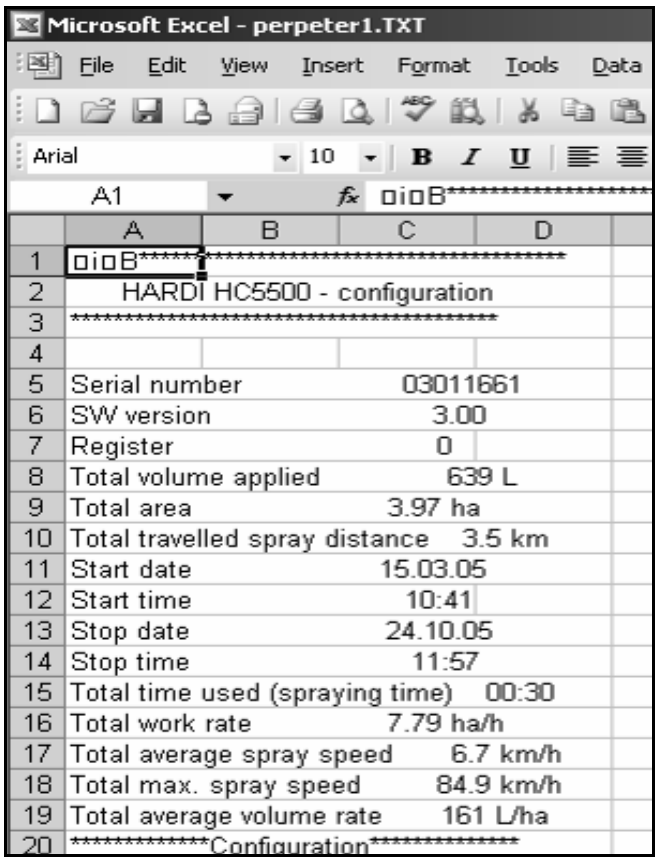
Picture 69: Text Import 2

In the next dialogue box, Picture 70, is there nothing to change just accept “finish” and go on.



Picture 70: Text Import 3

After this, Excel should open and the display should look like Picture 71.



Picture 71: Data file opened in Excel.

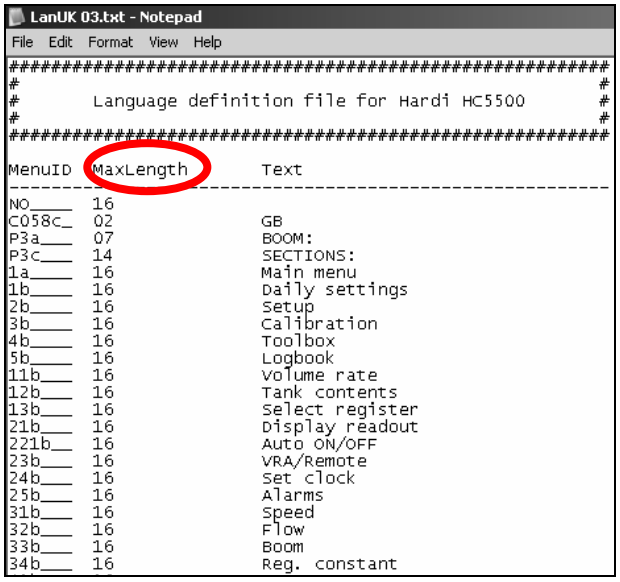
Language transfer

The HC 5500 has UK, D, DK, SF and HU as standard languages. It also can store 2 local languages. This allows you to write and download a local language.

Software and hardware for making the transfer:

PC, HC 5500 and Spray box with 12 volt power supply.

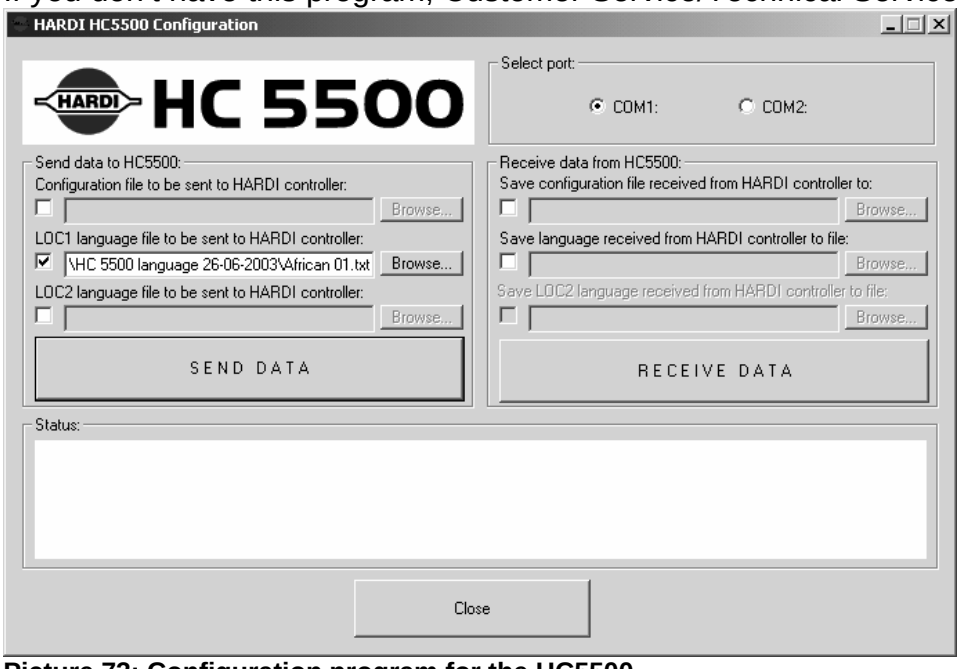
Standard language files.



