AutoSPRAY 6100
User Manual

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AutoSPRAY 6100 User Manual

Written for AutoSPRAY 6100 software Version 2.1

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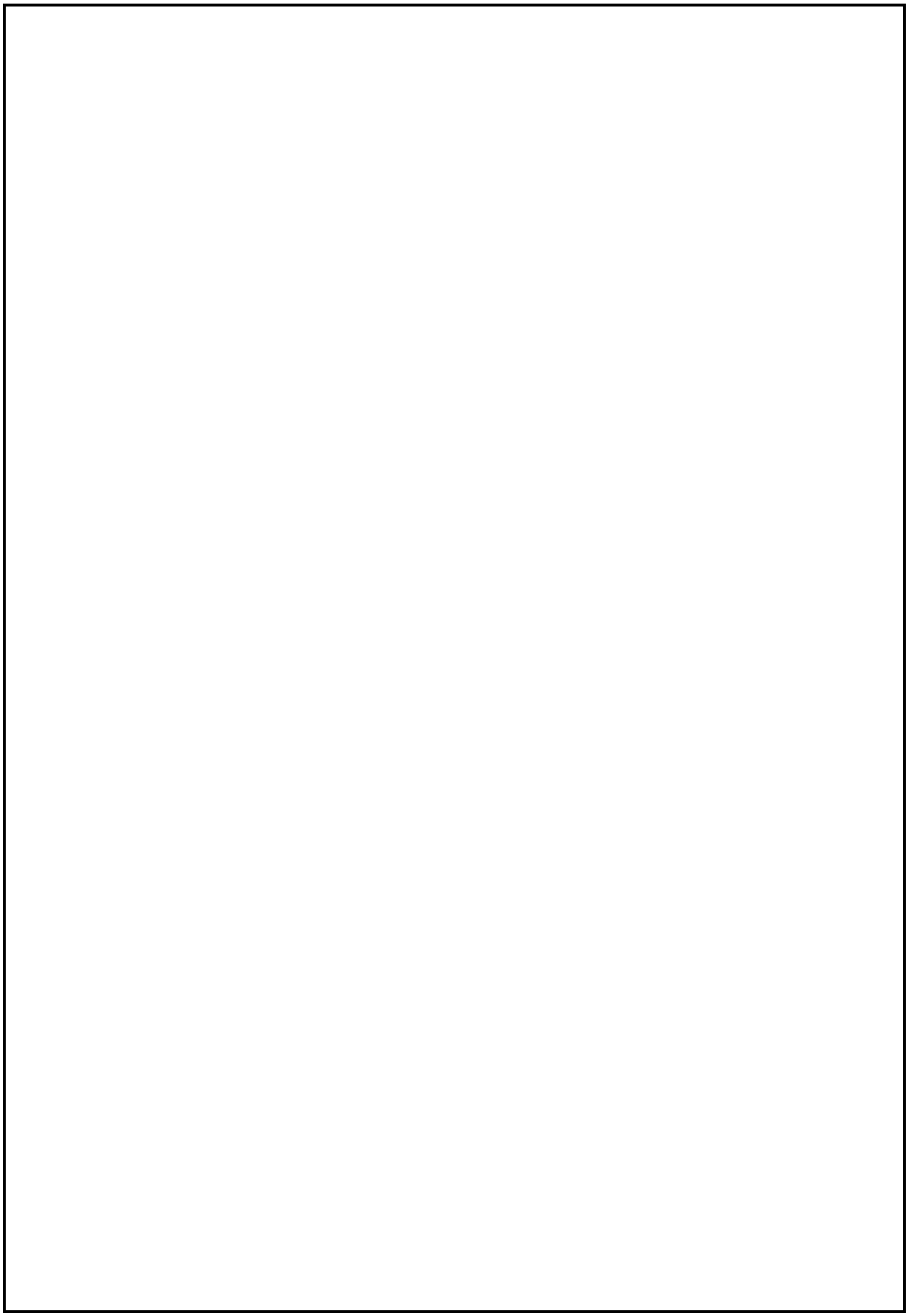

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Introduction

Welcome to the AutoSPRAY 6100 User Manual. This document describes how to use the AutoSPRAY 6100 system.

