CONTROLLER HC6500

Service Manual - SW 1.2X

679096-201 - Version 2.01
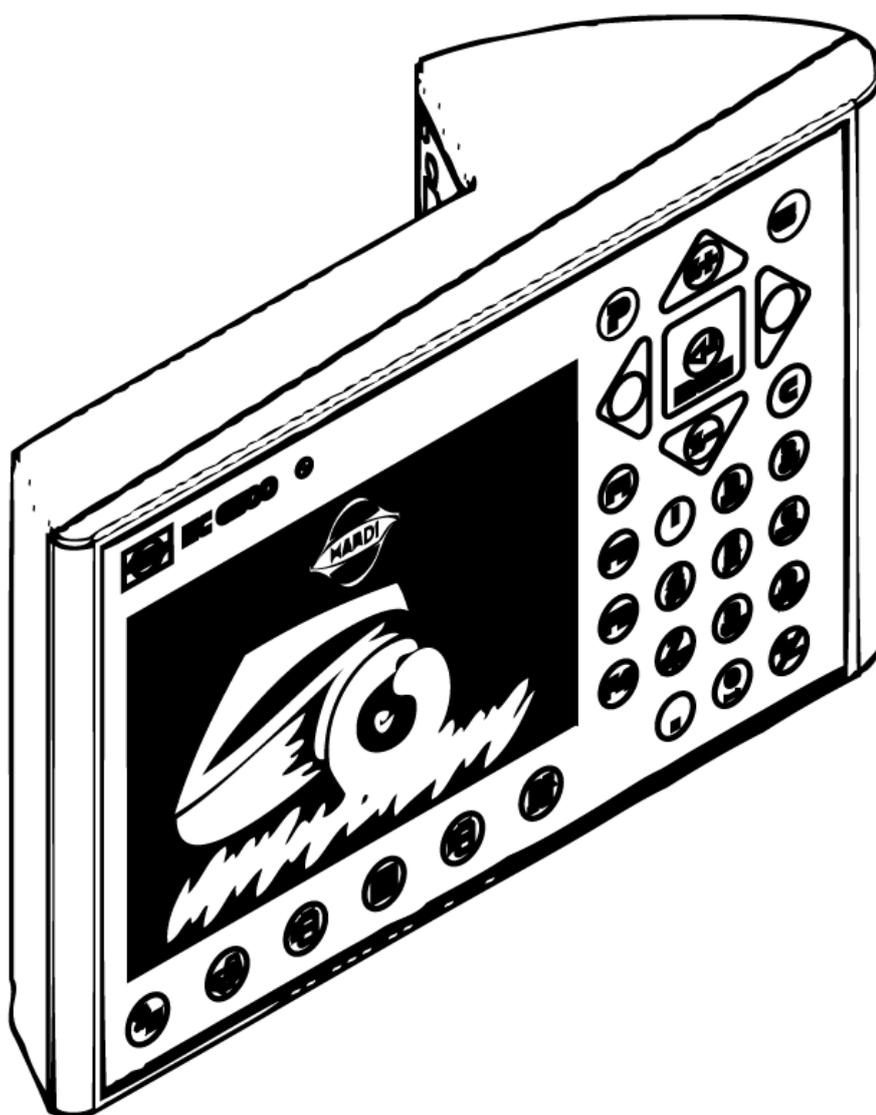GB - 10.2008

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Table of contents

Introduction to this Service Manual

The primary aim of this manual is to help with fault finding. Each chapter is built up in the following template to offer the service person the quickest route to solving the problem:

- **Feature**

- **General info/description**

- **Sensors involved**

- **Constants involved**

- **Pinning/plugs/colors/codes**

- **Fault finding options/results**

Measurements Rules of thumb for HC 6500

This manual contains the most important information about HC 6500.
In order to diagnose the system efficiently, remember the following rules of thumb.

1. Always check the feature functions correctly according to the Operators Instruction Book

   - **Does the boom rise when lift control button is activated upwards?**

   - **Does boom wing rise when tilt control button is activated upwards?**

   - **Does SafeTrack centre when centre button is activated?**

2. Check the sensors are correctly installed and that the signals correspond to check values.
3. Check that all constants are stored in the system and that the values correspond to the machine specifications.
4. Check the basic calibration values, e.g. speed by driving 3.6 km/h i.e. 1 m/s with the sprayer. Compare HC 6500 forward speed with tractor speedometer. Drive 100 meters. This should take 100 seconds.
5. Use the Guidance for HC 6500 setup chart as a reminder to set up all necessary menus.

Extended Menu for sw x.xx

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

This is how the main Extended Menu looks like on the controller display:

Extended Menu
E1   Language Sprog Spracke Langue
E2   Unit Metric or US
E3   Reserved
E4   Data exchange COM port set up
E5   Optional sensors
E6   Service interval
E7   Total register Master reset
E8   Settings Liquid sys Hydraulic
E9   Twin actuator setup
English Dansk Deutsh Francais
Svenska Cestina Nederlandse Polski

- **E1: Is the language choice. Note: For Russian, the HC6500 hardware version with Cyrillic text is used.**
- **E2: Is for what unit the controller shall use.**
- **E3: Reserved**
- **E4: Setup of the data communication.**
- **E5: Setup of optional sensors. It is typically the pressure, fan revolutions and tank contents (TankGauge).**
- **E6: Setup of the service interval.**
- **E7: Setup of factory settings.**
- **E8: Settings of the regulation, tank, track and misc. setting are**
- **E9: Is for setup of the TWIN actuators.**

E1 Language	**E1.1 English** *(Default)*
	E1.2 Dansk (Danish)
	E1.3 Deutsch (German)
	E1.4 Francais (French)
	E1.5 Svenska (Swedish)
	E1.6 Cestina (Czech)
	E1.7 Nederlandse (Dutch)
	E1.8 Polski (Polish)

E2 Unit	**E2.1 Metric units** *(default)*
	E2.2 US units

E3 Reserved

E4 Data exchange	**E4.1 COM1 Setup**	**E4.1.1 Equipment type**	**E4.1.1.1 Printer**
			Select if using a 12 volt printer
			E4.1.1.1 Dump
			Select if you want to dump data to a PC
			E4.1.1.1 Printer & Dump
			Select if you want to print to a 12 volt printer and data dump from the same COM
			E4.1.1.1 VRA / remote
			Variable Rate Application and remote control of liquid system
		E4.1.2 Baud rate	**E4.1.2.1 9600 baud** *(Default)*
			Fastest Baud rate. Select 9600 for HARDI 12V printer
			E4.1.2.2 4800 baud
			Fast Baud rate
			E4.1.2.3 2400 baud
			Medium speed Baud rate
			E4.1.2.4 1200 baud
			Slowest Baud rate
		E4.1.3 Protocol select	**E4.1.3.1 HARDI VRA protocol**
	E4.2 COM2 Setup	**E4.2.1 Equipment type**	**E4.2.1.1 Printer**
			Select if using a 12 volt printer
			E4.2.1.1 Dump
			Select if you want to dump data to a PC
			E4.2.1.1 Printer & Dump
			Select if you want to print to a 12 volt printer and data dump from the same COM
			E4.2.1.1 VRA / remote
			Variable Rate Application and remote control of liquid system
		E4.2.2 Baud rate	**E4.2.2.1 9600 baud** *(Default)*
			Fastest Baud rate. Select 9600 for HARDI 12V printer
			E4.2.2.2 4800 baud
			Fast Baud rate
			E4.2.2.3 2400 baud
			Medium speed Baud rate
			E4.2.2.4 1200 baud
			Slowest Baud rate
		E4.2.3 Protocol select	**E4.2.3.1 HARDI VRA protocol**

E5 Optional sensor	E5.01 Pressure	E5.1.1 Minimum	[-99.9 to 99.9]		
	Connected to section valve PCB	*Default is 0,0 Bar. Key in pressure making sensor output 4mA. See sensor for min. value.*			
		E5.1.2 Maximum	[0 to 999.9]		
		Default is 10.0 Bar Key in pressure making sensor output 20mA. See sensor spec. for max. value.			
	E5.02 Fan speed	E5.2.1 PPU	[0 to 999999]		
	Connected to section valve PCB	*Key in pulses per revolution. set to 1 if one puls is given per revolution*			
	E5.03 Tank contents	E5.3.1 Sensor Type	E5.3.1.1 Not present		
			E5.3.1.2 Reserved		
			E5.3.1.3 Reserved		
			E5.3.1.4 HARDI Tank gauge		
		E5.3.2 Reserved			

				Value	Unit	Default
E5.04 Wind speed	E5.4.1 Not used					
E5.05 Wind direction	E5.5.1	min	0	min	0	
	E5.5.2	max	359	max	359	
E5.06 Air temperature	E5.6.1	min	-20	min	-20	
	E5.6.2	max	70	max	70	
E5.07 Relative humid	E5.7.1	min	0	min	0	
	E5.7.2	max	100	max	100	
E5.08 RPM sensor		PPU	1	PPU	1	
E5.09 Extra 1	E5.9.1	PPU	1	PPU	1	
	E5.9.2	Extra1 name				
	E5.9.3	Extra1 unit				
E5.10 Extra 2	E5.10.1	PPU	1	PPU	1	
	E5.10.2	Extra2 name				
	E5.10.3	Extra2 unit				
E5.11 Extra 3	E5.11.1	3A Min	0	Volt	0	
	E5.11.2	3A Max	5	Volt	5	
	E5.11.3	Extra3 name				
	E5.11.4	Extra3 unit				
E5.12 Extra 4	E5.12.1	3A Min	0	Volt	0	
	E5.12.2	3A Max	5	Volt	5	
	E5.12.3	Extra4 name				
	E5.12.4	Extra4 unit				

E6 Service Interval	E6.1.1	Check filters	A hours	10 hours
PIN = 04711	E6.1.2	Grease boom	B hours	50 hours
	E6.1.3	Grease track and centre	C hours	250 hours
	E6.1.4	Miscellaneous service	D hours	Hours are not defined
	E6.1.5	Check nozzles	Nozzle	50 hours

E7 Factory settings	E7.1 Total register	E7.1.1	*Register 0. Shows start & stop dates & time*
	E7.2 Master reset		*Reset all values except for Register 0 in HC6500 and JobCom PIN = 12345*

E8 Settings	E8.1 Regulation	E8.1.1 Min. duty cycle	[2%]
			Minimum and default is 2%. Increase value if motor hesitates to turn. *For LookAhead, set to 5% +/- 1%.*
		E8.1.2 Min speed	[0.5Km/t]
			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 Reserved	
		E8.1.5 LookAhead	[Disabled/Enabled]
			Default = No. Regulation valve must have position feedback transducer and *Boom sensor must be fitted.*
		E8.1.6 LookAhead Regulation delay	[0 to 9 Sec.]
			Default = 3 seconds. *This is time the regulation valve waits before starting.* *Delay allows fluid system to stabilise before regulation valve starts operation.* *For few boom sections and or big liquid flow, 3 s is recommended.* *For many boom sections and or small liquid flow, 1 or 2 s is recommended.*
		E8.1.7 Sensors	**E8.1.7.11 Pressure sensor: passive**
			Default passive. If installed only pressure will be shown in display, no regulation **E8.1.7.12 Pressure sensor: active** *Select if pressure regulation should be active*
	E8.2	E8.2.1 Tank size	[L]
			Enter true tank size. Used by AutoFill and AutoAgitation
		E8.2.2 Reserved	
		E8.2.3 Data points	Calibration values for HARDI TankGauge
			Read out of: Data point number, measured water level and recorded volume.
	E8.3 Reserved		
	E8.4 Track	E8.4.01 Enable	[Disable/Enable]
			To enable SafeTrack function.
		E8.4.02 Reserved	
		E8.4.03 Chassis	[None, CM05 S, CM05 M, CM05 L]
			Default is CM05 M *For CM: Use S for 3200, M for 4400, L for 6600.*
		E8.4.04 Sprayer draw bar	[0-200 cm]
			Default for CM: 101 cm *Length from draw bar pin hole to front anchor bolt for draw bar.*
		E8.4.05 Manual angling	[-9% to 9%]
			Default is 0. Sets the manual steering speed. Note + and - can be changed by tog- *gling. Use steps of 10% as a guide.*
		E8.4.06 Boom fold sensor	[1,2]
			Default: 1. This is the number of boom fold sensors present.
		E8.4.07 Error print	[Yes]
			Prints last 3 hazardous situations and shows Alteration log changes.
		E8.4.08 Minimum radius	[6,0m]
			Minimum turning radius allowed for the trailer. Tank size 3200 L= 6.5, 4400 L= *7.0, 6600 L= 9.0. Increase to be able to make sharp corner at headland without* *SafeTrack*
		E8.4.09 Max speed when turning	[Km/t]
			Default 18km/t. Above set speed, no angling is possible.
		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 Settings	E8.5 Misc.	E8.5.1 Foot switch	[Disable, On/Off level, On/Off pulse]
			For remote On/Off of main switch, it allows the use of other switch system
		E8.5.2 Rate deviation	[Step size: xx%]
			Default is 10%. Can be altered.
			If set at 0%, this allows 3 rates to be set up in menu 1.1
		E8.5.3 Capacity left	[Distance, Area]
			Affects readout from Display icon. Will show distance or area remaining
		E8.5.4 AB switches setup	E8.5.4.1 AB switches disable
			E8.5.4.2 Valve or lamp
			E8.5.4.3 Hydraulics DAH
			E8.5.4.4 Hydraulics Delta DH
		E8.5.5 Foam marker	Setup when sprayer has foam marker.
			Also setup menu 2.2.2
		E8.5.6 Startup picture	Select desired startup picture
	E8.6 Sprayer type Liquid, boom	E8.6.1 Liquid system	E8.6.1.1 Equalization EVC
			Choose if system has return flow of liquid from section valve EVC type
			E8.6.1.2 No equalization EFC
			Choose if system has no return flow of liquid from section valve EFC type
			E8.6.1.3 PrimeFlow
			PrimeFlow is the circulation system
		E8.6.2 Dual Line	E8.6.2.1 Dual Line system type
			2 sets of boom tubes and valves.
			Only EVC
			E8.6.2.2 Sensor type line change
			Pressure or speed based sensor
			E8.6.2.3 System lag
			Time lag to prevent osc. between the 2spray lines
			E8.6.2.4 Line overlap
			Time the spraying overlaps so the liquid system stabilizes
		E8.6.3 Boom fold hydr.	E8.6.3.1 Force m. HPZ, HAZ
			E8.6.3.2 Force m. FTZ
			E8.6.3.3 Delta m. LPZ
			E8.6.3.4 Eagle m. SPC
			E8.6.3.5 Alpha GVA
			E8.6.3.6 TWIN Force 32-36m
		E8.6.4 PrimeFlow setup	E8.6.4.1 Test Nozzle positions
			Each nozzle is closed for 2 sec.
			Check that sequence does not jump
			E8.6.4.2 Assign nozzle position to SMCU
			Assign nozzle position after replacement.
			Confirm nozzle position after master reset.
			E8.6.4.3 Reset nozzle position in SMCU
			Reset all connected SMCU's to prepare for assignment of new nozzle type
			E8.6.4.4 Force to 2 motor SMCU
			For service a 3 motor SMCU can be forced to be a 2 motor drive
			E8.6.4.5 Reserved
			E8.6.4.6 Change Nozzle order
			Key in SMCU number for change of nozzle order at brackets

E8 Settings	E8.6 Sprayer type Liquid, boom	E8.6.5 AutoWash and AutoFill setup	E8.6.5.1 Select AutoWash and Fill options	E8.6.5.1.1 None
				Nothing installed
				E8.6.5.1.2 AutoWash installed
				Select if AutoWash installed
				E8.6.5.1.3 AutoWash/Fill inst.
				Select if AutoWash/Fill installed
				E8.6.5.1.4 AutoFill installed
				Select if AutoFill installed
			E8.6.5.2 Pump setup	E8.6.5.2.1 NCM 3200/4400
				AutoWash is automatic SuctionValve standard direction
				E8.6.5.2.2 NCM6600 single pump
				AutoWash is automatic SuctionValve rotated 180grd
				E8.6.5.2.3 NCM6600 double pump
				AutoWash prompts for start and stop on tractor hydraulic lever
				E8.6.5.2.4 NCM9000 double pump
				AutoWash prompts for start stop on tractor hydraulic lever
				E8.6.5.2.5 Hardi Alpha 2500 3000
				SuctionValve and PressureValve is turned 90 degrees
				E8.6.5.2.5 Hardi Alpha 3500 4100
				SuctionValve and PressureValve is turned 90 degrees
			E8.6.5.3 AutoAgitation setup	E8.6.5.3.1 Tank level for full to half
				Key in tank level% for shift from full tank to half tank
				E8.6.5.3.2 Tank level half to empty
				Key in tank level% for shift from half tank to almost empty tank
				E8.6.5.3.3 Powerful agitn full tank
				Adapt to risk of sedimentation but no risk of foaming
				E8.6.5.3.4 Powerful agitn half tank
				Adapt to small risk of sedimentation, some risk of foaming
				E8.6.5.3.5 Soft agitation full tank
				Some agitation needed, no risk of foaming
				E8.6.5.3.6 Soft agitation half tank
				Adapt to risk of foaming. Ensure a little agitation
			E8.6.5.4 AutoWash print report	
			Prints timestamps and water amounts transferred in each step. Select print report from 1 to 8.	
			E8.6.5.5 Register for AutoWash	
			Key in register no. If 0, wash is added to actual spraying register.	

E9 TWIN Actuator	E9.1 Fan speed Air angle	E9.1.1 Fan speed setup	E9.1.1.1 Fan speed forward
			Select forward for trailed sprayers
			E9.1.1.2 Fan speed reverse
			Select reverse for ALPHA sprayers
		E9.1.2 Air angle setup	E9.1.2.1 Air angle forward
			Select forward for trailed sprayers
			E9.1.2.2 Air angle revers
			Select reverse for ALPHA sprayers
		E9.1.3 Select TWIN actuator Type	E9.1.3.1 TWIN actuator Linak
			Select TWIN actuator type Linak
			E9.1.3.2 TWIN actuator new
			Not available

CAN-BUS

General info/description

Each computer (Terminal, Grip etc.) unit has a red LED, which indicates condition and status of this computer. When all is ok the LED is constantly on.