Picture 72: Language file opened in Notepad

Configuration program for HC 5500

For sending the file from the PC to the HC5500 is this program needed.
If you don't have this program, Customer Service/Technical Service can supply it.



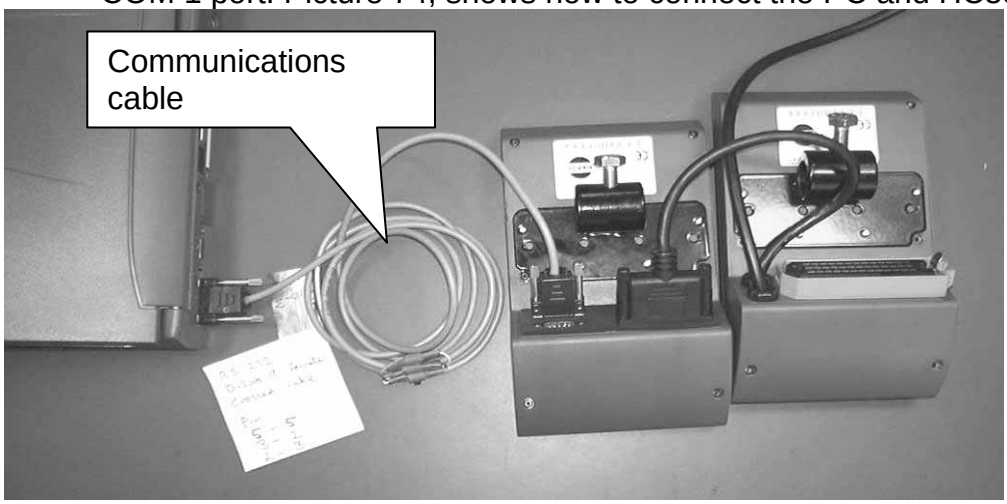
Picture 73: Configuration program for the HC5500

How to translate a language file

1. Select a file with a known language, e.g. English.
2. Open the file with Notepad and re-name it and overwrite the text. Note that “MaxLength”, see Picture 72, refers to the maximum number of letters that can be used and the spacebar counts for a letter.
3. When finished, save it. Now it can be downloaded to the HC 5500 via a PC.

Sending the language file from PC to HC5500

1. Connect RS 232 cable to HC 5500 COM 1 port and the Spray box. If using the HARDI communication cable, connect the yellow sticker of the cable to the HC5500 COM 1 port. Picture 74, shows how to connect the PC and HC5500.



Picture 74: PC connected to HC5500

2. Power up the Spray box (12 volt) and HC 5500 in extended menu mode.
3. Open Language configuration program on the PC, see Picture 73 on page 64.
4. Select COM port for PC.
5. Click “LOC 1” or “LOC 2” on left hand side and select your local language file to be sent with the browser function.
6. Click “Send data” and follow instructions in the “Status” box.

PCB's

There are several different kind 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, see Breakout PCB on pages 66
2. PCB for section valves, see PCB for Liquid on pages 66
3. Hydraulic PCB

Characteristic for these prints 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 see "PCB for Jobcom" on pages 73

On this print, 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 76 shows an example of how a PCB can look.

PCB for Liquid

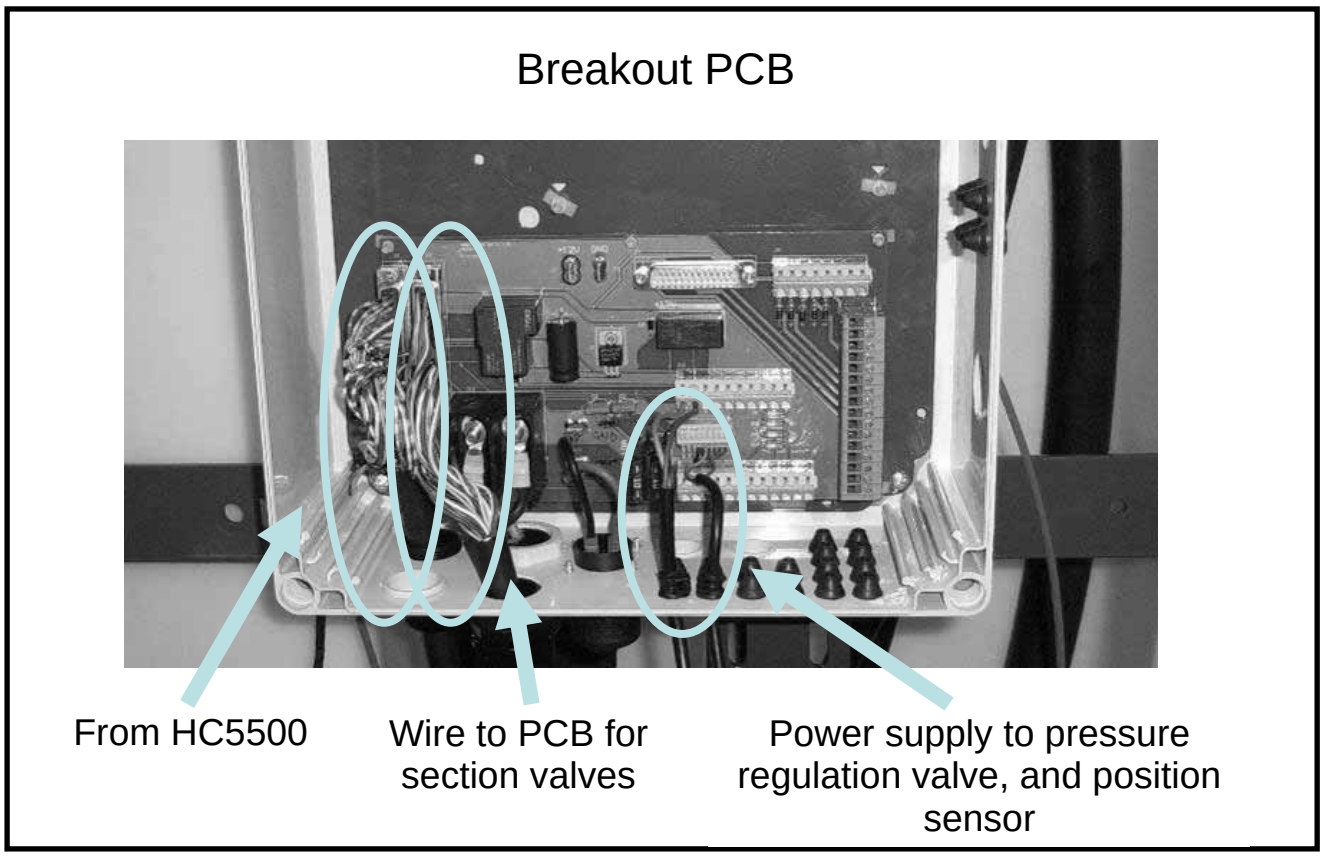
There are four different kinds of PCB for liquid control;