The AutoSPRAY 6100 system is designed to connect to your existing Spray Controller and GPS guidance system to provide automatic boom section control. This will greatly reduce the need for manually switching sections ON or OFF when going over previously sprayed crop or pasture. Its ability to automatically control the spraying state of the sections relieves the operator from an arduous task which requires split second timing on multiple switches. Unlike other AutoSPRAY models which were incorporated with the guidance system the AutoSPRAY 6100 is an autonomous system which can be interfaced with most existing spray rate controllers and GPS receivers.

This manual is designed to assist users of the AutoSPRAY 6100 in the operational use of the AutoSPRAY 6100 hardware and software.

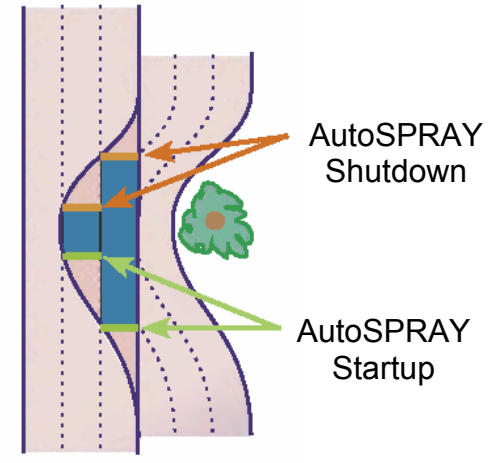
1.1 AutoSPRAY 6100 Standard Features

Timing Delays	The AutoSPRAY 6100 can be adjusted for delays from electrical to mechanical switching.
Variable Overlap	Allows the operator to configure the required overlap.
Vehicle Modeling	Allows the operator to accurately define vehicle and boom dimensions.
Antenna Offsets	Allows the operator to define the GPS antenna offsets.
Standby Mode	Allows the operator to disable AutoSPRAY to allow the spray controller to be operated manually.

1.2 Typical Uses of the AutoSPRAY 6100

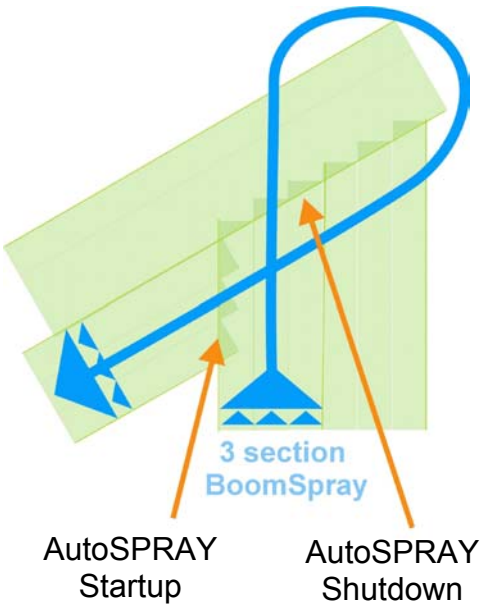
Spraying around obstacles

Automatically minimize over spray around trees or rock heaps. AutoSPRAY detects areas previously sprayed and shuts down sections and reactivates as necessary.



Spraying the headlands

AutoSPRAY detects areas previously sprayed as the headlands are approached and shuts down sections and reactivates as necessary.



1.3 AutoSPRAY 6100 Components

When you receive your AutoSPRAY 6100 system, please check that you have received all of the components detailed on the packing list. See below for a list of components supplied.