Sensors involved

Constants involved

Pinning/plugs/colors/codes

Mounting of CAN-BUS cables

CAN cables for the Jobcom are mounted on CAN On/Off, CAN Hi, and CAN Lo at the bottom left side in the JobCom PCB

Signal / cables:
Yellow   to CAN Hi
Green   to CAN Lo
Blue   to On / Off
SGND   is not used

When a key is pressed, the LED confirms by turning off for 0.2 sec.

LED

| on | on | on |

off due to key press   off due to key press

seconds   0,2   Period between 2 key press

The blink code consists of a sequence of blinks. A blink is a 0.3 second "on" of the LED. The blinks in a blink code are separated by a 0.3 second "off" of the LED.
Complete blink codes are separated by a 2 second "off" of the LED.

Only 1 fault is shown at a time. Fault codes are shown in order of priority.

Diagram below shows a 3 blink code

LED   on   pause   on   on   on   pause   on   on   on   pause   on   on   on   pause

off   off off   off   off off   off   off off   off

seconds   2   0,3 0,3

HARDI INTERNATIONAL A/S

Fault finding options/results

E = Error
P = When programming

Name	LED code	Explanation	
Power off CPU crashed	LED off	CPU crashed when LED was turned off	E
CPU crashed	LED on	CPU crashed (when LED was turned on), loosing control over LED No LED reaction on key press	E
CPU is ok No key is pressed	LED on	Connection to CAN is ok	E
Key is pressed	LED on, except off for 0.2 sec	Confirm that key press is read by CPU	E
CAN bus short circuit	1 blink code	Short circuits of cables: CANH or CANL connected to ground, 5Volt or 12Volt Detected by CAN transceiver Blink code is sent continuously	E
CAN bus open circuit	2 blink code	CAN controller Busoff error. Mostly due to no other computer on CANbus Blink code is sent continuously	E
JobCom not connected	3 blink code	No contact to JobCom. Receives no alive telegrams from JobCom Blink code is sent continuously. This code is disabled for JobCom	E
Data missing	4 blink code	Data (expected/subscribed) from other computer is not received. Other computer is Busoff or disconnected. Blink code is sent once. This code is disabled for SetBox, Grip, FluidBox	E
Ready for SW upload	5 blink code	Ready for software upload. Activated by Pin 17 BootLoadEnable Blink code is sent continuously	P
Terminal not connected	6 blink code	No contact to terminal. Receives no alive telegrams from terminal Blink code is sent continuously. This code is disabled for terminal	E
Received data is invalid	7 blink code	Computer software versions are incompatible, data sent from other computer cannot be used by this computer. Blink code is sent once per invalid data. This code is disabled for SetBox, Grip, FluidBox	E
SW upload successful	8 blink code	SW upload successful. Blink code is sent continuously	P
Watchdog reset	9 blink code	Watchdog reset. Note the watchdog is the CPU monitoring that all tasks are run. The watchdog does not detect when the CPU crashes. Blink code is sent once	E
Cannot logon	10 blink code	Cannot logon. CANbus address claimed by other computer Blink code is sent continuously	P
Loading software	Fast blinking 10Hz	Loading software. Blink code is sent continuously	P

LED on Jobcom

JobCom for LED	New HC6500 Green D27	New HC6500 Red D28
While starting	Version no, integer part	Version no, fractional part
While operating	0.5Hz	As for terminal
Ready for SW upload	Off	5 blink code
Loading software	Off	Fast (10Hz)
SW upload successful	Off	8 blink code

Measurements

The Blue CAN On/Off turns the units on when it is high (>2.0V) and off when it is low (<1.0V)

Software and Communication

The software in the HC6500 and Jobcom can be upgraded. Examples for this are improvements for better performance and bug fixes.

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

HC6500 Upgrade:
An update of the HC6500 will erase the settings saved in the HC6500 Controller, e.g. display and port settings.

JobCom Upgrade:
If the software of the JobCom is 1.15 and the new upgrade software is higher than 1.30, the settings in the JobCom will remain in the memory of the JobCom.

If the JobCom software is lower that 1.15 all settings are erased and all parameters have to be setup again manually.
After an update of the JobCom it needs up to 60 sec. to reset itself. The reset is performed after the first power up of the JobCom. It is not possible to see on the JobCom when it is resetting or when it is finished.

If the HC6500 is powered up in normal mode it will show alarm 110, "Warning JobCom resetting" when the JobCom is resetting, when it is finished alarm 111, "Alarm Switch HC6500 OFF & ON" will appear.

NOTE: Do not power up the HC6500 in Extended menu first time after a software update, the alarm will not appear in extended menu and all setting done when the JobCom is resetting will be erased during the reset.

Use following codes to reset the system:

Code	Function
89898	Store a backup of the current configuration
88888	Recall backup of configuration stored with 89898
12345	Resetting all parameters except register 0 and the backup configuration stored with code 89898
74650	Resetting all parameters to defaults

It is recommend strictly to follow these update sequences when updating the JobCom and HC6500:

A: Keep everything as is:
1. Update the JobCom.
2. Update the HC6500 Controller.
3. Setup the HC6500.
4. Test all functions of the HC6500, JobCom and sprayer.
5. Store the configuration in the JobCom. Enter code 89898.

B: Keep current setup and register 0, reset user registers and alarm log files:
1. Update the JobCom.
2. Update the HC6500 Controller.
3. Setup the HC6500.
4. Store the configuration in the JobCom. Enter code 89898.
5. Reset register and alarm log files. Enter code 12345.
6. Recall the configuration in the JobCom. Enter code 88888.
7. Test all functions of the HC6500, JobCom and sprayer.

C: Programming a new HC6500 and a new JobCom:
1. Update the JobCom.
2. Update the HC6500 Controller.
3. Setup the HC6500 and JobCom.
4. Store the configuration in the JobCom. Enter code 89898.
5. Reset register and alarm log files. Enter code 12345.
6. Recall the configuration in the JobCom. Enter code 88888.
7. Test all functions of the HC6500, JobCom and sprayer.

Read the chapters "JobCom software upgrade" and "HC6500 software upgrade" for a detail description of how to perform the updates.

Software program for the controller

The software sent in a mail as Zip file.

The Zip file must be unpacked and put into a folder.

The top file (HardiExeUploadWinvxxx.exe) is the upgrade program.
The two other files (xxx.bin) are the software for the controller and the Jobcom.
This example show HC5500 software file "HardiV316.bin" with software version is 3.16.
The Jobcom reads "HardiJCV1.11.bin" with software version 1.11.

Note: *It is very important that these three files are in the same folder at all time otherwise will the upgrade program not work.*
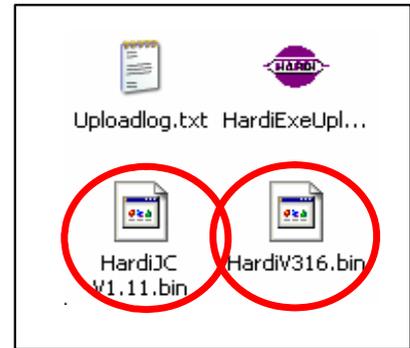
When the program is activated, a dialogue box will appear on the PC.
In the dialogue box, the software version for both the controller and the Jobcom can be seen before the software is uploaded.

How to use the Hardi upgrade program is described in section "Software upload HC6500" and "Software upload Jobcom".
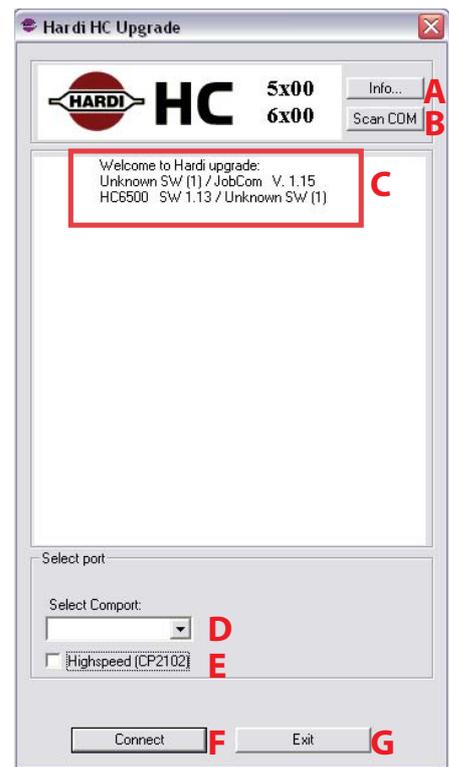
A:
Information about the current version of Hardi HC Upgrade and the software in the connected controllers.
B:
Here you do a complete serial port scan.
C:
Shows the software available in current folder on the PC:
HC5500 3.25, HC6500 1.02 and JobCom 1.26
D:
Here you select the PC comport to use.
E:
Only for production purposes.
F:
Start upgrade.
G:
Exit program.

Information from the Info button in step A:

Communication cable

The connection from the PC to the controller is made with HARDI cable P/N 72271600. The cable has a short circuit in one of the connector, normally where the label is.
For software update this means HC6500.

A: 12VDC from tractor
B: HARDI SprayBox
C: HARDI Controller
D: HARDI cable connected to COM 1 on Controller
E: Computer, cable connected to COM or USB port
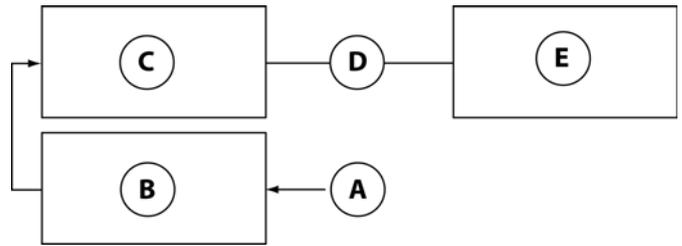
HARDI cable, P/N72271600, connections
Loop in communication cable pin 5 and 9.
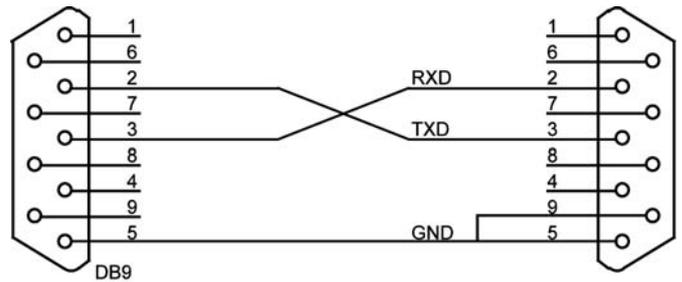
The cable is marked with "Hardware halt" at the end with the loop. The mark is on the cable or with a yellow sticker on the connector.
If the cable is turned the wrong way, the software upgrade is not possible.
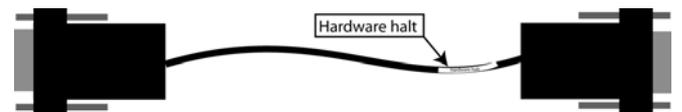
The communication cable is shown on the spare part CD, pages M302. Part number for the cable is 72271600 and can be ordered as a normal spare part.

USB to RS232 Converter

If there is no RS232 port, or problems with the Com port on the computer, use a converter from USB to RS232.
The systems requirement to use a converter is:
A computer with Windows XP or later.
USB to RS232 serial converter, Hardi P/N 26025900.
Serial NULL-modem cable, or Hardi "Communication cable" P/N 72271600.

Install the USB to RS232 serial converter using the instructions and driver, which should be included with the USB to RS232 serial converter.

NOTE:
Do not plug the USB-RS232 converter into the system before the driver is finished installing

Insert the CD-Rom with the driver in the drive.
Select "Search for the best driver in these locations" and "Search removable media floppy, CD-ROM" and select Next>
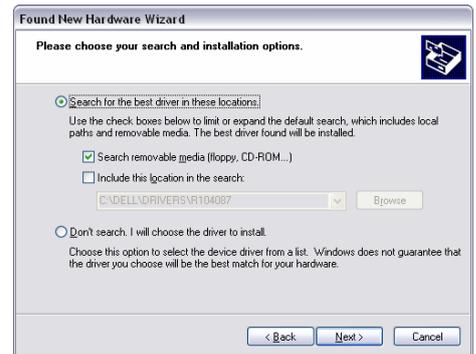
At this screen select "Next>"
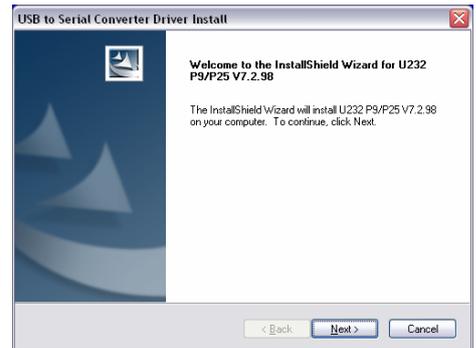
Accept the "Information" window by pushing the "Next>" button

Select restart the computer now.
Push the "Finish" button. After a restart of the computer the adaptor is ready to use.

Verify comport number.
Before you can start upgrading your Hardi controller, you need to find the number of the USB-serial Converter.
Click on the Windows "start" button and select "Control panel".

Double-click on the "System" icon.

Click on the "Hardware" tab.

Click on the "Device manager" button

Find and expand the "Ports" icon by clicking on the '+' left to the icon.
Now you will see a screen not so different from the picture above. Here you see that there are many devices using a COM number, This may varies from PC to PC.

In this case it is COM7.
But keep in mind, that this is just a guide, you need to see your self, what number your "Serial On USB Port" has been installed on.
With this number in mind you can close the Device Manager window, and continue to next step.
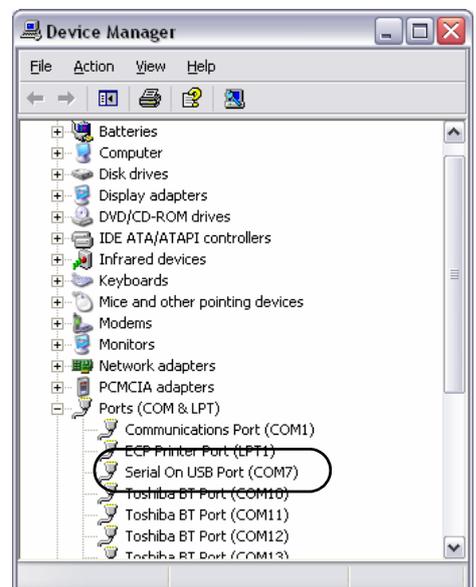
HC6500 software upgrade

Enter menu 4.8.2 to see the current software version in the controller

If the software version of the JobCom is 1.15, 1.30 or higher prior to the upgrade is it possible to save and recall the current configuration of the Job-Com after the update.
In menu E7 Enter code 89898 to save the configuration and code 88888 to recall the configuration.
The HC6500 display and port settings will not be saved.

It is always a good procedure to print or save the system configuration before a software upgrade, see chapter "Dump of data from HC6500 Controller" how to dump the configuration to the PC.

The communication cable without the "Hardware halt" is plugged into the PC.
This is done before the computer is powered up.
The communication cable with the "Hardware Halt" is plugged into the HC6500 in COM 1 (A) port.
Power ON the PC
Power ON the HC6500

The HC6500 beeps 3 times at start-up to indicate it is ready to upgrade. In addition, the red LED continues to flash 5 times and then pause. The screen will stay black during upgrade.
The controller awaits contact to the Hardi HC6500 upgrade software pro-gramme.

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

The dialogue box shows what software version will be uploaded to the HC6500 Controller.
Communication port has to be chosen.
If you use a USB-Serial converter see section "USB to RS232 Converter" how to find the Com port number.

Select "Connect".

High-speed (CP2102) can only be used with the HC6500 Controller.

4.8.2 Software versions all computer		
Terminal HC 6500	1.13	Version
JobCom HC 6100	1.15	
Grip HC 6300	0.00	
SetBox HC 6400	0.00	
FluidBox HC 6200	0.00	
Computer detail screens show details in case of faults		
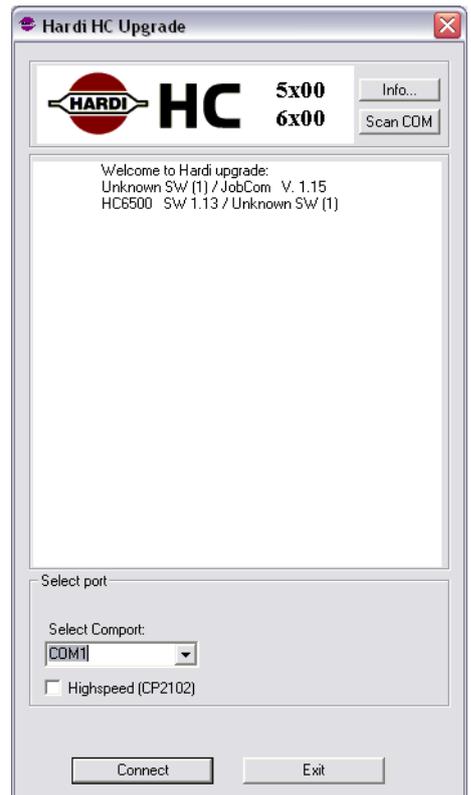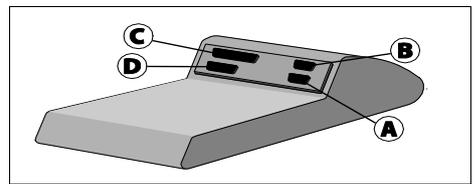
If there are problems with the connection the upgrading program will tell what kind of error there is and what can be done to solve the problem.
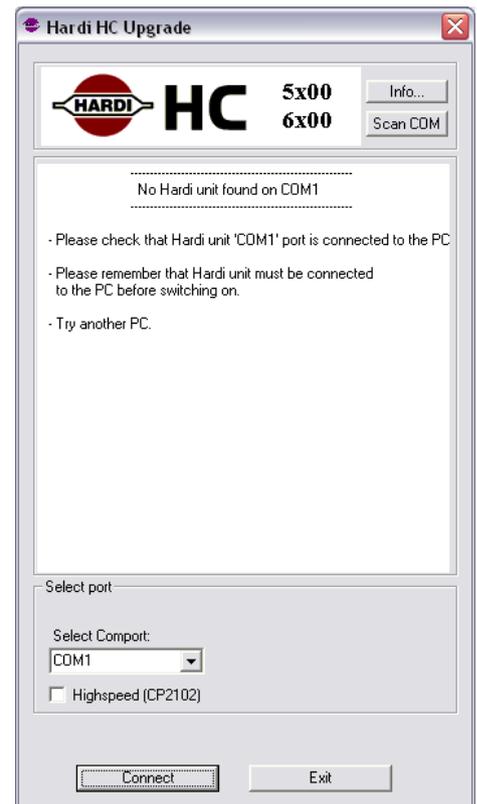
When you press "Connect" the upgrade begins, after a little while, you will be prompted with a window.
There are two versions of this window; one where you have to upload a new boot and a new application. This looks like the window to the right.
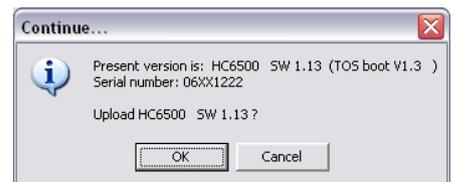
The only difference between the two versions is the "Upload new boot…" line. This is because it isn't always necessary to upload a new boot, to upload new application software.
- Click "OK" to upgrade HC6500.
- If HC6500 needs to upgrade boot software it will erase the old one, and the "Hardi HC Upgrade" will upload a new version.
- If it was necessary to upgrade the boot software (if not, skip this step), you will be prompted with the following window after the boot upload.