1. Breakout PCB Picture 75 on pages 67
2. 9 section's PCB Picture 76 on pages 68
3. 13 section's PCB Picture 77 on pages 71
4. Jobcom PCB Picture 80 on pages 74

A further description of the PCB is made in each section.
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

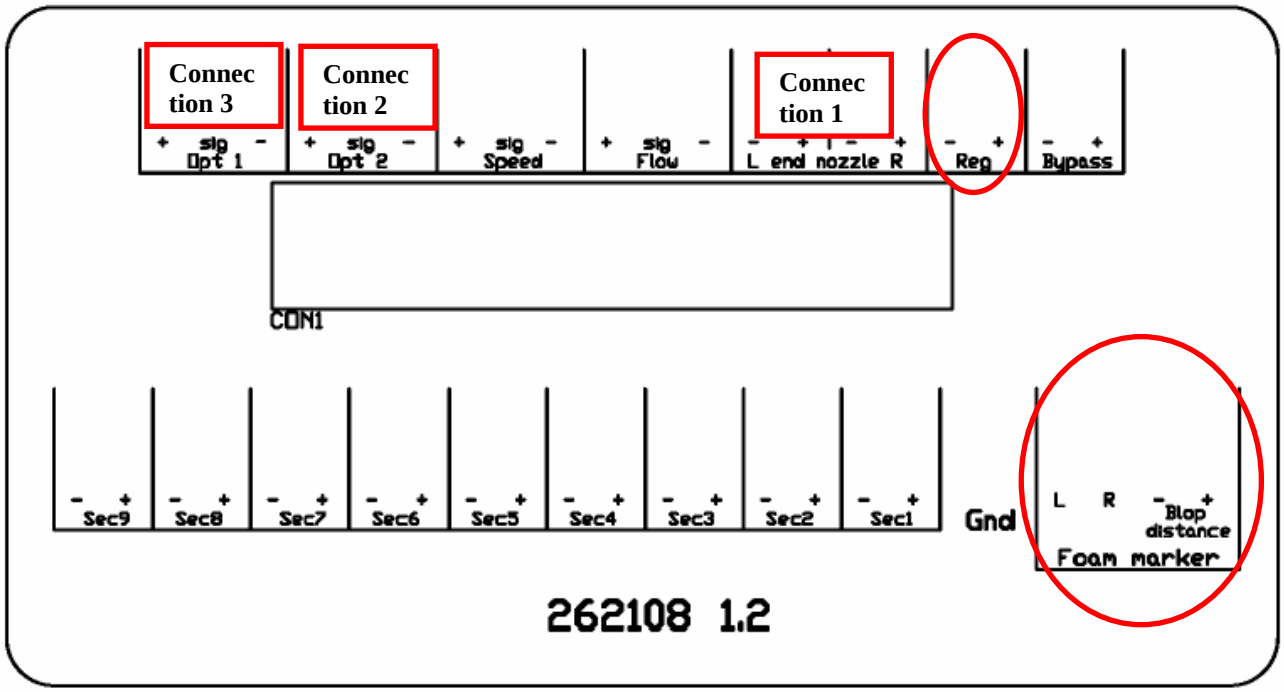
The Breakout PCB is used when the sprayer is without SafeTrack. The Breakout PCB will split up the cable from the HC5500. The wires for the pressure regulation valve will be taken out here and the rest of the cable from the HC5500 will go on to the PCB for section valves. Page 71 shows the PCB for section valves 13 sections.



Picture 75 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.
On the 9 section PCB, the connection for the pressure regulations valve, see Picture 76, is shown in the red circle.
On the 13 section PCB is there no connection for the pressure regulation valve, see Picture 77 on pages 71. This means that there cannot be a direct connection between the HC5500 / Spray box 2 and 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 or MEGA sprayer, where all the section valves and the pressure regulation are mounted at the same place on the sprayer. The cable from the HC5500 will therefore not be split up before it is connected to the 9 section PCB. The wiring for the two PCB's is not the same, so they can not replace each other.



Picture 76 PCB for sections valves (9 section's PCB)

(Order number for the 9 sections PCB is 72173900)

Foam marker
From the foam marker connection is there a power supply 1 – 2 Amp. The PCB can pull up to 5 Amp but the volts will then drop.