Quantity	Description	Part Nō.
1	AutoSPRAY 6100 Controller	1-0482
1	Mounting kit	1-0212
1	Power cable	1-2406
1	AutoSPRAY 6100 User Manual	1-1251
1	AutoSPRAY 6100 Quick Start Card	1-1319
1	GPS interface cable	1-2207
1	Spray rate controller able	1-2207
1	AS6100 LCD Display Module	1-0472

Inspect all items for visual damage. If any component appears to be damaged, contact your supplier immediately. Ensure all packaging and shipping details are kept for future reference.

2

Installation

This section describes how to connect and install the components of the AutoSPRAY 6100 system.

A schematic of the AutoSPRAY 6100 and how it connects to the spray rate controller and GPS receiver is shown in Figure 2.1

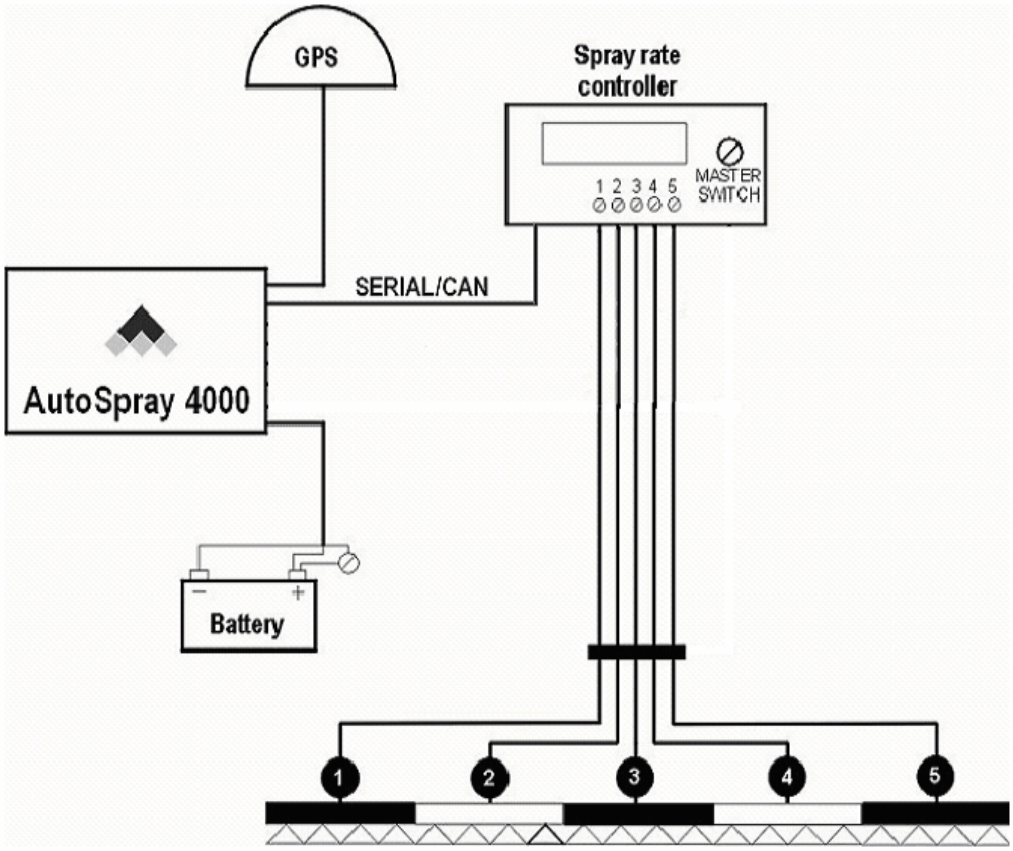


Figure 2.1 Schematic layout of the AutoSPRAY 6100

Installing the AutoSPRAY 6100

Step	Instruction
1	Assemble the mounting kit, P/N 1-0212. Using the four screws to secure the mounting bracket to the AutoSPRAY 6100 controller.
2	Install the AutoSPRAY 6100 Controller in a suitable location in the vehicle to allow the operator to have access to the front panel. Four screws are provided to mount the controller to the vehicle. Ensure that the Isolation Power Switch is in the OFF (O) position.
3	Connect power cable P/N 1-2406 to the vehicle battery and switched power supply. Further details are provided on connecting the power below.
4	Connect spray rate controller adaptor cable P/N 1-2207 to the spray controller. Further details are provided with the spray rate controller cable.
5	Connect GPS interface cable P/N 1-2206 to the GPS receiver.
6	Use the IPS to power ON the AutoSPRAY 6100 controller to check power cable has been correctly installed. Note! The unit will not power up completely at this point in time. Power Status LED should display in RED. Power OFF controller using IPS.

2.1 Connecting Vehicle Power

The RINEX power cable (P/N 1-2406) is a three core power cable which allows the AutoSPRAY 6100 controller to be connected directly to the vehicle's battery. The cable can be connected directly to a 12vDC battery supply without the need for any additional step-down converters.

RED — Positive wire with in-line fuse connects to the vehicle battery positive terminal (12 vDC ONLY), fitted with a M12 ring connector.

BLACK — Ground wire connects to the vehicle battery negative terminal, fitted with a M12 ring connector.