- Turn off and on the power on HC6500 and wait until HC6500 have beeped 3 times and the red LED continues to flash 5 times and then pause. Then click "OK" to continue upgrading HC6500.
- Afterwards "Hardi HC Upgrade" will erase the current application on HC6500 and upload the new one.

The upgrade takes about 5-10 minute.

WARNING:
Do not power down the PC during the upgrade.
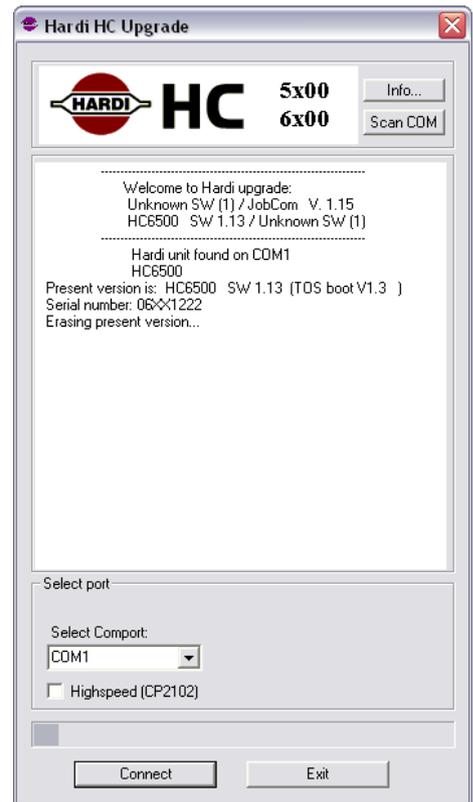
- At last "Hardi HC Upgrade" will prompt: "Upload of HC6500 SW X.XX was successful!".
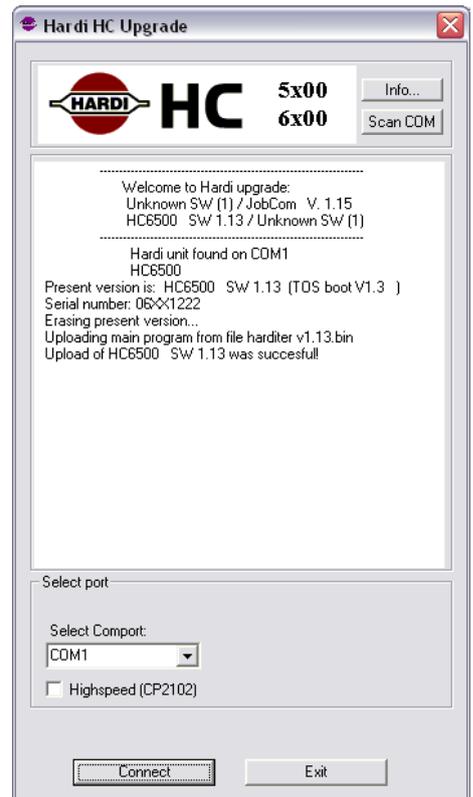
Read first page in this chapter "Software and Communication" to decide if or which reset/recall code should be used to complete the upgrade of the HC6500.

WARNING:
Code 74650 will erase all settings in the HC6500 Controller and the JobCom, also the stored backup saved with code 89898.

E7 Total register Master reset		
E7.1	Total register	
» E7.2	Factory default/Master reset	

Two PIN possibilities. One for factory default setting and the other for master

Jobcom software upgrade

Enter menu 4.8.2 to see the current software version in the JobCom.

If the software version of the JobCom is 1.15, 1.30 or higher prior to the upgrade is it possible to save and recall the current configuration of the JobCom after the upgrade.
In menu E7 enter code 89898 to save the configuration and code 88888 to recall the configuration.
The HC6500 display and port settings will not be saved.

It is always a good procedure to print or save the system configuration before a software upgrade, see chapter "Dump of data from HC6500 Controller" how to dump the configuration to the PC.

The communication cable without the "Hardware halt" is plugged into the PC.

This is done before the computer is powered up.

The communication cable with the "Hardware Halt" is plugged into the Job-Com.

The communication cable is plugged into the Jobcom before it is switched on.
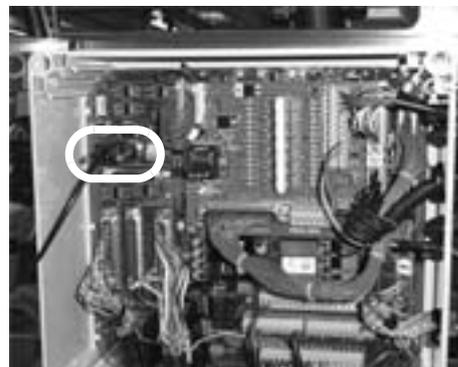
Power ON the PC

Power ON the JobCom on Spray box.

To be sure that JobCom is ready to be upgraded, ensure that the red LED flashes 5 times and then pause in a loop.
Here you notice the circle which surrounds the red LED on the JobCom.

4.8.2 Software versions all computer		
Terminal HC 6500	1.13	Version
JobCom HC 6100	1.15	
Grip HC 6300	0.00	
SetBox HC 6400	0.00	
FluidBox HC 6200	0.00	
Computer detail screens show details in case of faults		

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

The dialogue box shows what software version will be uploaded to the Job-Com.
Communication port has to be chosen.
If you use a USB-Serial converter see section "USB to RS232 Converter" how to find the Com port number.

Select "Connect".
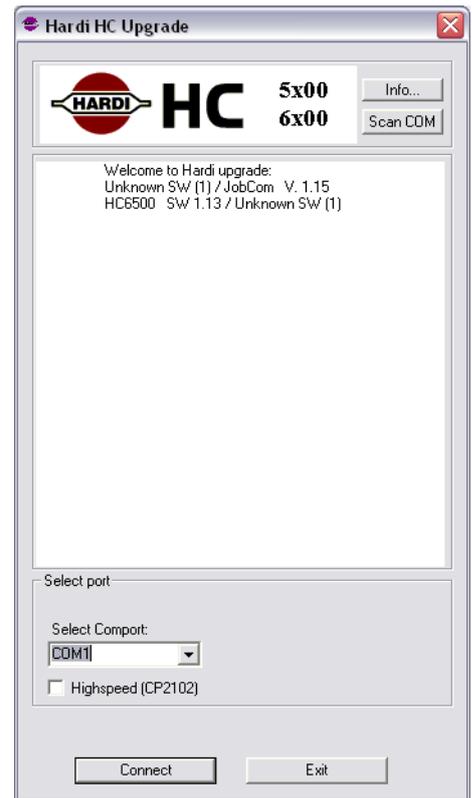
If the upgrade program does not find a connection between the Jobcom and PC, this error message will appear.

If this message appears, then see if the cable is attached correctly and there is power on the controller. If this does not help, power down the PC and the controller and start all over.
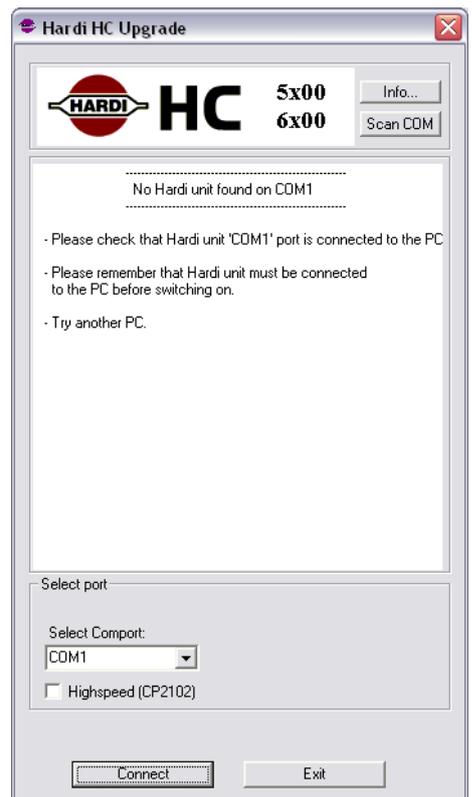
When you press "Connect" the upgrade begins, after a little while, you will be prompted with a window. There are two versions of this window, one where you have to upload a new boot and a new application. This looks like the window to the right.

The only difference between the two versions is the "Upload new boot…" line. This is because it isn't always necessary to upload a new boot, to upload new application software.
- Click "OK" to upgrade JobCom.
- If JobCom needs to upgrade boot software it will erase the old one, and the "Hardi HC Upgrade" will upload a new version.
- If it was necessary to upgrade the boot software (if not, skip this step), you will be prompted with the following window after the boot upload:

- Turn off and on the power on JobCom and wait until JobCom red LED continues to flash 5 times and then pause in a loop. Then click "OK" to continue upgrading JobCom.

- Afterwards "Hardi HC Upgrade" will erase the current application on Job-Com and upload the new one.

The bottom bar of the display dialogue box indicates the upload progress.
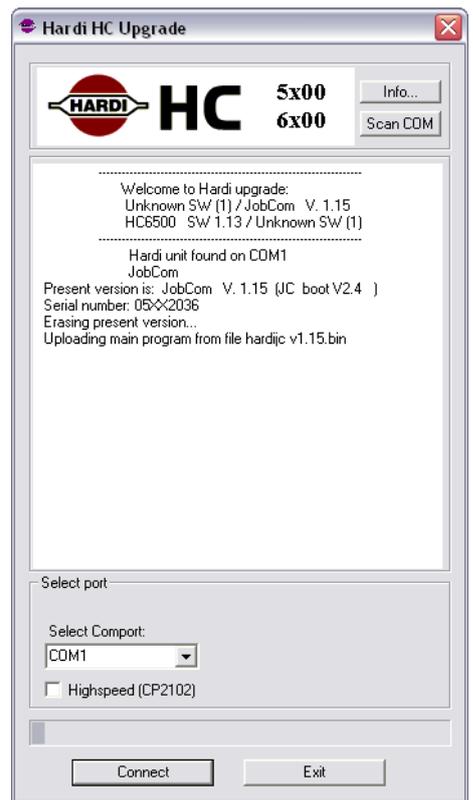
When the upload of the new software has started, diode N28 and D27 will start to flash together with the watchdog.
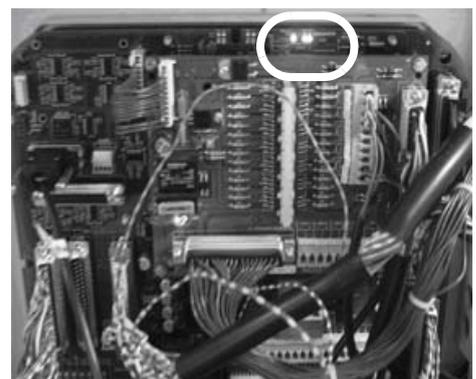
- At last "Hardi HC Upgrade" will prompt: "Upload of JobCom SW X.XX was successful!" and you are done.

If the updating was not successful, try again.
Check the power supply to sprayer and PC.
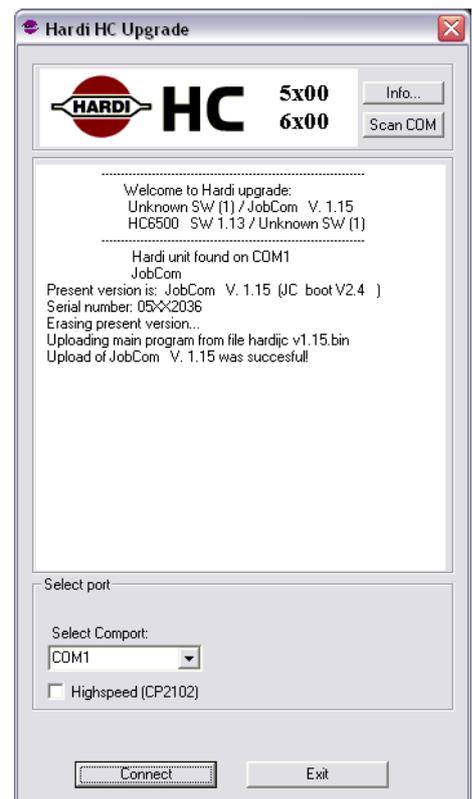
Read first page in this chapter "Software and Communication" to decide if or which reset/recall code should be used to complete the upgrade of the JobCom.

WARNING:
Code 74650 will erase all settings in the HC6500 Controller and the JobCom, also the stored backup saved with code 89898.

E7 Total register Master reset		
	E7.1	Total register
»	E7.2	Factory default/Master reset
Two PIN possibilities. One for factory default setting and the other for master		

Software error codes

Controller error codes

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:

3	H8 Flash could not be erased
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

Hardi HC Upgrade software error messages:

Message	Possible Error	Solution
Please select a Comport	Didn't select a Comport	See section "Software program for the controller"
No Hardi Unit found on ComX (Xbeing the selected comport number).	A: Didn't select correct comport, which is connected to Hardi Unit. B: No power on unit. C: Comport already in use.	A: See section "Software program for the controller" B: Make sure the device power cable is correctly installed. C: Make sure that the comport selected, isn't already in use by another program, in that case, close the other program.
Upload of main program failed, error code (20)	Forgot to turn off the HC6500/JobCom after boot Upload	HC6500: See section "HC6500 software upgrade". JobCom: See section "JobCom software upgrade".
Upload of main program failed, error code (2)	No software to upload found	See section "Software program for the controller".

Dump of data from HC6500 Controller

Configuration of HC6500 to dump data

Open the extended menu in the controller by doing following:

Switch OFF the Controller
Push and hold the "ESC" button on the Controller
Switch ON the Controller and release the "ESC" when the start up picture has disappeared

Select:
E.4 Data exchange COM port set up

Extended menu		
	E1	Language Sprog Sprache Langue
	E2	Unit Metric or US
	E3	Reserved
»	E4	Data exchange COM port set up
	E5	Optional sensors
	E6	Service interval
	E7	Total register Master reset
	E8	Settings
	E9	TWIN actuator setup
Setup of RS232 COM 1,2		
Equipment, baud rate, protocol		

Select:
E4.1 COM 1 setup

E4 Data exchange COM port set up		
»	E4.1	COM 1 setup
	E4.2	COM 2 setup
Setup communication for VRA/remote, printer, dump, print dump		

Select:
E4.1.1 Equipment type

E4.1 COM 1 Setup		
»	E4.1.1	Equipment type
	E4.1.2	Baud rate
	E4.1.3	Protocol select
Choices are VRA/remote, printer, dump, Print dump		

Select:
E4.1.1.3 Print & Dump

Push "ESC" to return to previous menu

E4.1.1 Equipment type		
	E4.1.1.1	Printer
	E4.1.1.2	Dump
o »	E4.1.1.3	Printer & Dump
	E4.1.1.4	VRA / remote
Select if you want to print to a 12 volt printer and data dump from the same COM		

Select:
E4.1.2 Baud rate

E4.1 COM 1 Setup		
	E4.1.1	Equipment type
»	E4.1.2	Baud rate
	E4.1.3	Protocol select

Choices are VRA/remote, printer, dump,
Print dump

Select:
E4.1.2.1 9600 baud

E4.1.2 Baud rate			
o	»	E4.1.2.1	9600 baud
		E4.1.2.2	4800 baud
		E4.1.2.3	2400 baud
		E4.1.2.4	1200 baud

Fastest Baud rate

Leave the extended menu by switching off the controller

Dump data from HC6500

Switch on the controller and open the normal menu by pushing the Menu button

Select:
5 Logbook

Main menu		
	1	Daily settings
	2	Setup
	3	Calibration
	4	Toolbox
»	5	Logbook

Data records of registers or
configuration for print or dump

Select:
5.1 Print

5 Logbook		
»	5.1	print
	5.2	Data dump

Register and configuration can be
printed to the 12 volt printer

Select one of following options:
5.1.1 Print single register
5.1.2 Print all registers
5.1.3 Print configuration
5.1.4 Print PrimeFlow status

Push the Enter button to select which type of dump is desired. The data can be read in Hyper terminal

5 Logbook		
»	5.1	print
	5.2	Data dump

Register and configuration can be
printed to the 12 volt printer

Select:
5.2 Data dump

5 Logbook		
	5.1	print
»	5.2	Data dump
Register and configuration can be dumped to a PC via e.g. Hyper Terminal		

Select one of following options:
5.2.1 Data dump of raw data
5.2.2 Hyper terminal service report

Push the Enter button to select which type of dump is desired. The data can be read in Hyper terminal

5.2 Data dump		
»	5.2.1	Data dump of raw data
	5.2.2	Hyper terminal service report
Transmit data from all 99 registers in comma-separated file for Excel		

Configuration of HyperTerminal

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

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

Configuration of the HyperTerminal:
Baud rate9600
Data bit 8
ParityNone
Stop bit1
Flow controlHardware
EmulationANSI