Connection of optional sensors:
Pressure sensor:
The wires from the Pressure sensor are attached to "Connection 3" on the PCB. See Picture 76.

Fan speed on TWIN:
The wires from the Fan speed sensor are connected to "Connection 2". Picture 76.

End nozzle kit:
The wires from the End nozzle kit are connected to "Connection 1" on the PCB, on Picture 76.

General:

	2500		+	Sig.	-	5500		+	Sig.	-	NOVA		+	Sig.	-
Opt 1	Pressure sensor		Brn	Blu	-	Pressure sensor		Brn	Blu	-	Boom sensor NOVA track		Brn	Gre	Whi
Opt 2	RPM sensor		Brn	Blu	Blk	RPM sensor or anemometer		Brn	Blu	Blk	Pressure sensor		Brn	Gre	Whi
Speed			Brn	Blu	Blk			Brn	Blu	Blk			Brn	Blu	Blk
Flow			Brn	Blu	Blk			Brn	Blu	Blk			Brn	Blu	Blk
L end nozzle	Pendulum lock at HAY+LPY		Brn		Blu	Pendulum lock at HAY+LPY		Brn		Blu	User-defined functions C&D				
R endnozzle	Pendulum lock at HAY+LPY		Brn		Blu	Pendulum lock at HAY+LPY		Brn		Blu	Or pendulum lock HAY+LPY-See 67903				
Reg (Yellow)			Brn		Blu			Brn		Blu					
Bypass	EC on/off		Brn		Blu	EC on/off		Brn		Blu	EC on/off or EC motors for circulation		Brn		Blu
Sec 9	User defined A&B 2		x		x	User defined A&B 2		x		x			Brn		Blu
Sec 8	User defined A&B 1		x		x	User defined A&B 1		x		x			Brn		Blu
Sec 7	Twin speed		Brn		Whi	Twin speed		Brn		Whi			Brn		Blu
Sec 6	Twin angle		Yel.		Gre	Twin angle		Yel.		Gre			Brn		Blu
Sec 5			Brn		Blu			Brn		Blu			Brn		Blu
Sec 4			Brn		Blu			Brn		Blu			Brn		Blu
Sec 3			Brn		Blu			Brn		Blu			Brn		Blu
Sec 2			Brn		Blu			Brn		Blu			Brn		Blu
Sec 1			Brn		Blu			Brn		Blu			Brn		Blu
Gnd															
		Gnd	L	R	-	+	Gnd	L	R	-	+	Gnd	L	R	-	+
Foam marker	No. 4 Not used	2	6	5	1	3	No. 4 Not used	2	6	5	1	3	No. 4 Not used	2	6	5	1	3

Table 2 General wiring to the PCB for section valves.

	GB	D	F	DK	ES
Brn	Brown	Braun	Marron	Brun	Marrón
Blu	Blue	Blau	Bleu	Blå	Azul
Blk	Black	Szhwarz	Noit	Sort	Negro
Yel	Yellow	Gelt	Jaune	Gul	Amarillio
Whi	White	Weiss	Blanc	Hvid	Blanco
Gre	Green	Grün	Vert	Grøn	Verde

Table 3 Translations of the wiring colour coding

2500 og 5500 - 6 sections and TWIN

	2500	+	Sig.	-	5500	+	Sig.	-
Opt 1	Pressure sensor	Brn	Blu	-	Pressure sensor	Brn	Blu	-
Opt 2	RPM sensor	Brn	Blu	Blk	RPM sensor or anemometer	Brn	Blu	Blk
Speed		Brn	Blu	Blk		Brn	Blu	Blk
Flow		Brn	Blu	Blk		Brn	Blu	Blk
L end nozzle	Pendulum lock at HAY+LPY	Brn		Blu	Pendulum lock at HAY+LPY	Brn		Blu
R endnozzle	Pendulum lock at HAY+LPY	Brn		Blu	Pendulum lock at HAY+LPY	Brn		Blu
Reg (Yellow)		Brn		Blu		Brn		Blu
Bypass	EC on/off	Brn		Blu	EC on/off	Brn		Blu
Sec 9	User defined A&B 2	x		x	User defined A&B 2	x		x
Sec 8	Twin speed	Brn		Whi	Twin speed	Brn		whi
Sec 7	Twin angle	Yel.		Gre	Twin angle	Yel.		gre
Sec 6		Brn		Blu		Brn		Blu
Sec 5		Brn		Blu		Brn		Blu
Sec 4		Brn		Blu		Brn		Blu
Sec 3		Brn		Blu		Brn		Blu
Sec 2		Brn		Blu		Brn		Blu
Sec 1		Brn		Blu		Brn		Blu
Gnd								