ORANGE — Positive wire connects to the vehicle ignition ON circuit. The wire is connected into the vehicle's ignition circuit such that the AutoSPRAY 6100 will detect when the ignition is switched on and off.

☞ *The Rinex power cable is assembled within split tubing to allow the orange wire to be separated at any point to allow for in-cab termination.*

The cable should be routed from the operator's cab to the vehicle's batteries through a dedicated cable gland if supplied. If necessary an exit hole will have to be drilled into the vehicle which should be fitted with a rubber grommet to protect the cable from rubbing directly on the vehicle wall. The hole should be sealed with the supplied silicone sealant to prevent dust and moisture from entering the cab.

DC Power Cautionary Notes

⚠ The RINEX power cable supplied should only be connected directly to the battery with the supplied fuse in place. We strongly recommend NOT removing the supplied fuse. If a power wire should short to the vehicle body, a battery can supply a current that will heat the wire to the point where the insulation will catch fire. A fuse mounted inline near the battery connection point and before the cable passes through the vehicle panel will prevent the risk of a vehicle fire.

⚠ The RINEX power cable should not be connected to the input or output terminals of a step-down converter in a 24v DC system as typically the converter will effect system performance.

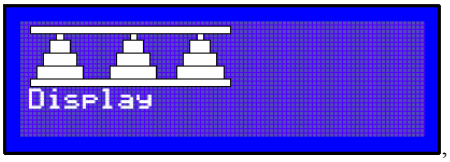
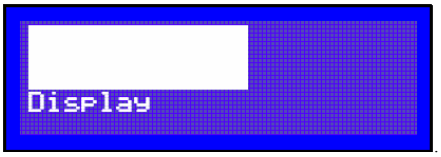
⚠ The RINEX power cable should not be connected directly to the battery if the vehicle is equipped with a battery isolator switch. In these cases the negative wire (black) should be connected to the vehicle side of the isolator.

2.2 Connecting the Spray Rate Controller

A generic spray rate controller cable is supplied with the AutoSPRAY unless a specific cable was ordered at the time of purchase.

See Appendix B – AutoSPRAY 6100 Options for available spray rate controller cables. Each cable kit is supplied with comprehensive installation instructions.

To test Spray Rate Controller cable, follow the steps below.

Step	Instruction
1	Use Isolation Power Switch (IPS) to power ON.
2	When the DISPLAY menu is shown  .
3	Switch the spray rate controller Master Section switches ON.
4	The Master Status On should be displayed  , If number of boom sections is more then 10, the Master Status On should be displayed  .
5	Use the Master Section switch to toggle OFF.
6	The Master Status On should not be displayed  .