The HyperTerminal is normally installed in the "Start" menu in Windows:
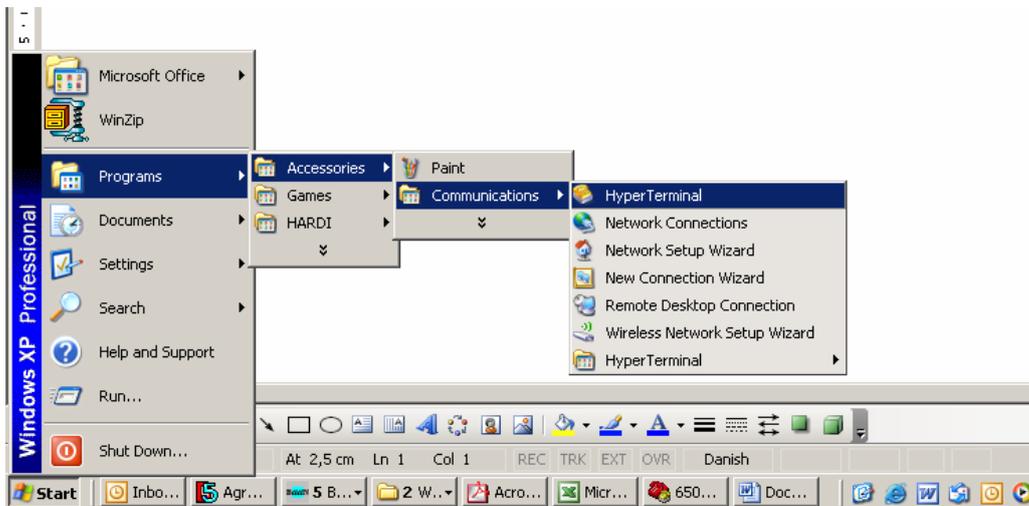
Open HyperTerminal and enter a name

Select COM1 or another available COM port on the PC

Add the port setting data and select "Apply" and "OK".
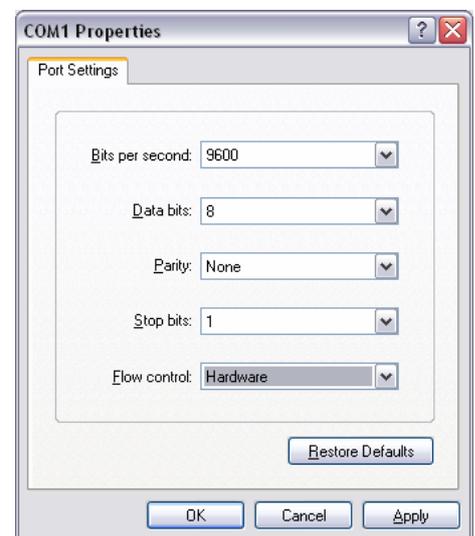
To set up the Emulation in HyperTerminal select in the File menu:

Properties and then Settings

If the data should be saved in a file the "Capture Text" need to be activated

When the "Capture Text" is activated select a place to save the file

When the controller is finished to transmit data select "Stop" or "Pause" in the menu

If the terminal is open with wrong settings do following:

The terminal can be connected or disconnected. It is not possible to change settings in the Connection and Port settings if the terminal is connected.
Push the "phone" button to connect/disconnect.
To change settings, push the "Properties" button in the menu.

Handling data from HyperTerminal

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

Open the data file in Excel
Open Excel and select "Open" file.
Select "Files of type *.txt.".

Select the file to open, e.g. Test.TXT.

Select OK in this warning window.

Select "Delimited" as data type in the next window.

Mark "Other:" with an "|" (press AltGr+|).

Select "Finish"

And Excel will open the file:
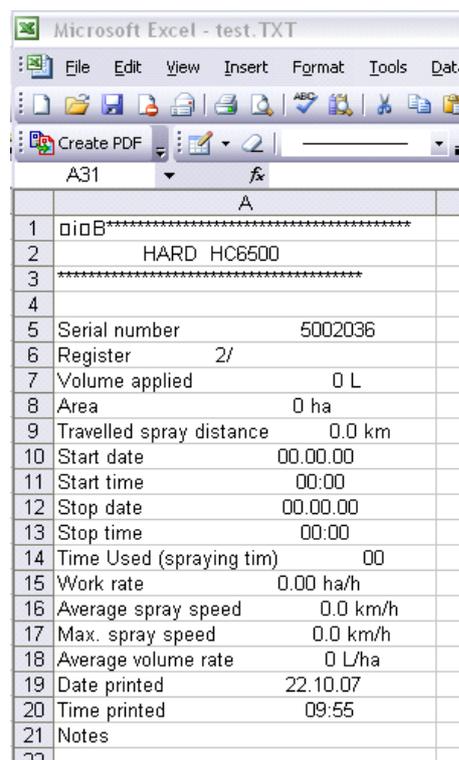
SafeTrack

General info/description

SafeTrack can be set to a minimum radius which activates "soft stops" at the hydraulic cylinders. This is to ensure smooth operation of the machine when reaching the hydraulic cylinder end stop.

Sensors involved

Angle sensor at drawbar 70 Deg. Connected to JobCom
Angle sensor rear under machine 120 Deg. Fitted at junction box under machine
Boom fold sensor at boom swivelConnected to hydraulic harness
Lock sensor under machineConnected at junction box under machine
Speed sensorConnected to section valve PCB

Constants involved

Speed
Track With
Chassis size
Drawbar length
Tractor drawbar length
Calibration of proportional hydraulics
Minimum radius
Safety Factor
Maximum speed

Pinning/plugs/colors/codes:

	Pot. meter	Sensor	AMP pin	PCB	
Blue	Signal	Signal	3	-	
Black	GND	GND	1	Signal	
Brown	+12V	+12V	2	+	
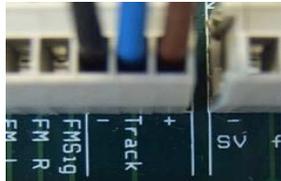
Fault finding options/results

Check power supply and hydraulic supply; follow instructions in Operators Instruction Book.

Measurements

In menu 4.7 sensor readouts can be seen.
Be careful as all automatic functions are disabled.
Do not try to operate before checking that the boom is clear from the transport brackets and the SafeTrack lock under the machine is open.
When machine are straight the potentiometers must show 2.5 Volt
Inductive sensors show 0.8 V or 5.0 V

LookAhead

General info/description

LookAhead is a system which ensures the pressure regulation motor to be in the correct position even though the nozzles are not spraying. If the flow is under the minimum limit for the flow meter it changes to pressure based regulation if a pressure transducer is fitted.

PTO revolutions must be constant when using LookAhead. Calibration must be done at the same R.P.M. as when spraying.

To indicate the system is active, pressure regulation winds down and up during start up. System is disabled when boom is folded.

Sensors involved

Speed sensor
Flow sensor
Pressure regulation position sensor
Boom unfold sensor
Pressure transducer if fitted

Constants involved

SpeedPWM (Ext menu)
FlowReg. constant (Ext menu)
Boom sections/width

Check flow meter calibration

Diameter 13mm ca. 120 PPUOne outside groove
Diameter 20mm ca. 60 PPUNo groove
Diameter 36mm ca. 17 PPUTwo outside grooves

Pinning/plugs/colors/codes
Pressure regulation valve

Function	Positions		Color
SGND	-	J2	Black
SIG	Reg fb	J2	Blue
+12V sensor	+	J2	Brown
+12V power	Reg +	J3	Brown
GND	Reg -	J3	Blue

Fault finding options/results

Measurements

Pressure regulation valve
Peak load Max 0.6 amp.
Normal load Max 0.4 amp
Signal is Hz.

Pressure based regulation

General info/description

To improve non equal pressure systems such as EFC, PrimeFlow, EVC with closed equal pressure ports, is it as an option possible to equip the system to switch from flow to pressure based regulation. The system switch automatically when the flow drops below the minimum flow rate selected in the controller.

The drop of flow can be due to how many sections are selected for the boom and how many nozzles there are in each section. If there are few or only one nozzle in the last section of the boom and the sprayer is spraying in a angle and only the last section is open there is almost no flow in the liquid system and it will close down.
It will be the same if the sprayer is fitted with a large flow house, then the flow meter will measure almost no flow with small boom sections or nozzles with low output (L/min).
With the sensor installed the liquid system will switch to pressure based regulation instead.

To switch from flow to pressure based regulation a pressure sensor needs to be installed. The sensor is mounted in the liquid system on the boom and connected to the PCB in the distribution valve junction box on the rear of the sprayer.

For mounting and setup of the sensor pleas read the "Sensor" chapter in this book, page 74.

Boot sequence

When the pressure sensor is active will the HC6500 prompt for a nozzle choice. The last used nozzle is designated by the ‰ symbol at the line of the nozzle description in the display.

If the nozzle and application rate used at last spray job is going to be re-used, then press ~ and the work screen will appear.

If not; select another nozzle and press # and the minimum pressure screen will appear.

1.6 LookAhead nozzle select		
o »	1.6.06	Blue ISO 03
	1.6.07	Red ISO 04
	1.6.08	Brown ISO 05
	1.6.09	Grey ISO 06
	1.6.10	White ISO 08
	1.6.11	Light blue ISO 10
	1.6.12	Light green ISO 15
	1.6.13	Custom 1
	1.6.14	Custom 2
Select nozzle for ISO 03		
for 1,2 l/min. at 3 bar		

Minimum pressure

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.
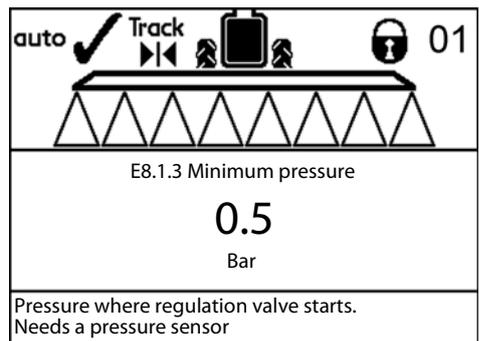
E8.1.3 Minimum pressure

0.5

Bar

Pressure where regulation valve starts.
Needs a pressure sensor

AutoFill

General info/description

When AutoFill is started the agitation will automatically go to no agitation.
If the "0 agitation" key is pressed for 2 sec, the AutoAgitation will be disabled.
AutoAgitation then has to be setup in menu 2.2.6
If rinse tank is not completely full, the system will show "Rinse tank not full" when filling is completed.

Sensors involved

Potentiometer inside motor housing of suction valve
Main tank full sensor
Tank content sensor (Tank Gauge)
Rinse tank full sensor
Agitation position sensor

Constants involved

Tank gauge calibration

Pinning/plugs/colors/codes

Electrical filling valve:

Function	Positions		Color
SGND	-	J1	Black
SIG	Fill. val. fb	J1	Blue
+12V sensor	+	J1	Brown
+12V power	Filler +	J3	Brown
GND	Filler -	J3	Blue

Tank gauge sensor:

Function	Positions		Color
SGND	-	J1	Black
SIG (Hz)	Tank gauge	J1	Blue
+12V sensor	+	J1	Brown

Cable is connection to potentiometer:
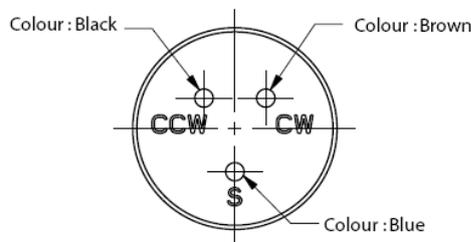
Fault finding options/results

Electrical filling valve
When 12 Volt is applied to the brown wire and ground to the blue wire, the valve will turn clockwise when looking through the threaded connecting opposite the motor housing

Measurements

Menu 4.5.4.5 motor suction valve
Open to suction smart valve at 0.5 V
Closed 1.8 V
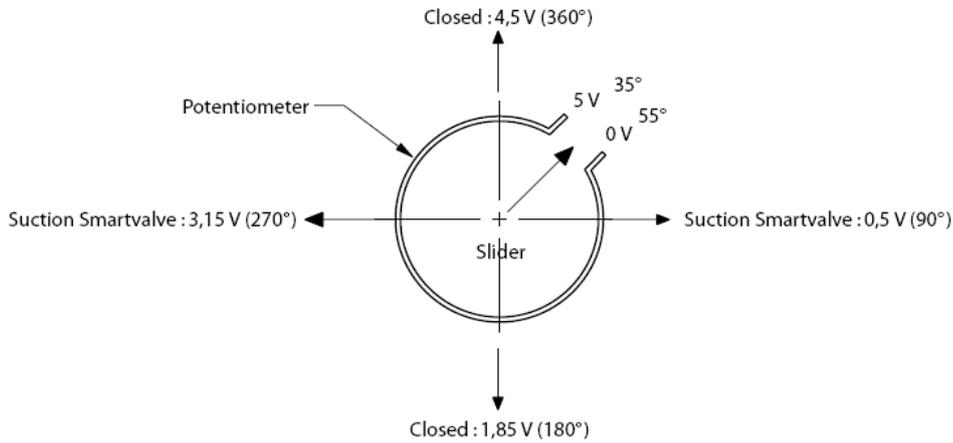
Tank full sensors Main & Rinse tank

The tank full sensors in the tanks read:
"0L" ohm for open
1.0ohm for closed
Connection at J1 to Jobcom ver. 2.1
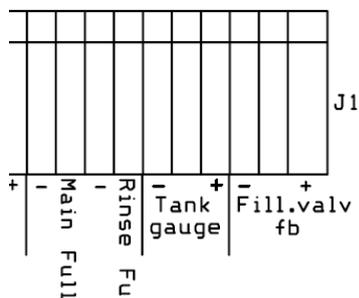
Headland Assist

General info/description

A potentiometer on PARALIFT measures boom height. A potentiometer on pendulum will measure slant angle. The system will lift the boom when turning at headland and can be set to mirror slant angle at the same time.

At startup or when folding, the system enters manual mode (state 1, ON or OFF). The system remains in this state until the nozzles are opened. When the nozzles are opened, it enters state 2. From this state the user can either enter AUTO ON (state 3) or MANUAL OFF (state 1). If the pendulum is locked, an alarm is displayed when spraying is commenced.

If the boom is operated manually while HeadlandAssist is in the process of moving it, the system immediately jumps to MANUAL mode.

Sensors involved

Potentiometer on PARALIFT120 Deg. connected to hydraulic harness
Potentiometer on Pendulum30 Deg. connected to JobCom J2
Speed sensor

Constants involved

Delay from tractor (reference point) to boom on sprayer
Height to raise boom when turning
Speed constant

Pinning/plugs/colors/codes

FunctionPositionsColor
SGND-J2Black
SIGheightJ2Blue
+12V sensor+J2Brown

Fault finding options/results

Check that boom reacts correctly to control box buttons (manual), up/down and slant right/left.

Measurements

Check menu 4.5.4.4
Turn slant potentiometer to the sprayers' right side, reading is 3.6 to 4V.
Turn height potentiometer to the up, reading is 3.6 to 4V.
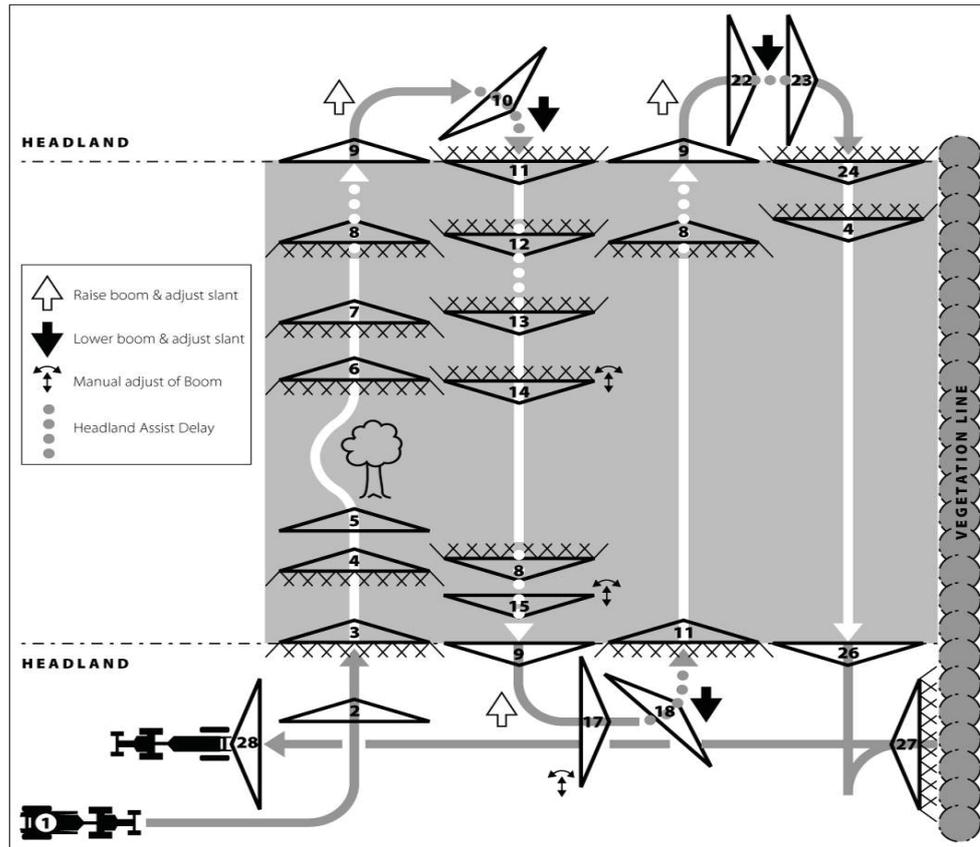
	State	State icon	Nozzle icon
1	When folded it is assumed that the sprayer has just arrived in the field and therefore has not or has just been powered up (booted).		
2	After unfolding the boom no spraying height has yet been recorded and AUTO mode isn't possible yet.		
3	When the nozzles are opened for the first time the system changes from MANUAL OFF to MANUAL ON. The boom height is already or is now in the process of being adjusted by the operator.		
4	Now AUTO at the HeadlandAssist icon can be pressed. Manual control of the boom is still possible at this point.		
5	In the event of an obstacle – known or suddenly appearing – the set delay can be overridden by a long press on the OFF button.		
6	After clearing the obstacle the boom is readjusted, the operator presses ON and starts moving. As the machine is in MANUAL the nozzles open immediately.		
7	Now AUTO is pressed and spraying continues normally.		
8	When pressing OFF HeadlandAssist is activated. The machine continues with normal pressure regulation through the predefined delay.		
9	When the HeadlandAssist delay has been trvelled, the nozzles close, the spraying height and slant angle is registered and the boom is lifted and the slant is centred as simultaneously as possible. From the moment the nozzles close, LookAhead takes over the positioning of the regulation valve.		