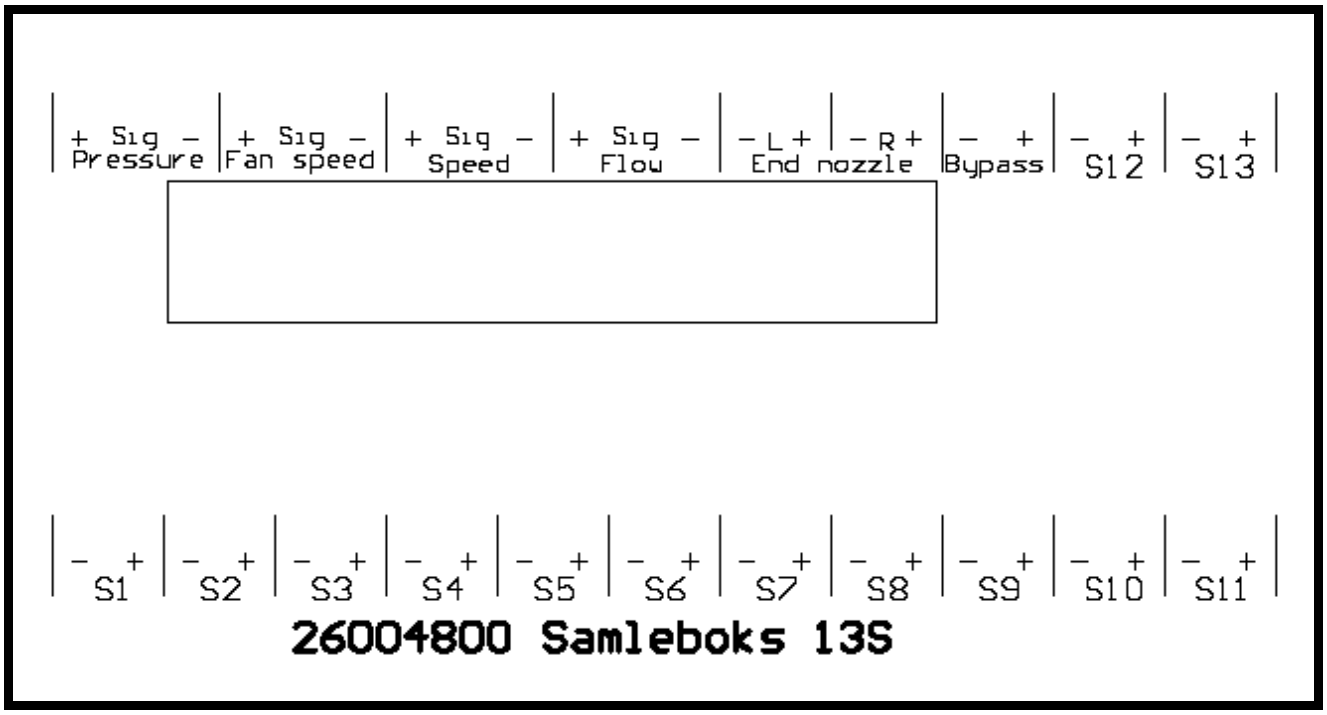
Table 4 Wiring for the PCB for section valves with 6 sections and TWIN

2500 og 5500 - 7 sections and TWIN

	2500	+	Sig.	-	5500	+	Sig.	-
Opt 1	Pressure sensor	Brn	Blu	-	Pressure sensor	Brn	Blu	-
Opt 2	RPM sensor	Brn	Blu	Blk	RPM sensor or anemometer	Brn	Blu	Blk
Speed		Brn	Blu	Blk		Brn	Blu	Blk
Flow		Brn	Blu	Blk		Brn	Blu	Blk
L end nozzle	Pendulum lock at HAY+LPY	Brn		Blu	Pendulum lock at HAY+LPY	Brn		Blu
R endnozzle	Pendulum lock at HAY+LPY	Brn		Blu	Pendulum lock at HAY+LPY	Brn		Blu
Reg (Yellow)		Brn		Blu		Brn		Blu
Bypass	EC on/off	Brn		Blu	EC on/off	Brn		Blu
Sec 9	Twin speed	Brn		Whi	Twin speed	Brn		whi
Sec 8	Twin angle	Yel.		Gre	Twin angle	Yel.		gre
Sec 7		Brn		Blu		Brn		Blu
Sec 6		Brn		Blu		Brn		Blu
Sec 5		Brn		Blu		Brn		Blu
Sec 4		Brn		Blu		Brn		Blu
Sec 3		Brn		Blu		Brn		Blu
Sec 2		Brn		Blu		Brn		Blu
Sec 1		Brn		Blu		Brn		Blu
Gnd								

Table 5 Wiring for the PCB for section valves with 7 sections and TWIN

PCB for section valves 13 sections



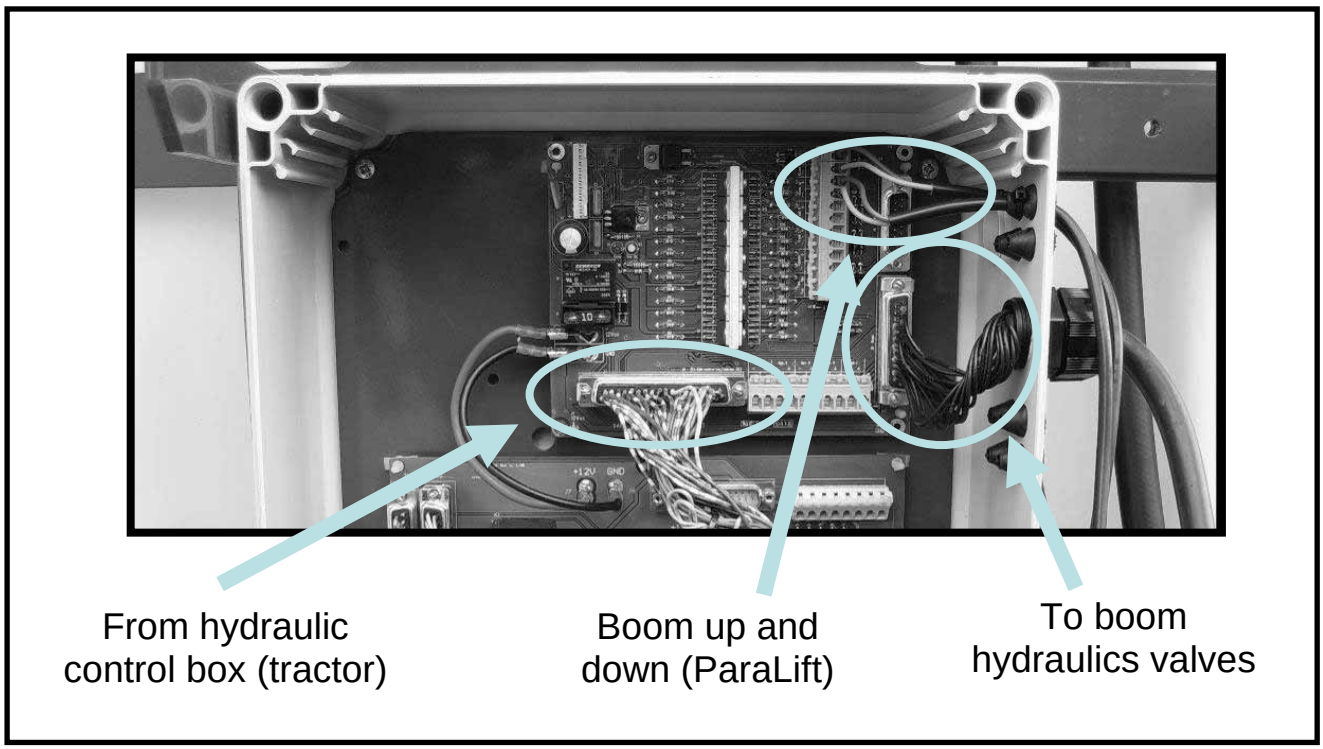
Picture 77 PCB for section valves "New Commander" (13 sections PCB)