A delay may occur between the switching of the Master Section switch and when the Master Status is displayed on the AutoSPRAY 6100. This delay is due to the type of electrical circuit switching used within the Spray Rate Controller.

If Master Status value does not change, check that the cable has been installed correctly.

2.3 Connecting the GPS

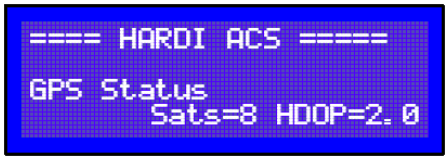
A GPS receiver or guidance system with an incorporated GPS needs to be connected to the AutoSPRAY 6100 using a serial interface.

An interface cable is supplied with the AutoSPRAY 6100 kit, which will suit most GPS receivers. However it is possible that a different cable will be required to connect the GPS receiver to the AutoSPRAY 6100. See Appendix B for common GPS receiver interface cables.

The GPS output messages required are NMEA GGA and VTG at 5Hz. The default baud rate is 19,200 but can be changed if required.

You will need to refer to your GPS system User Manual to assist in determining data port settings.

To test the GPS interface, follow the steps below.

Step	Instruction
1	With the Isolation Power Switch (IPS) ON, turn the vehicle ignition ON.
2	Use ▼ to show DISPLAY menu, then ▶ to move to the  sub-menu.
3	The **Sats=** will display the number of current satellites available. If the number is equal to 0 (zero), then GPS maybe configured incorrectly.

GPS Accuracy – An Important Issue

The relative accuracy of your GPS system will determine the overall performance of the AutoSPRAY 6100 system. The more accurate the GPS, the more accurate AutoSPRAY will be.

By default the AutoSPRAY 6100 is configured to function only with a differentially corrected GPS position (DGPS). Typically DGPS is quoted

with sub-metre accuracy; hence the AutoSPRAY will be of an equivalent accuracy.

The AutoSPRAY 6100 can be configured to function with non-corrected GPS positioning, or sometimes referred to as stand-alone GPS. The resultant accuracy of the AutoSPRAY 6100 will once again be directly related to the GPS signal.

RINEX recommend that the AutoSPRAY 6100 always be used with a DGPS to provide optimal accuracy with the overall system, it is the operator's responsibility to determine the accuracy of the GPS.

☞ *Check with your supplier of the GPS receiver or guidance system to determine to overall accuracy you should expect*.

3

Getting Started

This section details the steps taken for the first time user of the overall system. In particular this section describes the correct way in which to power the system ON and OFF.

Furthermore this section describes the necessary information, which includes measurements on the vehicle to ensure that the system will function correctly.

3.1 Powering the System

Prior to this step the AutoSPRAY 6100 system should be completely installed into the vehicle in accordance with the installation instructions (See Section 2 of this manual).

1. Turn the Isolation Power Switch (IPS) on the AutoSPRAY 6100 controller box to the ON position (-). This will not immediately power the system as the vehicle ignition must also be ON. See Figure 3-1 to locate the IPS.

2. With the IPS on the AutoSPRAY 6100 controller in the ON position, start the vehicle and leave the engine running. The AutoSPRAY 6100 will start to power on after approximately one minute.

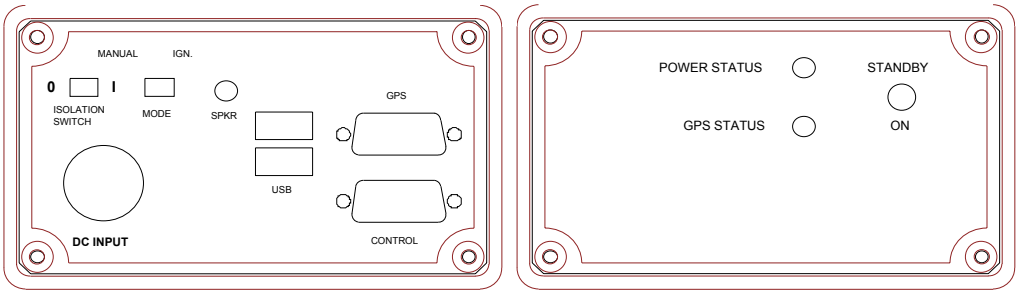


Figure 3-1: AutoSPRAY 6100 Controller & IPS

3. To shut the AutoSPRAY 6100 Controller OFF, simply turn the vehicle ignition off. This will shutdown the AutoSPRAY 6100 Controller and power down the system. The IPS should not be switched to the OFF position.