10	When pressing ON the lowering of the boom and the mirroring of the slant angle is initiated as simultaneously as possible. The distance driven starts counting up to the set HeadlandAssist delay. LookAhead still controls pressure regulation.		
11	When the HeadlandAssist delay is driven the nozzles are opened. Until the regulation delay has expired, LookAhead controls the regulation valve.		
12	If OFF is pressed by accident and it is detected by the operator before the HeadlandAssist delay has expired……		
13	……the operator can press ON and spraying is resumed without incident. The driven distance under the HeadlandAssist delay must be reset so the nozzles don't close to soon next time OFF is pressed.		
14	During spraying the operator can adjust boom height and slant angle. This doesn't affect the AUTO mode.		
15	After pressing OFF and before the nozzles close the operator adjusts boom height and slant angle. This doesn't affect the AUTO mode as the boom height and slant angle are not registered until at step 16 when the nozzles close.		
17	During turning in the headland the operator adjusts boom height and slant angle. This doesn't affect the AUTO mode. Likewise the operator can stop the sprayer to take a break without interfering with the AUTO mode.		
18	When pressing ON the boom is moved to the last registered spraying height. The slant angle of the boom in step 16 is used to calculate the new slant angle regardless of the corrections made in step 17.		
22	If ON is pressed unintentionally, the boom will begin moving to the last registered spraying height and mirror the last registered slant angle immediately.		
23	Before the expiry of the HeadlandAssist delay OFF is pressed which causes the system to stop the boom immediately and return to MANUAL mode with the nozzles closed. An audible and visual alarm is given to the operator.		
24	The nozzles are opened by pressing ON. As the system is in MANUAL mode, the nozzles open immediately. LookAhead controls the regulation valve until the expiry of the regulation delay. After pressing ON the operator can switch to AUTO mode.		
26.	At the end of the last tramline the sprayer is stopped which causes the system to enter MANUAL mode. OFF is pressed and the nozzles close immediately. The operator manoeuvres the sprayer to the end of the headland in order to spray this last part of the field.		
27.	The operator lowers the boom manually, presses ON and commences forward driving.		
28.	When the operator stops at the far end of the headland no warning is given as the system was in MANUAL mode.		

STATE #	STATE 1 to 4 when spraying				
STATE #	1	2	3	3b	4
ICONS DISPLAYED	man △	man ▲	auto ▲	▲	▲
ACTION TAKEN	HeadlandAssist MANUEL NOZZLES OFF	HeadlandAssist MANUEL NOZZLES ON	HeadlandAssist AUTO NOZZLES ON	FINISH BOOM MOVEMENT AUTO ON	WAIT DELAY
NO INPUT	No action.	No action.	No action.	Open nozzles. Finish boom movement. Goto state #3.	When delay is expired, read spraying height and slant angle. Close nozzles. Goto state #5.
PRESS ON/OFF	Goto state #2.	Goto State #1.	Goto state #4.	Stop boom movement. Goto state #4.	Reset delay. Goto state #3.
PRESS AUTO	ILLEGAL! No action.	Goto state #3.	Goto state #2.	Goto state #2.	Goto state #2.
MANUEL CONTROL OF LIFT OR SLANT	Move boom accordingly.	Move boom accordingly.	Move boom accordingly.	WARNING! Move boom accordingly. Goto state #2.	Move boom accordingly.
LONG PRESS ON/OFF	Goto state #2.	Goto state #1.	Goto state #1.	Stop boom movement. Goto state #1.	Goto state #1.
SLOW DOWN BELOW LIMIT	No action.	No action.	Goto state #2.	Goto state #2.	WARNING! Goto state #2.
FOLD BOOM	Move boom accordingly.	Move boom accordingly.	Move boom accordingly. Goto state #2.	WARNING! Move boom accordingly. Goto state #2.	WARNING! Move boom accordingly. Goto state #2.
OPERATE SMARTVALVES	Move valves accordingly.	Move valves accordingly.	Move valves accordingly. Goto state #2.	Move valves accordingly. Goto state #2.	Move valves accordingly. Goto state #2.
CENTER SLANT	Move boom accordingly △	Move boom accordingly △	Move boom accordingly △	WARNING! Goto state #2	Move boom accordingly △

STATE #	STATE 5 to 8 in headland				
STATE #	5	6	7	8	
ICONS DISPLAYED	▲ △	▲ △	▲ △	auto △	
ACTION TAKEN	MOVE BOOM TO TURNING HEIGHT	MOVE BOOM TO SPRAYING HEIGHT	WAIT REMAINING DELAY	AUTO OFF	
NO INPUT	When desired height is reached and slant is centered goto state #8.	If delay expires goto state #3b. When desired spraying height and slant angle is reached goto state #7.	When delay is expired open nozzles. Goto state #3.	No action.	
PRESS ON/OFF	WARNING! Goto state #1.	WARNING! Goto state #1.	WARNING! Goto state #1.	Goto state #6.	
PRESS AUTO	Stop boom movement. Goto state #1.	Stop boom movement. Goto state #1.	Goto state #1.	Goto state #1.	
MANUEL CONTROL OF LIFT OR SLANT	WARNING! Move boom accordingly. Goto state #1.	WARNING! Move boom accordingly. Goto state #1.	Move boom accordingly.	Move boom accordingly.	
LONG PRESS ON/OFF	Stop boom movement. Goto state #1.	Stop boom movement. Goto state #1.	Goto state #1.	Goto state #1.	
SLOW DOWN BELOW LIMIT	No action.	No action.	No action.	No action.	
FOLD BOOM	WARNING! Move boom accordingly. Goto state #1.	WARNING! Move boom accordingly. Goto state #1.	WARNING! Move boom accordingly. Goto state #1.	Move boom accordingly. Goto state #1.	
OPERATE SMARTVALVES	Move valves accordingly. Goto state #1.	Move valves accordingly. Goto state #1.	Move valves accordingly. Goto state #1.	Move valves accordingly. Goto state #1.	
CENTER SLANT	WARNING! Goto state #2	WARNING! Goto state #2	Move boom accordingly △	Move boom accordingly △	

AutoWash

General info/description

Wash programmes are started with the F soft keys in the right side of the display.

Manual pressure +/- can be used during wash in case pressure is too high or too low.

In case a manual function has to be done by the operator this is shown in the display. Confirm that action has been taken with the F keys.

Alarms (information level) can be neutralized by pressing enter and wash will continue.

When programme is completed this is prompted in the display.

Sensors involved

Suction smart valve potentiometer
Pressure smart valve potentiometer
Rinse tank flow meter
Rinse tank full sensor
Pressure regulation position sensor
Agitation pressure regulation position sensor
Tank content sensor (tank gauge)

Constants involved

Rinse tank flow constant

Pinning/plugs/colors/codes

Cable is connected to potentiometer as shown:
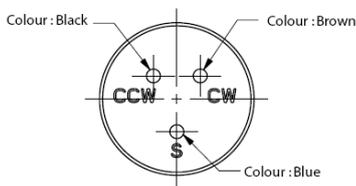
Fault finding options/results

Check rinse tank content.

Flow out of nozzles must be 30 l/min., raise pressure manually in case it is lower then this.

Measurements

The indicator and symbol on the valve has to line up when washing. If valves doesn't line up then check valve potion in menu 4.5.4.5

0 to 5 volt range of the slider corresponds to 340 degrees; note that the blind spot occupies 20 degrees. Hence 14.7 mV corresponds to 1 degree.

Minimum	Slider Voltage Nominal	Maximum	Pressure Smart Valve	AutoFill valve	Suction SmartValve NCM32-44	Suction SmartValve NCM6600
0,35	0,51	0,65	Pressure Empty	Fill open	Blind	MainTank
1,7	1,84	2	Sections	Fill closed	FastFiller	RinseTank
3	3,16	3,3	TankClean	(not used)	MainTank	Blind
4,35	4,49	4,65	Ejector	(Position not used)	RinseTank	FastFiller

Pressure smart valve.
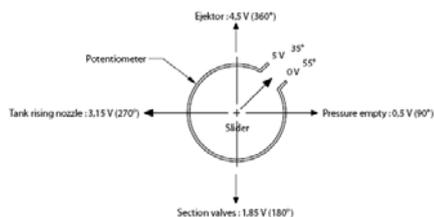
Suction smart valve.
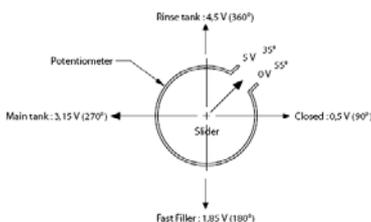
Wash program

There are 3 wash programmes
The following diagrams are showing which valves are active in the different steps in the washing programs.
When message "Start double pump" is shown, the hydraulic lever for the double pump must be activated and the "F button" done must be pressed. When prompted to stop the double pump, the oil flow is stopped by the hydraulic outlet and the "F button" are used to confirm that the action is taken.

BoomFlush

	Suction Valve	Pressure Valve	Main ON/OFF	Cyklone Filter Boost	Agitation
01					
02					
03	⬤	⬤	⬤	⬤	⬤
04	⬤	⬤	⬤	⬤	⬤
05	⬤	⬤	⬤	⬤	⬤
06	⬤	⬤	⬤	⬤	⬤
07	⬤	⬤	⬤	⬤	⬤
08	⬤	⬤	⬤	⬤	⬤
09	⬤	⬤	⬤	⬤	⬤

Multi Rinse	FastFlush		Suction Valve	Pressure Valve	Main ON/OFF	Cyklone Filter Boost	Agitation
01	01						
02	02						
03	03		🔵	🟢	⚪	⚪	⚪
04	04		🔵	🟢	⚪	⚪	⚪
05	05		🔵	🟢	⚪	⚪	⚪
06	06		🔵	🟢	⚪	⚪	⚪
07	07		🔵	🟢	⚪	⚪	⚪
08	08		🔵	🟢	⚪	⚪	⚪
09	09		🔵	🟢	⚪	⚪	⚪
10	10		🔵	🟢	⚪	⚪	⚪
11	11		**Double Pump Step**				
12	12		🔵	🟢	⚪	⚪	⚪
13	13		🔵	🟢	⚪	⚪	⚪
14	14		🔵	🟢	⚪	⚪	⚪
15	15		🔵	🟢	⚪	⚪	⚪
16 20 24 28 32 36			🔵	🟢	⚪	⚪	⚪
17 21 25 29 33 37			🔵	🟢	⚪	⚪	⚪
18 22 26 30 34 38			**Double Pump Step**				
19 23 27 31 35 39			🔵	🟢	⚪	⚪	⚪

TWIN

General info/description

The system has electrical actuators for fan speed and air/nozzle angle.
Two preset combinations of speed and position can be stored in 1 and 2.
They can be chosen on the Setbox or on the 2 buttons on the front of the Grip.
Sensors involved
TWIN fan speed sensor in blower housing
Constants involved
R/min. PPU for fan

Pinning/plugs/colors/codes

Color	Harness plug	Actuator plug	Function
White	2	1	PGND
Brown	1	2	SGND
Green	3	3	+12V
Yellow	4	4	SIG
Angle L / R and fan speed has the same color combinations of wires			
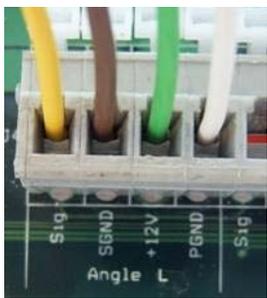
Disconnection options/results

If actuators are moving unintended, disconnect the 2 fuses placed in the middle of the JobCom PCB.
Do not unplug the actuators at the AMP plugs (on boom), as spray liquid may corrode the AMP plugs coursing internal short-circuits.

Measurements

Disconnect the yellow wire for TWIN fan speed, right or left side actuators and measure the Voltage. Must be 0 V. If not so, then this there are short-circuits in the actuators or harness.
Note! All other wires must be connected.

AutoAgitation

General info/description
The schematics show the standard setting from the factory. The curve can be moved back and forth but the syntax can not be changed.
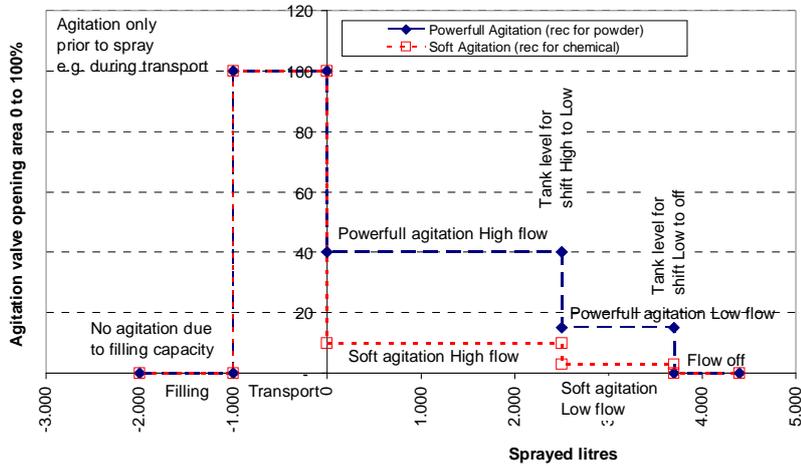
AutoAgitation will stop when FastFiller is used but start up again when AutoFill is stopped or ended.
Long key press on "0 Agitation" on FluidBox will turn off agitation completely.
If agitation is turned off, it can be started by in menu 2.2.6 AutoAgitation.

Sensors involved
Tank Gauge
Agitation pressure regulation position sensor

Constants involved
Tank gauge calibration

Pinning/plugs/colors/codes
Agitation pressure regulation valve

Function	Position	Connector	Color
SGND	-	J2	Black
SIG	Agt fb	J2	Blue
+12V sensor	+	J2	Brown
+12V power	Agt +	J3	Brown
GND	Agt -	J3	Blue

Fault finding options/results
Tank gauge must function correctly.
The procedure for testing the agitation motor is the same as the pressure regulation motor as they are identical.

Measurements
Agitation level can be selected to be shown in the display

PrimeFlow

PrimeFlow system:

Fault finding:

General description of the electronic:

1. HC6500
2. JobCom junction box
3. Cable JobCom to Junction box, P/N 26015000
4. Cable Junction to SMCU
5. Central junction box
6A. SMCU, number 1
6X. SMCU, number x from left side of boom
7. Stepper motor

Cable configuration
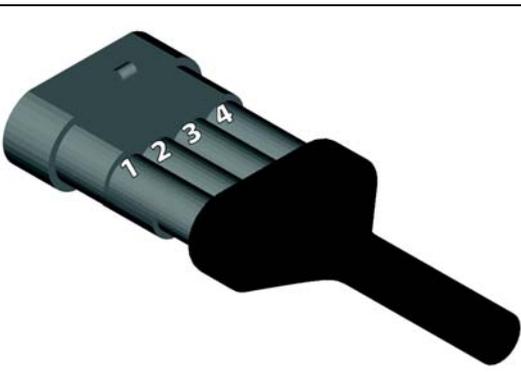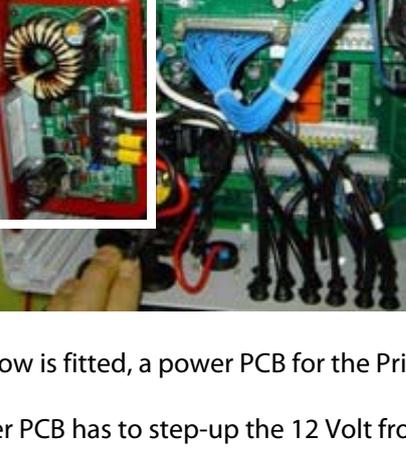
1	White	GND
2	Brown	BUS +
3	Green	+24Vcc
4	Yellow	Bus -

Jobcom

JobCom with Power PCB

Power PCB
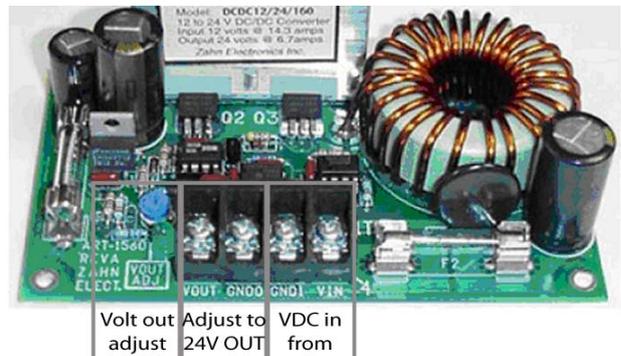
P/N 26016400

If PrimeFlow is fitted, a power PCB for the PrimeFlow mounted in the Jobcom.

The power PCB has to step-up the 12 Volt from the battery to 24 Volt so the central junction box will work optimal.

There are 2 fuses:
30AT F2 / 32V 311
10AT F1 / 32V 313 (Hardi ref. no. 26023500)

Central junction box

The central junction box PCB, P/N 26027000 is mounted on the centre part of the boom.
It is not possible to make any adjustments on this PCB.
Wires can be checked for short circuit.
If there is a short circuit on the left or right side of the boom the two fuses (10A) will be damaged.
If there is an error in the PrimeFlow system and the alarm will start it can be switch-off by flipping the switch inside the gray box.
Normal position is down. If the switch is up It will allow the farmer to continue spraying with out any alarms.
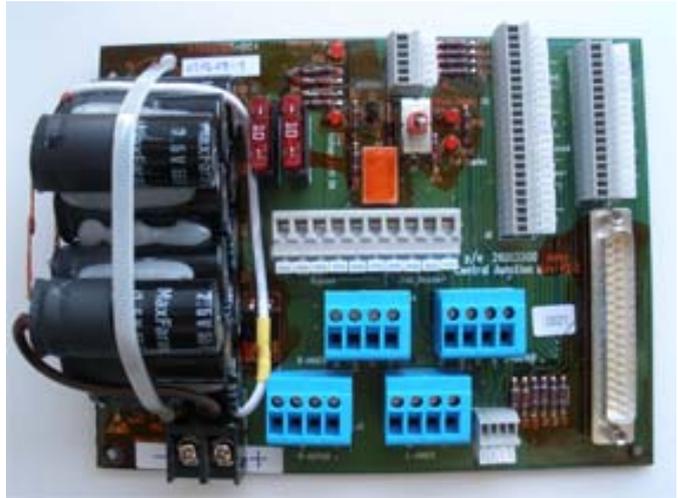
Color	Connection
Yellow	BUS -
Blue	Vcc
Brown	BUS +
White	Gnd

SMCU

The SMCU is the device that is controlling the stepper motor, each SMCU has to be programmed to a exact position on the boom and a exact order the stepper motor should turn on or off compared to each other.
When the system is setup correctly, the stepper motor -nozzle, farthest to left on the boom will open first in the "Test Nozzle positions" test in menu E8.6.4.2, then nozzle next on the right side will open.
The menu E8.6.4.2 setup PrimeFlow SMCU and nozzle numbers in each SMCU module and it makes JobCom register what SMCU and nozzle numbers is mounted on the boom.