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 as described in section "PCB for section valves, 9 sections", Table 2 on pages 69.

PCB for hydraulic

The PCB for hydraulic is also called DAH (Direct Activated Hydraulic) and can be seen on Picture 78.
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 78.
If it is with SafeTrack, the PCB will be mounted on top of the Jobcom, see Picture 80 on pages 74.
Furthermore the PCB for SafeTrack will also be mounted, see Picture 79.
The part number for the hydraulic PCB is 26004300.



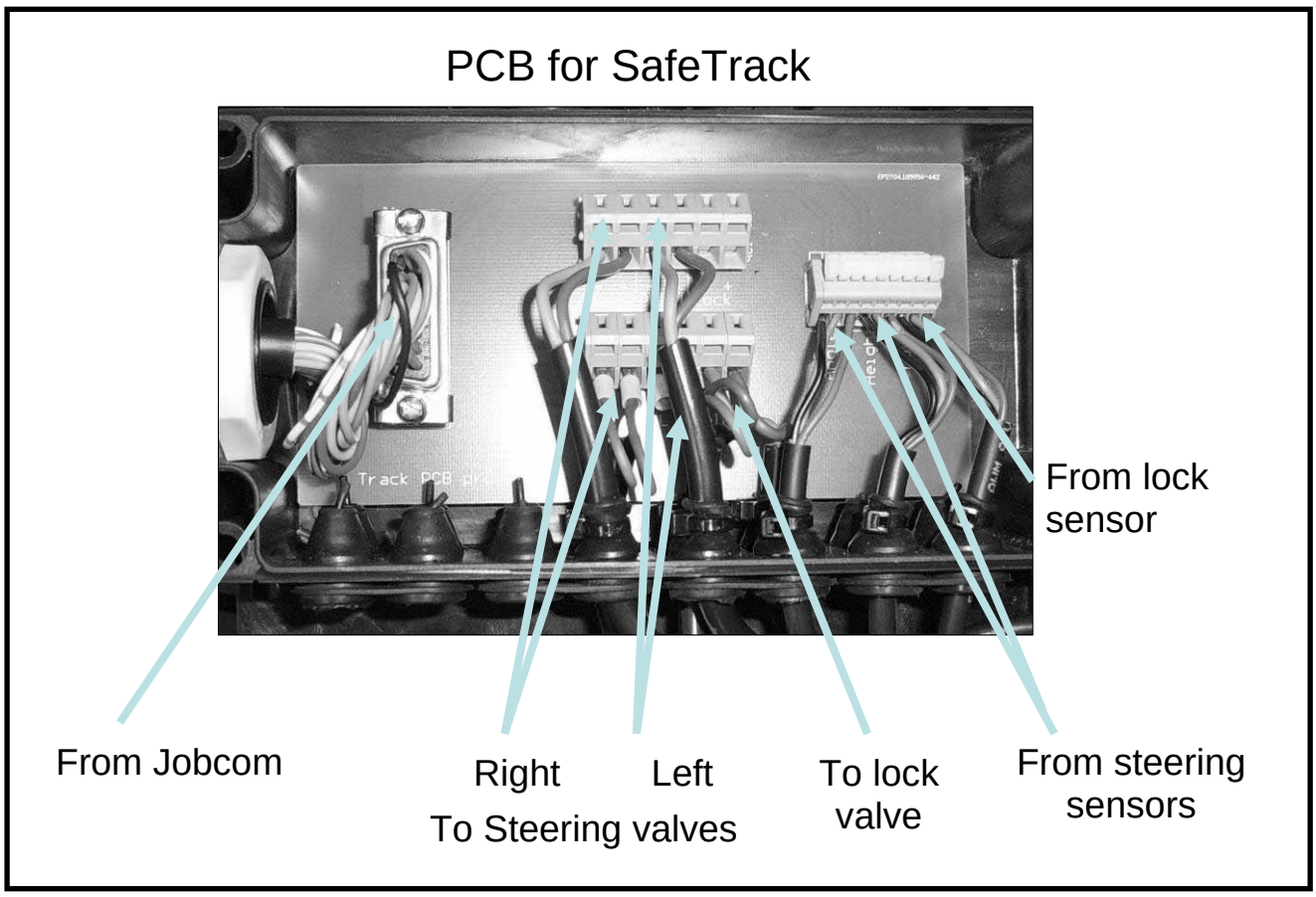
Picture 78 PCB for hydraulic

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.



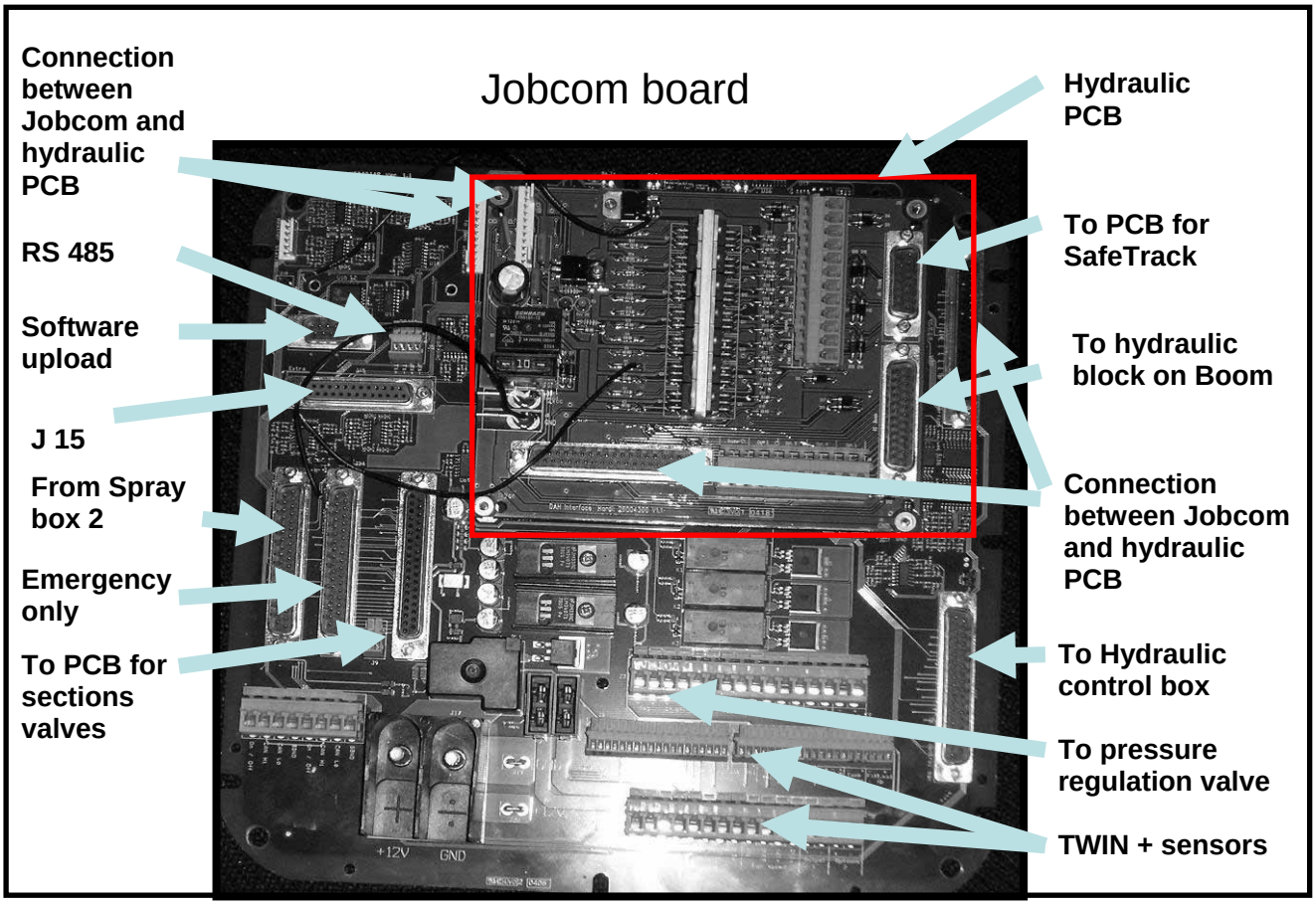
Picture 79 PCB for SafeTrack

PCB for Jobcom

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

Resetting the Jobcom

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



Picture 80 Jobcom

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	Cable 72271600 has to be used. The plug with the yellow tag has to be mounted in the Jobcom.

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 future use!
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 future use!
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.	