Setup nozzle position can operate in 2 ways:
"1 beep way": Reconfirm SMCU and nozzle numbers. JobCom updates data on SMCU. No data is programmed in the SMCU.
"2 or 3 beep way": Position on boom is programmed in SMCU. JobCom updates data on SMCU.

There are two types of SMCU, one that can control 2 step motors and one that can control 3 step motors.
A 3 step motor type can be programmed to control 2 step motors, use menu E8.6.4.4 "Force to 2 motor drive" to change to 2 motor drive.

LED is light at all time: SMCU is reset to factory setting. They have no address so Jobcom can not open and close them.

LED is flashing (slow or fast): SMCU is programmed to a place on the boom.

LED is flashing slow: 1 Hz all nozzles are closed.
LED is flashing fast: 4 Hz 1 or more nozzles are open.

When programming the SMCU should the power supply only be connected from the left side of the boom.

When resetting a single SMCU should all other SMCU be disconnected from the data bus.

LED codes on SMCU
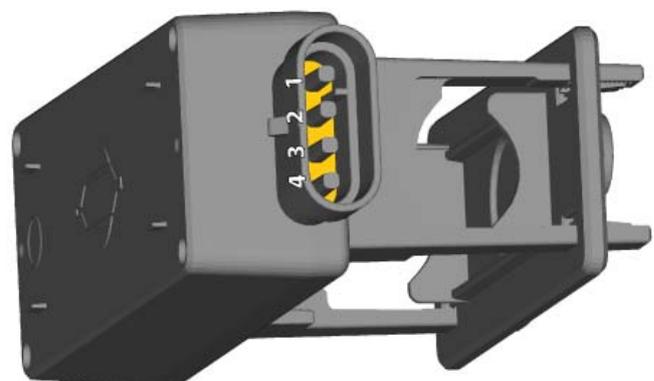
Stepper motor

8 L/min. max. With 1 bar pressure drop
0.5 sec reaction time
Grease between O-rings
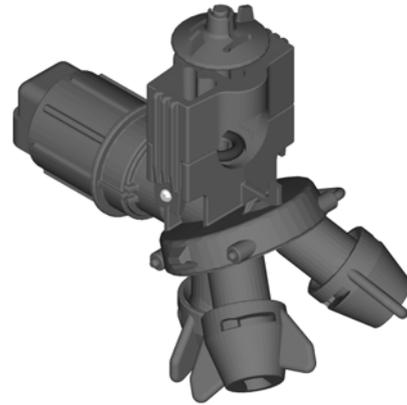
PrimeFlow basic setup

PrimeFlow is setup in menu E8.6.4.2 "Assign nozzle position to SMCU" and E8.6.4.6 "Change Nozzle order".
If a master reset made for other reason e.g. software update has been done a "Assign nozzle position" setup in menu E8.6.4.2 has to been performed.
The master reset clears the information stored i JobCom about the connected PrimeFlow SMCU's. When performing confirmation of already programmed PrimeFlow SMCU's this data is recreated in the JobCom.

Confirmation of already programmed PrimeFlow SMCU's is made with all cables mounted. The PrimeFlow SMCU's do not need to be powered up one at a time Check that all PrimeFlow SMCU's LED either blinks or is lit up constantly.	A: Left outer, connected B: Left inner, connected C: Right inner, connected D: Right outer, connected
Terminal show: Menu E8.6.4 PrimeFlow setup Choose Menu E8.6.4.2 Assign nozzle positions to SMCU	**E8.6.4 PrimeFlow setup** E8.6.4.1 Test Nozzle positions » E8.6.4.2 Assign nozzle position to SMCU E8.6.4.3 Reset nozzle position in SMCU E8.6.4.4 Force to 2 motor drive E8.6.4.5 Reserved E8.6.4.6 Change Nozzle order Assign nozzle position after replacement Confirm nozzle position after master reset
Terminal show: Menu E8.6.4.2.1 Prepare cables for assign pos Press enter to start confirmation	auto ✓ Track ▶◀ 🔒 01 E8.6.4.2.1 Prepare cables for assign pos 0 Connect SMCU having nozzle position. Disconnect reset SMCU. Then press enter

Terminal show: Menu E8.6.4.2.2 SMCU nozzle position assigned. Terminal counts up number for confirmed nozzles and gives a single beep for each PrimeFlow SMCU 52	auto ✓ Track ▶◀ E8.6.4.2.2 SMCU nozzle position assigned 6 When counter stops, check position, thenconnect
When terminal stops counting Check that number of nozzles shown on terminal equals number of nozzles on boom Press enter to finish and return **24m boom: Stop at 48** **36m boom: Stop at 72**	auto ✓ Track ▶◀ E8.6.4.2.2 SMCU nozzle position assigned 21 When counter stops, check position, thenconnect
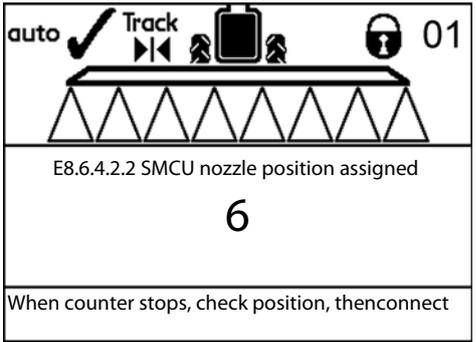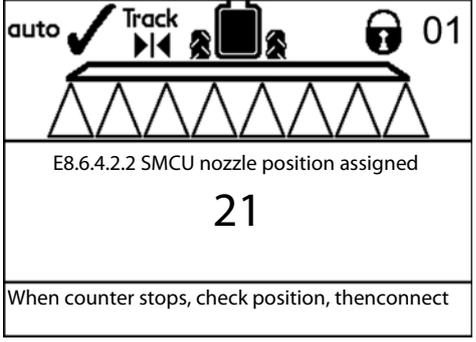
Test PrimeFlow setup

Test of complete system

Check that all sections are open. Switches on Grip points downwards.	
Start pump Start HC6500 in normal mode (not in extended menu) Press Main on off button to close sections (red frame triangles)	
Check that all SMCU LED's blink slowly 1Hz	
Press Main on off button to open sections (Green solid triangles)	
Check that all SMCU LED's blink fast 4Hz Adjust pressure to between 3 and 5 bar Close pressure regulation valve Close agitation, if flow is inadequate Check that all nozzles spray They must not be closed or drip	
Start HC6500 in normal mode (not in extended menu) Press Main on off button to close sections (red frame triangles)	
Check that all SMCU LED's blink slowly 1Hz Check that all nozzles are able to close i.e. do not spray or drip	

Nozzle positions test

Turn off HC6500 and start HC6500 in extended menu Select Menu E8 Setup Menu E8.6 Sprayer type liquid boom Menu E8.6.4 PrimeFlow setup	E8.6 Sprayer type, liquid, boom E8.6.1 Liquid system E8.6.2 Dual Line E8.6.3 Boom hydraulics type » E8.6.4 PrimeFlow setup E8.6.5 AutoWash AutoFill setup Setup and test SMCU's First select PrimeFlow in E8.6.1.3
Menu E8.6.4.1 Test Nozzle positions When pressing enter next screen appear and test starts	E8.6.4 PrimeFlow setup » E8.6.4.1 Test Nozzle positions E8.6.4.2 Assign nozzle position to SMCU E8.6.4.3 Reset nozzle position in SMCU E8.6.4.4 Force to 2 motor drive E8.6.4.5 Reserved E8.6.4.6 Change Nozzle order Each nozzle is closed for 2 sec. Check that sequence does not jump
Menu E8.6.4.1.1 Test Nozzle positions Each nozzle is closed for 2 sec. Check that sequence does not jump Note fault in help text: Each nozzle is opened for 2 sec Test sequence is started	 E8.6.4.1.1 0 Each nozzle is closed for 2 sec.
Immediately = After 0 seconds Display show 0 All nozzles are open, display show green solid triangles	
All nozzles are open	All nozzles open, all LED's blink 4Hz

After 5 seconds Display show 0 All nozzles are closed, display show red frame triangles	
All nozzles are closed	
After 8 seconds Display show 0 All nozzles are open, display show green solid triangles	
All nozzles are open	
After 11 seconds Display show 0 All nozzles are closed, display show red frame triangles	
All nozzles are closed	
One nozzle is opened at a time A: Left boom side Nozzle 1 sprays for 2 seconds Nozzle 2 sprays for 2 seconds	

Display show positive number when the nozzle just opened has a short cable being the SMCU's first nozzle Display show negative number when the nozzle just opened has a medium or long cable being the SMCU's 2nd or 3rd nozzle Negative is medium or long. Nozzle 3 spray for 2 seconds.	auto ✓ Track ▶|◀ 🔒 01 E8.6.4.1.1 3 Each nozzle is closed for 2 sec.
A: Left boom side Nozzle 3 sprays for 2 seconds Nozzle 4 sprays for 2 seconds	Ⓐ Ⓐ
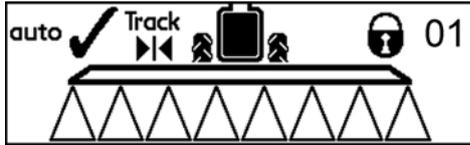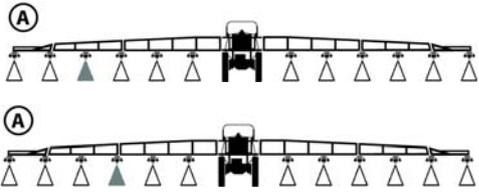
Programming a new SMCU

Before a new SMCU can be used in the PrimeFlow system it has to be programmed with a nozzle position, therefore perform following procedure when you receive a new SMCU from Hardi.

Check that the spare part SMCU is reset Connect the new PrimeFlow SMCU to any connector, ex. at the connector on the left outer boom side. Check that LED turns on and that it does not blink LED on others SMCU should blink If it blinks, it is currently has assigned a nozzle position and cannot be assigned a new position. Take an other SMCU, check that this is reset If impossible, the SMCU must be reset, see next section and be careful	①

Disconnect the connectors Right Outer boom side. Disconnect extension cable A: Left outer, connected B: Left inner, connected C: Right inner, connected D: Right outer, **dis**-connected	
Delta boom Right outer cables Disconnect cable to SMCU from cable to PrimeFlow junction box	Right Outer Disconnected Last SMCU on right boom side. LED lights
Force boom Right outer cables Disconnect cable to SMCU from cable to PrimeFlow junction box Note: Photo from front side of sprayer	Right Outer Disconnected Last SMCU on right boom side. LED lights
Clip the new spare part PrimeFlow SMCU on to the boom tube Note: Do not yet connect any of the 2 pcs. 4 pole AMP plugs for Prime-Flow bus	Existing SMCU New SMCU LED is off Existing SMCU Disconnected
Select Menu E8.6.4.2 Assign nozzle position to SMCU Assign nozzle position after replacement Confirm nozzle position after master reset "Assign nozzle position" does not require a master reset of JobCom. Master reset of JobCom requires as Assign nozzle position. (Master reset made for other reason e.g. software update) See "Confirm already programmed PrimeFlow SMCU's"	E8.6.4 PrimeFlow setup 　　E8.6.4.1　Test Nozzle positions »　E8.6.4.2　Assign nozzle position to SMCU 　　E8.6.4.3　Reset nozzle position in SMCU 　　E8.6.4.4　Force to 2 motor drive 　　E8.6.4.5　Reserved 　　E8.6.4.6　Change Nozzle order Assign nozzle position after replacement Confirm nozzle position after master reset

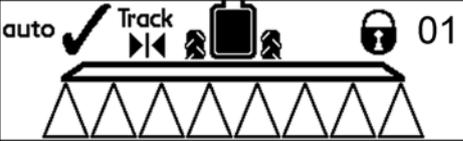|	
Menu E8.6.4.2.1 Prepare cables for assign pos Connect SMCU having nozzle position Disconnect reset SMCU. Then press enter Cabling is just connected as specified in help text. Press enter	auto ✓ Track ▶◀ 🔒 01 E8.6.4.2.1 Prepare cables for assign pos 0 Connect SMCU having nozzle position. Disconnect reset SMCU. Then press enter
After mounting the last PrimeFlow SMCU, check that the terminal display counter show the number of nozzles on the boom.	
Menu E8.6.4.2.2 SMCU nozzle position assigned When counter stops, check position, then connect next SMCU. Press enter at finish Check that display counts up until the PrimeFlow SMCU to be replaced. Check that terminal for each existing SMCU gives 1 beep, which means that existing SMCU ID is correct.	auto ✓ Track ▶◀ 🔒 01 E8.6.4.2.2 SMCU nozzle position assigned 6 When counter stops, check position, thenconnect
Picture shows cables before they are connected and before SMCU is assigned nozzle position	Existing SMCU New SMCU LED is off Existing SMCU Disconnected
When the terminal stops counting and beeping, then Connect the cable with the 4 poles AMP connector to the new PrimeFlow SMCU Check that the PrimeFlow SMCU LED blinks	Connect cable from left side to new SMCU Existing SMCU blinks New SMCU LED begin to
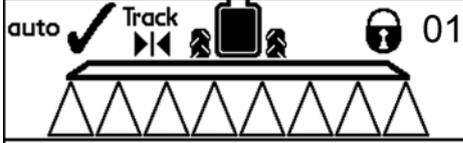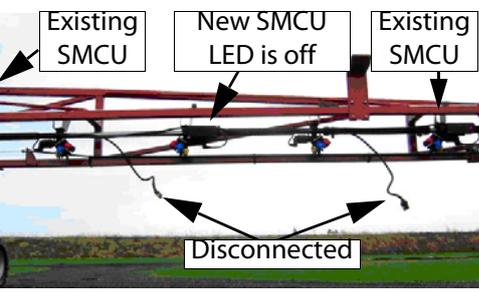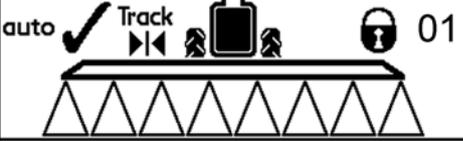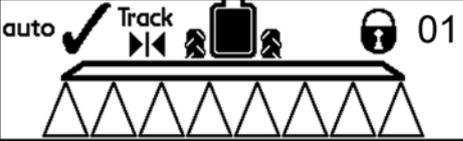
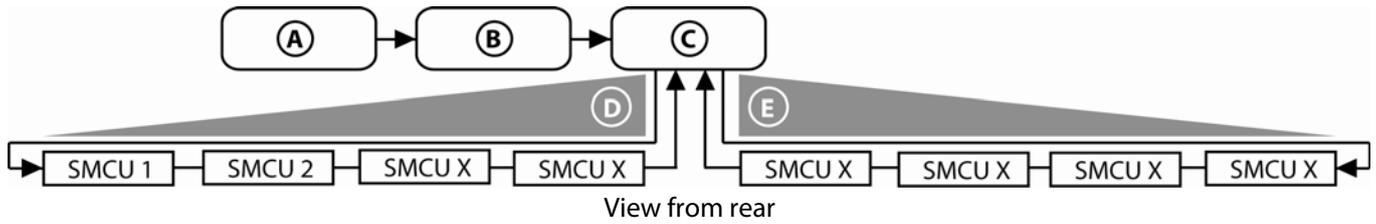|	
Determine whether the new PrimeFlow SMCU is for 2 motors (nozzles) or 3 motors (nozzles) When it is a 2 motor SMCU: Check that terminal gives 2 beeps Check that terminal display increases counter by 2. When it is a 3 motor SMCU: Check that terminal gives 3 beeps Check that terminal display increases counter by 3 Now the new PrimeFlow SMCU is programmed	 E8.6.4.2.2 SMCU nozzle position assigned **9** When counter stops, check position, thenconnect
The Terminal stops counting and beeping Connect the cable with the 4 pole AMP from the new PrimeFlow SMCU to the next existing PrimeFlow SMCU	 Connect cable from new SMCU to next SMCU
Check that display continues to count. Check that terminal for each existing SMCU gives 1 beep, which means that existing SMCU ID is correct.	 E8.6.4.2.2 SMCU nozzle position assigned **12** When counter stops, check position, thenconnect
When the Terminal stops counting and beeping, check that the terminal display counter show the number of nozzles on the boom. 24m boom: Stop at 48 36m boom: Stop at 72	 E8.6.4.2.2 SMCU nozzle position assigned **21** When counter stops, check position, then
Right Outer boom side. Connect extension cable Now all 4pcs. 4 pole AMP connector are connected again. A: Left outer, connected B: Left inner, connected C: Right inner, connected D: Right outer, connected	
Perform boom test and single nozzle test to verify replacement succeeded	
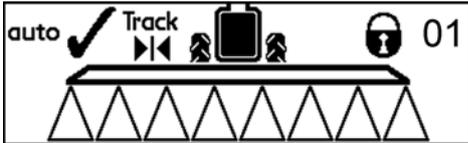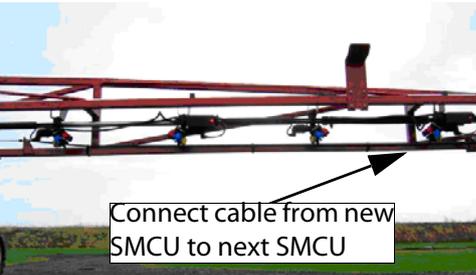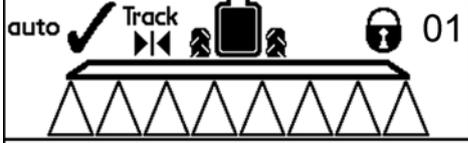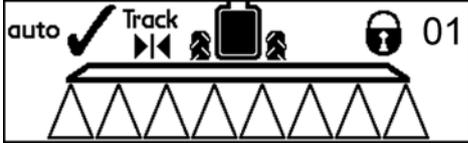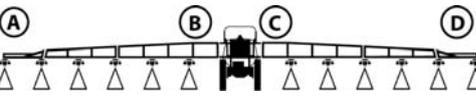
Reset a single SMCU