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

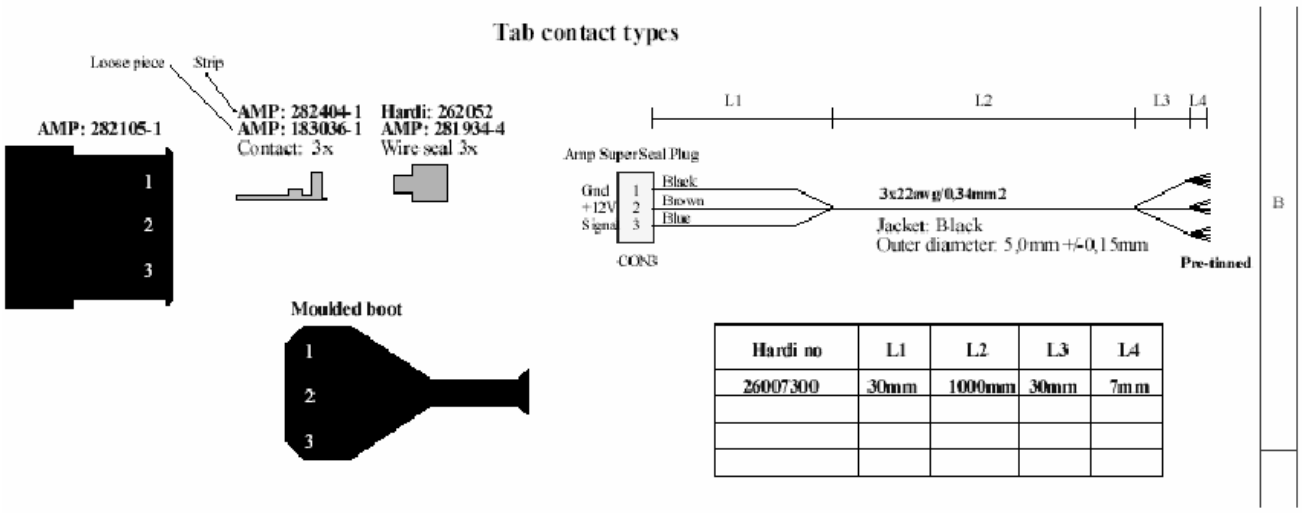
Appendix

Tank Gauge sensor

WIKA pressure tranducer

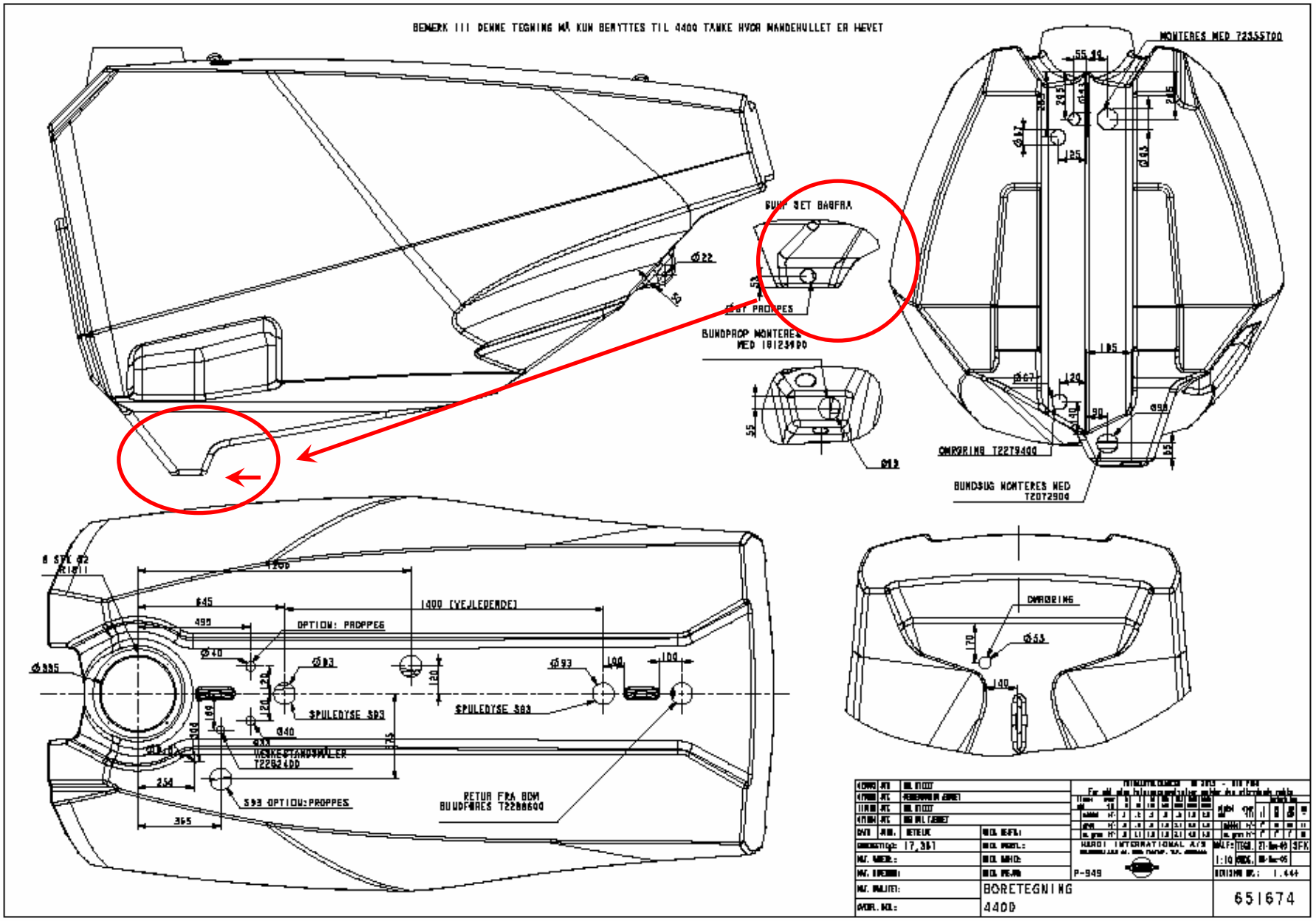
Model:	S11
Range:	0..250mBar
Accuracy:	0,5% (0,25%BSL)
Supply voltage:	12V (9-16V automotive)
Output:	100-2600hz, open collector NPN
Pull up:	10K ohms to Vcc.
Cable:	1m (see below)
Process:	G1/1B
Protection:	IP67
Compensation:	Thru Goretex membrane

Cable connection:



Hardi no	L1	L2	L3	L4
26007300	30mm	1000mm	30mm	7mm

Appendix 1: Hole for Tank Gauge sensor



Revision

Date	Subject	Section	Pages	Written By
04/09/2006	Error codes on HC5500	Error code on the HC5500	76	PER
25/09/2006	Proof reading of whole document	Error code on the HC5500	78	AF