First PrimeFlow power and databus is checked, to ensure that reset commends sent from JobCom will reach the SMCU to be reset.Change SMCU 3 motor to 2 motor drive

Check that all sections are open (switches on Grip point downwards)	
Press Main on off button to open sections (Green solid triangles)	
Check that all SMCU LED's blink fast 4Hz except defect ones	 All nozzles open, all LED's blink 4Hz
Press Main on off button to close sections (red frame triangles)	
Check that all SMCU LED's blink slowly 1Hz except defect ones	 LED's blink 1Hz LED's blink 1Hz
Disconnect the connectors A: Left Outer. Disconnect connectors on SMCU. B: Left Inner. Disconnect extension cable C: Right Inner. Disconnect connectors on SMCU. D: Right Outer. Disconnect extension cable	
Check that all LED's are off Connect the new SMCU to the cable at Left Outer boom side 1. Connect left outer to new SMCU. LED must be off on OK SMCU's.	
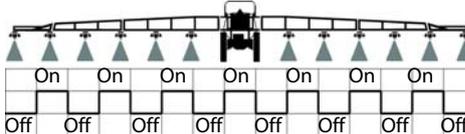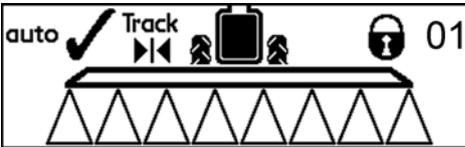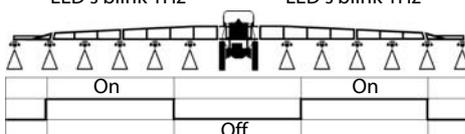
E8.6.4.3 Reset nozzle position in SMCU
Resets all connected SMCU's to prepare for assignment of new nozzle position

E8.6.4 PrimeFlow setup	
E8.6.4.1	Test Nozzle positions
E8.6.4.2	Assign nozzle position to SMCU
» E8.6.4.3	Reset nozzle position in SMCU
E8.6.4.4	Force to 2 motor drive
E8.6.4.5	Reserved
E8.6.4.6	Change Nozzle order

Resets all connected SNCU's to prepare
for assignment of new nozzle position

Press enter
2 previous photos of boom show disconnected SMCU' s as required in help text

auto ✓ Track ▶|◀ 🚶 🔋 🚶 🔒 01
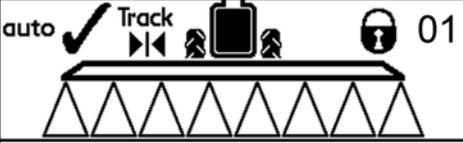
E8.6.4.3.1 Confirm reset of SMCU's

0

Connect SMCU at left side to reset.

Check that PrimeFlow SMCU LED lights constantly. SMCU is reset.
HC6500 display counts up.
Press ESC when SMCU's LED lights constantly

auto ✓ Track ▶|◀ 🚶🔋🚶 🔒 01
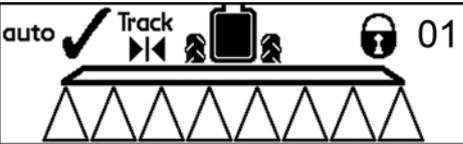
E8.6.4.3.2 Resetting SMCU

3

SMCU's are reset. JobCom verifies each

Check that all LED's are off
Connect the new SMCU to the cable at Left Outer boom side

1.
Connect left outer to new SMCU

LED must be off on OK SMCU's

LED change from blinks to constant light

①
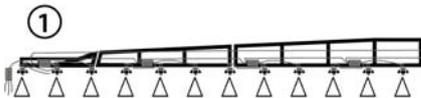
Order of operation:
1.Reset SMCU
2.Change to 2 motor drive as shown below
3.program nozzle number into SMCU

A: Left outer, dis-connected
B: Left inner, dis-connected
C: Right inner, dis-connected
D: Right outer, dis-connected

Ⓐ Ⓑ Ⓒ Ⓓ

The SMCU must be reset before a 3 motor SMCU is changed to 2 motor drive

1.
Connect left outer to new SMCU

LED must be off on OK SMCU's

LED change from blinks to constant light

E8.6.4 PrimeFlow setup	
E8.6.4.1	Test Nozzle positions
E8.6.4.2	Assign nozzle position to SMCU
E8.6.4.3	Reset nozzle position in SMCU
» E8.6.4.4	Force to 2 motor drive
E8.6.4.5	Reserved
E8.6.4.6	Change Nozzle order

For service a 3 motor SMCU can be forced to be a 2 motor drive

E8.6.4.4.1

0

Connect motor

E8.6.4.4.2

0

In progress!

Error message

E8.6.4.4.4

0

System cannot program SMCU

PrimeFlow fault finding; check first guide

View from rear

A: HC6500
B: JobCom
C: Central junction box at the centre part of the boom; data com and 24V connection to SMCU
D: Left boom
E: Right boom

Caution:

All PrimeFlow cables have to be connected and the Data com switch (S1) on the central junction PCB has to be in down position. If the S1 has changed position is it necessary to turn ON/OFF the controller.

A: General fault finding

1. Check fuse on PrimeFlow PCB in the JobCom
2. Check PrimeFlow fuses 10A (F1, F2), in the junction box PCB on the centre part of the boom
3. The data com switch (S1) should be set in the Down position, Full Duplex
4. All SMCU LED should flash, if not there is no 24V, continue fault finding at point C.1
5. Enter Menu 4.5.3; check the SMCU for data and/or power errors
6. Enter Menu 4.5.6; Reset SMCU error counters
7. If possible turn the nozzles on/off 5-6 times
8. Enter Menu 4.5.3 again and check the error log
9. Replace defect SMCU

B: Data com fault finding

1. Disconnect cable on last SMCU at the right boom
2. Use Menu E8.6.4.2 to assign nozzle position to SMCU
3. If possible for all nozzles, turn the controller ON/OFF, see if the fault still are there
4. If only possible for some nozzles, it may be a SMCU or connector at the right side of the SMCU where the process stopped that is defect
5. If it is not possible to assign nozzle position; Disconnect SMCU from right to left until assign of nozzles is possible. Last disconnected cable or SMCU is defect, replace this SMCU.
6. In menu E8.6.4.1 check that all nozzles open in the right order

C: Power fault

1. Disconnect cable from last SMCU on right boom. If the LED not is flashing on all SMCU's there is a power failure on the right side of the boom with the SMCU that is flashing
2. Replace the defect SMCU, check that there is no error code and proceed to point 3
3. Disconnect cable from last SMCU on left boom. If the LED not is flashing on all SMCU's there is a power failure on the right side of the boom with the SMCU that is flashing
4. Replace the defect SMCU; check that there is no error code

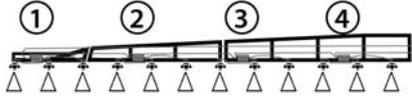| PrimeFlow cable configuration			PrimeFlow error log	
Connector	Conductor	Signal	Error code	Error
Pin 1	White	GND = 0 Volt	99	Flow data cable weakness
Pin 2	Brown	Data-bus +	100	Low PrimeFlow voltage
Pin 3	Green	Vcc = 24 Volt	101	PrimeFlow power cable defect
Pin 4	Yellow	Data-bus -	102	PrimeFlow computer defect

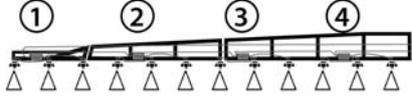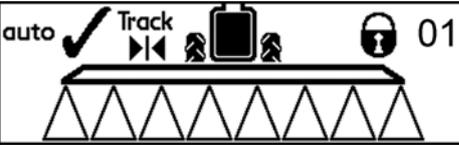# Fault finding options and results

How to fault find when the programming did not succeed
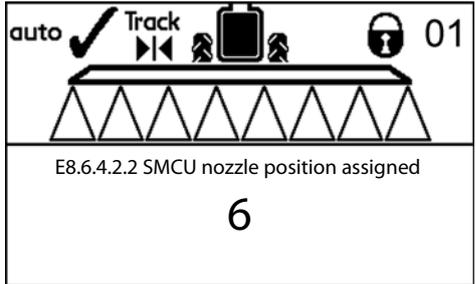
When connecting a SMCU for assigning nozzle position and no beep sounded then 2 SMCU's can be defect: Either the last SMCU - which could not be assigned - already had a nozzle position - or the SMCU just before, which can have a defect data cable 1. SMCU 1 is ok 2. SMCU 2 is ok 3. SMCU 3 beeps ok. Perhaps defect 4. SMCU 4 gives no beep. Perhaps defect	
Verify that counter on terminal	 E8.6.4.2.2 SMCU nozzle position assigned 6 When counter stops, check position, thenconnect
show the position of the last = right-most nozzle which connected and assigned to an SMCU	

If positions does not match, something else went wrong.
Reset the complete boom, disconnect all connectors and begin programming them from left side again.

If position match, check cables from previous SMCU.

Measure between pin 1 and pin x; expected values:					
PIN	Color	Function	VDC	VAC	Unit
1	White	GND	0	0	V
2	Brown	Data bus +			V
3	Green	Vcc	24		V
4	Yellow	Data bus -			V

Inside limits then continue:	
If measurements are inside limits, then the fault is in the last SMCU, which could not be assigned a nozzle position. simply take a new SMCU and continue programming 1. SMCU 1 is ok 2. SMCU 2 is ok 3. SMCU 3 Measurements inside limits 4. SMCU 4 is defect	
Outside limits then replace previous	
If one (or several) of the 3 cables gives measurements outside the limits, then the previous SMCU is defect Because the fault SMCU was assigned a nozzle position correctly, programming must be stopped and started again. 1. SMCU 1 is ok 2. SMCU 2 is ok 3. SMCU 3 beeps ok, but cable to next is defect 4. SMCU 4 gives no beep, but is not defect	
Disconnect and dismount this SMCU and report it defect Do not disconnect other cables Stop programming by pressing ESC Start programming again Select Menu E8.6.4.2 Assign nozzle position to SMCU Assign nozzle position after replacement, Confirm nozzle position after master reset	E8.6.4 PrimeFlow setup E8.6.4.1 Test Nozzle positions » E8.6.4.2 Assign nozzle position to SMCU E8.6.4.3 Reset nozzle position in SMCU E8.6.4.4 Force to 2 motor drive E8.6.4.5 Reserved E8.6.4.6 Change Nozzle order Assign nozzle position after replacement Confirm nozzle position after master reset
Menu E8.6.4.2.1 Prepare cables for assign pos Connect SMCU having nozzle position Disconnect reset SMCU. Then press enter Cabling is just connected as specified in help text. Press enter	 E8.6.4.2.1 Prepare cables for assign pos 0 Connect SMCU having nozzle position. Disconnect reset SMCU. Then press enter

Menu E8.6.4.2.2 SMCU nozzle position assigned Counter will increase until the last signed nozzle where it will stop counting It will give 1 beep at each count	 E8.6.4.2.2 SMCU nozzle position assigned 6 When counter stops, check position, then

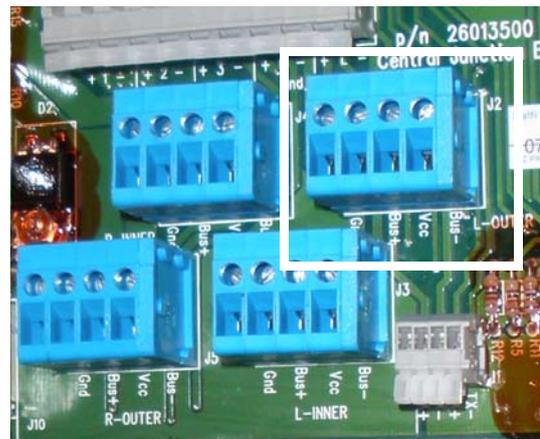# PrimeFlow alarms

Alarm 99, data cable weakness

Test 1A:
Turn on the HC6500
Measure the voltage between following points on the PrimeFlow Junction box PCB L-OUTER terminal J2:

If voltage on Bus+ and Bus- are above values specially if voltage is above 5 volt, a SMCU's has a fault between VCC (24V) and the bus wires.
Then none of the RS485 modules can work


| Terminal	Terminal	Max value	Unit	Min. value	Unit
GND	Vcc	28	V	23	V
GND	L-Outer Bus-	2,5	V	2,2	V
GND	L-outer Bus+	2,7	V	2,5	V
Bus+	Bus-	5,2	V	4,7	V

Check of 37 pole cable from JobCom to PrimeFlow junction box
Move switch lever up to Half Duplex position.
Turn off and turn on HC6500

If Alarm 99 still occurs with this setting (Half Duplex position)
1) 37 pole cable from JobCom to PrimeFlow junction box is faulty
2) Short circuit PrimeFlow junction box, cables and SMCU's on the boom.
Continue with test 1 and then 2

If Alarm 99 does not occurs now (disappears), the fault is isolated to a disconnection in the PrimeFlow junction box, cables and SMCU's on the boom
Move switch lever down to Full Duplex position again
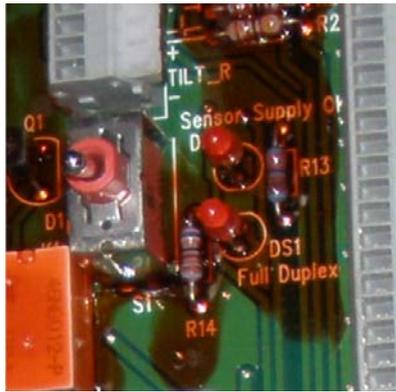
Check of data cables and SMCU's on the boom
Turn off HC6500
Wait until the supercaps has discharged. LED's on PrimeFlow SMCU's are off. (Alternatively remove the to red 10A fuses)
Measure resistance between screw/cable-terminals as described.
Note that in most cases all cables should be connected in the terminals.
Resistances in JobCom and SMCU's are included in specified limits.
A note specifies when a wire should be dismounted.
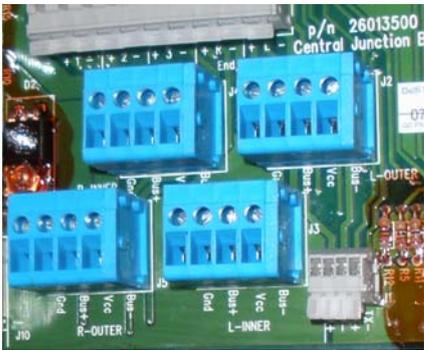
Test 1: Test disconnection of data cables on boom:

In terminals	In terminals	Max limit	Min. limit	Write value
L-Outer Bus+	R-Outer Bus+	5 ohm	1 ohm	
L-Outer Bus-	R-Outer Bus-	5 ohm	1 ohm	

If above max limit continue with test 4a, 4b, 4c, 4d.

Test 2: Test short circuit of data cables

In terminals	In terminals	Max limit	Min. limit	Write value
L-Outer Bus+	L-Outer Bus-	160 ohm	140 ohm	

2 pcs termination resistors in the JobCom makes 150 ohm
Disconnection in PrimeFlow data cables will increase to 300 ohm or more, also tested in Test1
Resistance below Min. limit indicates short circuit between Bus+ and Bus-.
Go to Test 5 to identify location of short circuit

Test 3: Test short circuit to GND and Vcc (24V)

In terminals	In terminals	Max limit	Min. limit	Write value
L-Outer Gnd	L-Outer Bus+		290 ohm	
L-Outer Gnd	L-Outer Bus-		290 ohm	
L-Outer Vcc	L-Outer Bus+		1 Mohm	
L-Outer Vcc	L-Outer Bus-		1 Mohm	

If values are below Min. limit, use Test 5 to identify location of short circuit
Test 4A: Find boom part of disconnection

In terminals	In terminals	Max limit	Min. limit	Write value
L-Inner Bus+	R-Inner Bus+	3 ohm	1 ohm	
L-Inner Bus-	R-Inner Bus-	3 ohm	1 ohm	

If values are above Max limit, fault is on the PrimeFlow junction box PCB

In terminals	In terminals	Max limit	Min. limit	Write value
L-Outer Bus+	L-Inner Bus+	4 ohm	1 ohm	
L-Outer Bus-	L-Inner Bus-	4 ohm	1 ohm	

If values are above Max limit, fault is on the left boom part, use Test 4c to identify location

In terminals	In terminals	Max limit	Min. limit	Write value
R-Inner Bus+	R-Outer Bus+	4 ohm	1 ohm	
R-Inner Bus-	R-Outer Bus-	4 ohm	1 ohm	

If values are above Max limit, fault is on the right boom part, use Test 4c to identify location

Test 4B: Find SMCU position of disconnection on left boom part
Dismount the 4 wires mentioned in the table and measure between the wires ends

Dismounted	Dismounted	Max limit	Min. limit	Write value
L-Outer Bus+	L-Outer Bus-			
L-Inner Bus+	L-Inner Bus-			

Compare with values in test 4D

Test 4C: Find SMCU position of disconnection on right boom part
Dismount the 4 wires mentioned in the table and measure between the wires ends

Dismounted	Dismounted	Max limit	Min. limit	Write value
L-Outer Bus+	L-Outer Bus-			
L-Inner Bus+	L-Inner Bus-			

Compare with values in test 4D

Test 4D: Measure and count position of disconnection.

Resistance	Disconnection between:
>1MOhm	Junction box and SMCU 1
260 kOhm	SMCU 1 and 2
130 kOhm	SMCU 2 and 3
87 kOhm	SMCU 3 and 4
65 kOhm	SMCU 4 and 5
52 kOhm	SMCU 5 and 6
43 kOhm	SMCU 6 and 7
37 kOhm	SMCU 7 and 8
33 kOhm	SMCU 8 and 9
29 kOhm	SMCU 9 and 10
26 kOhm	SMCU 10 and 11
24 kOhm	SMCU 11 and 12
22 kOhm	SMCU 12 and 13
20 kOhm	SMCU 13 and 14
19 kOhm	SMCU 14 and 15
17 kOhm	SMCU 15 and 16
16 kOhm	SMCU 16 and 17
15 kOhm	SMCU 17 and 18
14 kOhm	SMCU 18 and 19

Each SMCU includes a resistor of 260 kOhm between Bus+ and Bus-.

Hence all connected SMCU's add 160 kOhm in parallel.

The higher the number of SMCU's connected, the lower the resistance measured.

Resistance measured between Outer Bus wires defines a SMCU position counted from the outer end of the boom wing.

Resistance measured between Inner Bus wires defines a SMCU position counted from the inner end of the boom wing.

Test 4E: Use 2 adaptor cables with AMP connectors to measure resistance between connectors at the ends of cables and SMCU's to check location of fault.

Test 5: Find boom part with short circuit

Dismount the 4 Inner Bus wires and measure between

The wires L-Outer Gnd and L-Outer Vcc can stay in terminals

Dismounted	Dismounted	Max limit	Min. limit	Write value
L-Inner Bus+	L-Inner Bus-		140 ohm	

If the value is below Min. limit, fault is on left boom part

In terminals	Dismounted	Max limit	Min. limit	Write value
L-Outer Gnd	L-Inner Bus+		140 ohm	
L-Outer Gnd	L-Inner Bus-		140 ohm	
L-Outer Vcc	L-Inner Bus+		1 Mohm	
L-Outer Vcc	L-Inner Bus-		1 Mohm	

If the value is below Min. limit, fault is on left boom part

Dismounted	Dismounted	Max limit	Min. limit	Write value
R-Inner Bus+	R-Inner Bus-		140 ohm	

If the value is below Min. limit, fault is on right boom part

| In terminals	Dismounted	Max limit	Min. limit	Write value
L-Outer Gnd	R-Inner Bus+		140 ohm	
L-Outer Gnd	R-Inner Bus-		140 ohm	
L-Outer Vcc	R-Inner Bus+		1 Mohm	
L-Outer Vcc	R-Inner Bus-		1 Mohm	

If the value is below Min. limit, fault is on right boom part

Use Test 6 to identify location on boom part of short circuit

Test 6 to identify location on boom part of short circuit

Keep multimeter test leads mounted on the 2 terminals, which show the faults.

Divide boom in halves by opening 4 pole AMP connectors to narrow in location of short circuit


open 1   open 3   open 1   open 1
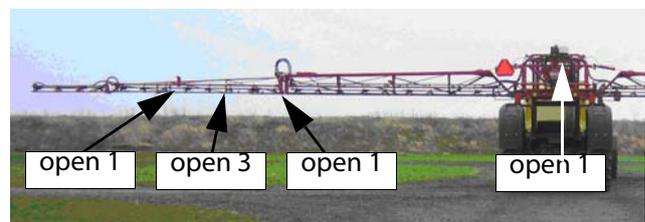
Alarm 100 Low PrimeFlow voltage

JobCom measure PrimeFlow supply voltage after fuse for left and right boom part at AI11 and AI12. Alarm occur when voltage is below 14 volts.

A fuse is open or too many rapid shifts on and off of sections has drained the power supply

Warning 101 PrimeFlow power cable defect

Low power warning from SMCU, when supply is re-established.
First low power warning received after power up of system is not valid
First low power warning received after "Low voltage on supercap" is not valid
Poor power wiring to PrimeFlow computers. One of the 2 power lines are disconnected or connectors are corroded and gives high resistance
Test: Find boom part with short circuit
Dismount the Gnd, Vcc in the upper screw terminal blocks, which are easy accessible.
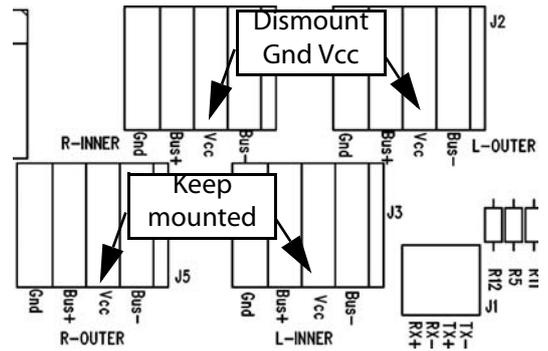
In terminals	Dismounted	Max limit	Min. limit	Write value
L-Inner Gnd	L-Outer Gnd	2 Ohm		
L-Inner Vcc	L-Outer Vcc	2 Ohm		
R-Inner Gnd	R-Outer Gnd	2 Ohm		
R-Inner Vcc	R-Outer Vcc	2 Ohm		

Warning 102 PrimeFlow computer defect

SMCU does not reply on status
No status request while "Low voltage on supercap" occurs
Internal fault in PrimeFlow computer. Can also be caused by 2 or more defects in PrimeFlow data cable. Check for PrimeFlow data cable weakness

Menu 4.5.3 PrimeFlow test PrimeFlow test for nozzles and PrimeFlow computers on boom Check No answer count	**4.5 Test** » 4.5.1 Flow Speed Optional sensors 4.5.2 Action keys 4.5.3 PrimeFlow test 4.5.4 Input test 4.5.5 Valve test Activate function to monitor sensor (e.g. drive forwards, start flow)
Menu 5.2.2 Hyper terminal service report Open Service report in Notepad Check No answer count	

Checking SMCU and stepper motors

4 types of fault are seen

SMCU motor driver transistor is defect

Stepper motor does not rotate

Stepper motor has lost power but can rotate

Valve seat is leaking

PrimeFlow Basic rules
Power connects to the boom centre.
Data/power connects to the boom ends.

When programming:
Always disconnect data cable at the right boom end.
Always start the programming at the left boom end.
Always disconnect power at the centre at the boom when resetting a SMCU.
If SMCU LED is flashing, it must be reset before it can be re-programmed.

Sensors

General info/description
Tank gauge
Main and rinse tank full sensors
Speed, TWIN, Boom and SafeTrack lock sensors
Front angle sensor
SafeTrack and Paralift angle sensor
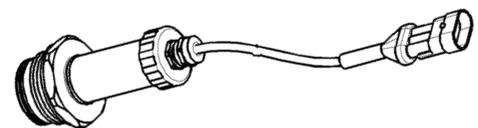Slant angle sensor
Flow
Pressure sensor

Pinning/plugs/colors/codes

General:

	Angle sensor	Sensor	AMP Connector	PCB
Blue	Signal	Signal	3	Signal
Black	GND	GND	1	-
Brown	+12V	+12V	2	+

Tank gauge
Hardi P/N	26014100
Type:	Pressure
Range:	0-250mBar
Signal:	100-2600Hz, open collector NPN
Pull up:	10K Ohm to Vcc
Power:	12V
Hardi Pin assignment:	Brown +
	Blue signal
	Black -

Tank full switch
Hardi P/N	72411300
Type:	Switch
Full tank:	Switch open
Not full tank:	Switch closed, <2.0 ohm
Power:	12V
Hardi Pin Assignment:	Brown +
	Blue signal
	Black -
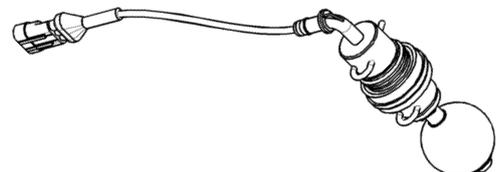
Speed, TWIN, Boom and SafeTrack lock sensor

|	
Hardi P/N	28047500
Type:	Inductive
Range:	0-8mm
Signal:	0-200Hz
Operation indicator:	Yellow light when active (0,8V)
Power:	12V
Visual indicator:	LED to indicate active stastatus
Hardi Pin assignment:	Brown +
	Blue signal
	Black-
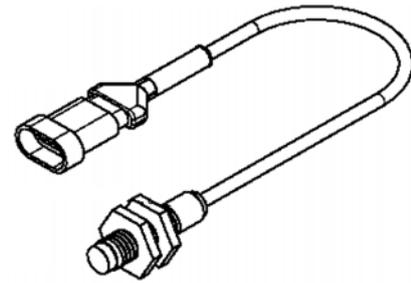
Front angle sensor:

Hardi P/N	26005700
Type:	Potentiometer
Range:	0-70°
Signal:	0,5 - 4,5V
Centre position:	2,5 V
Power:	12V
Hardi Pin assignment:	Brown +
	Blue signal
	Black -
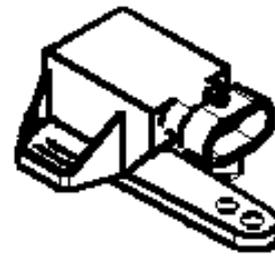
SafeTrack and Paralift angle sensor:

Hardi P/N	26005800
Type:	Potentiometer
Range:	0-120°
Signal:	0,5 - 4,5V
Centre position:	2,5 V
Power:	12V
Hardi Pin assignment:	Brown +
	Blue signal
	Black -
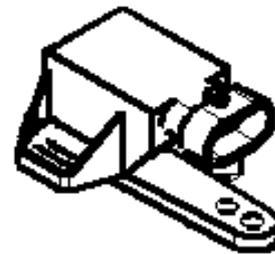
Slant angle sensor:

Hardi P/N	26014300
Type:	Potentiometer
Range:	0-30°
Signal:	0,5 - 4,5V
Centre position:	2,5 V
Power:	12V
Hardi Pin assignment:	Brown +
	Blue signal
	Black -
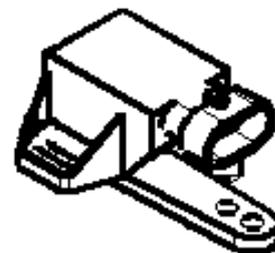
Flow sensor:

Hardi P/N	72117500
Type:	Inductive
Range:	On, 0,2-0,5 V
	Off, 6,5-7,0 V
Visual indicator:	Red light when Off (0,8V)
Power:	12V
Hardi Pin assignment:	Brown +
	Blue signal
	Black -
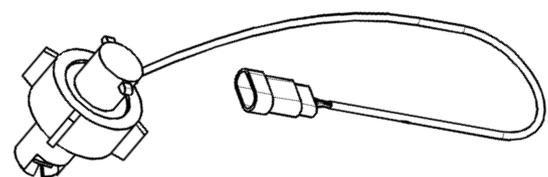
Pressure sensor:

|	
Hardi P/N	842022
Type:	Pressure
Range:	0-10 Bar
Signal:	4-20mA
Power supply:	8-30V
Hardi pin assignment:	Brown +
	Blue Signal
	Black N/C
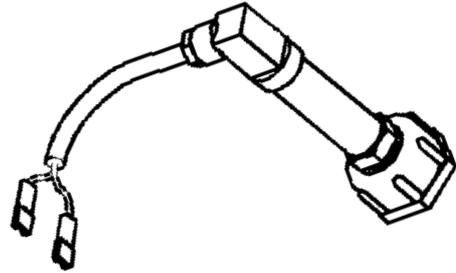
Pressure sensor connection:

9 Section PCB
The wires from the Pressure sensor is connected to "Opt 1" on the 9 section PCB P/N 262108

262108 1.2
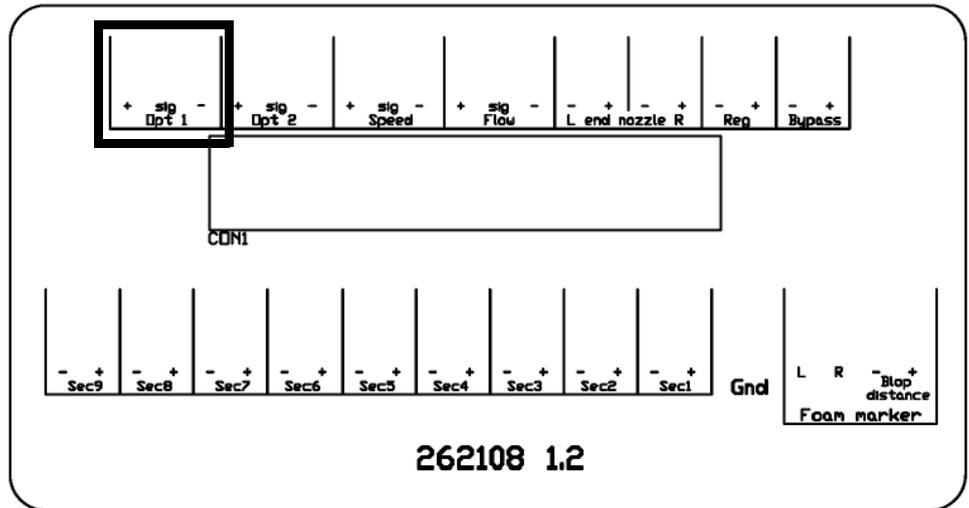
13 Section PCB
The wires from the Pressure sensor is connected to "Pressure" on the 13 section PCB P/N 26004800

26004800 Samleboks 13S
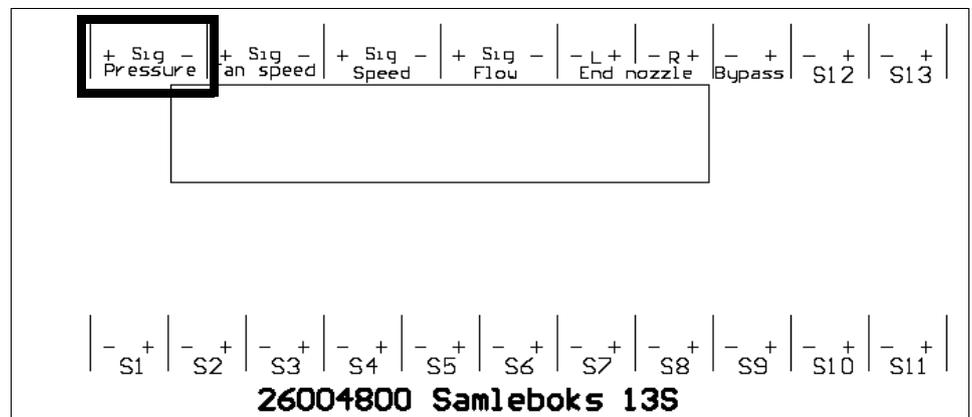
PrimeFlow
The wires from the Pressure sensor is connected to "Pressure" on the PrimeFlow PCB P/N 26027000
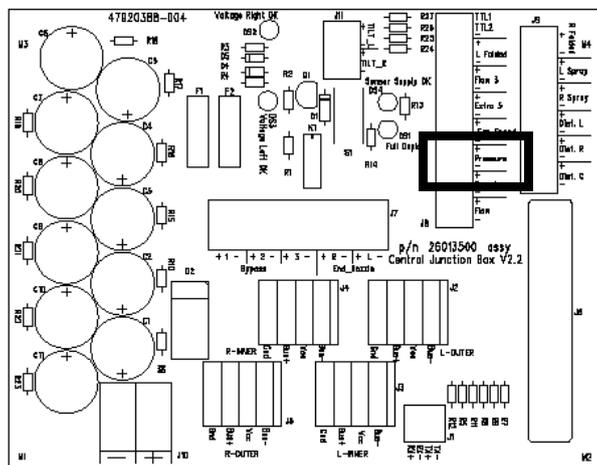
Sensor setup

The boom pressure sensor is setup in menu E8.1.7.

Default setting for the sensor is "passive".
If the sensor is set to passive it can only be used for read out purpose.

Select "active" when the sensor should be used for regulation at low flow.

E8.1.7.1 Pressure	
» E8.1.7.11	Pressure sensor: Passive
E8.1.7.12	Pressure sensor: Active
Pressure sensor used for read out purpose only	

Display readout setup

For a readout on the HC6500, the sensor must be setup.
To show the pressure in the upper middle window select E.2.1.1.11.

2.1.1 Show upper middle	
E2.1.1.07	Speed
E2.1.1.08	Volume sprayed
E2.1.1.09	Area sprayed
E2.1.1.10	Active boom size
o » E2.1.1.11	Pressure
E2.1.1.12	Fan speed
E2.1.1.13	Wind speed
E2.1.1.14	Wind direction
E2.1.1.15	Humidity
Displays spray pressure if sensor is fitted	

Alarms:

Alarm 109; pressure sensor:
The alarm is generated, if the sensor signal is shorted or not connected.

The HC6500 has min. and max pressure alarm that can be shown in the display.
The display need to be set up to show this alarm.
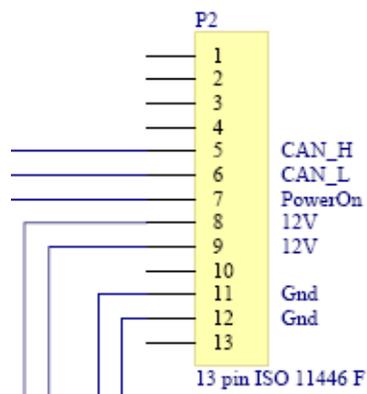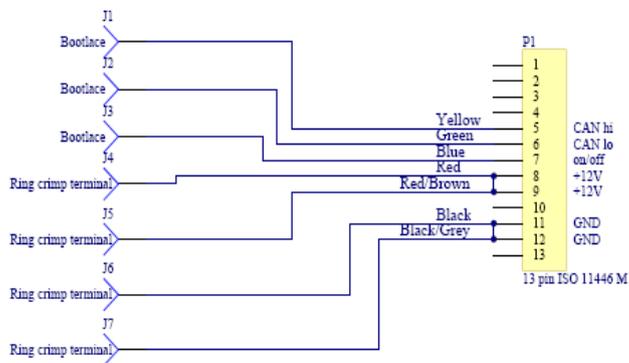
Cable from Jobcom to tractor

General info/description

The cable from Jobcom to tractor has 7 wires and the connector is a standard 13 pin M / F following the ISO 11446. See section COMMUNICATION / CAN for wire connection on Jobcom.

Consult Operators Instruction book for connections to tractor battery

Pinning/plugs/colors/codes

Revision

P/N 679096-201		Service Manual HC6500		Revision 2.01. GB 10.2008	
Date	**Revision**	**Subject**	**Section**	**Pages**	**Author**
13-03-2007	1.8	Release of manual	All	25	AF
14-03-2008	2.00	Menu tree, Datacom and PrimeFlow fault finding added	Ext menu, datacom and PrimeFlow	57	PAO
07-10-2008	2.01	Updated	Menu tree, Datacom, PrimeFlow faultfinding, Sensors.	5-10,13-31, 61-69,70-73	PAO
		Added	Pressure regulation, PrimeFlow description, setup, test, programming. Software error codes	34, 46-60. 25-26	PAO
		Removed	Guidance for HC6500 setup	(4)	PAO