In normal operation, leave the Isolation Power Switch (IPS) on the AutoSPRAY 6100 controller in the ON position (-) at all times. Use the vehicle ignition switch to turn the AutoSPRAY 6100 ON and OFF, the IPS should only be turned OFF if the AutoSPRAY 6100 is not required to be operational for an extended period.

3.2 LCD Panel

The LCD panel of the AutoSPRAY 6100 consists of an LCD screen and buttons that allow the operation of the system. The components of the panel are described below.

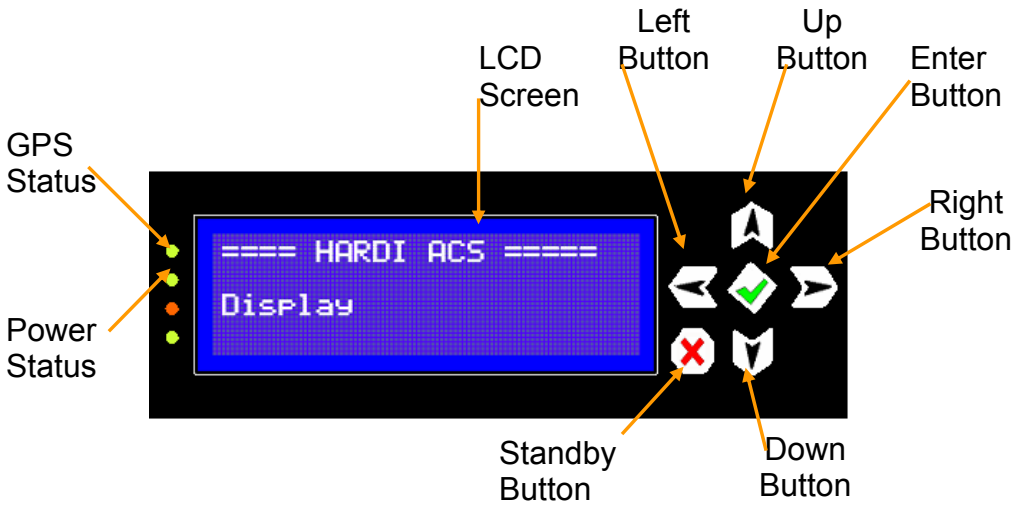


Figure 3-2: The AutoSPRAY 6100 LCD Panel

☞ *LCD Panel should always be connected to the top USB port*

Component	Description
LCD Screen	A four line LCD screen, used to display program menus.
GPS Status	GPS Status LED Green – Good DGPS Orange – Poor DGPS Red – No DGPS Off – No Data See page 18 for more details on GPS Status.
Power Status	Power LED Green – AutoSPRAY operational Orange – Standby Mode Orange – Edit Mode Red – Power connected but unit is off. Off – No power connected
Standby Button	Press to enter Standby Mode or alternatively used as a master switch when the Control setting is set to front panel.
Up Button	Press to move between menus or to change setting values.
Down Button	Press to move between menus or to change setting values.
Left Button	Press to move left in a menu.
Right Button	Press to move right in a menu.
Enter Button	Press to select a menu item for editing. Press to save setting after editing.

3.3 The Front and Back Panels

The back panel of the AutoSPRAY 6100 is used to connect to the spray controller and to the external GPS source among other peripherals. The components of the back panel are described below.

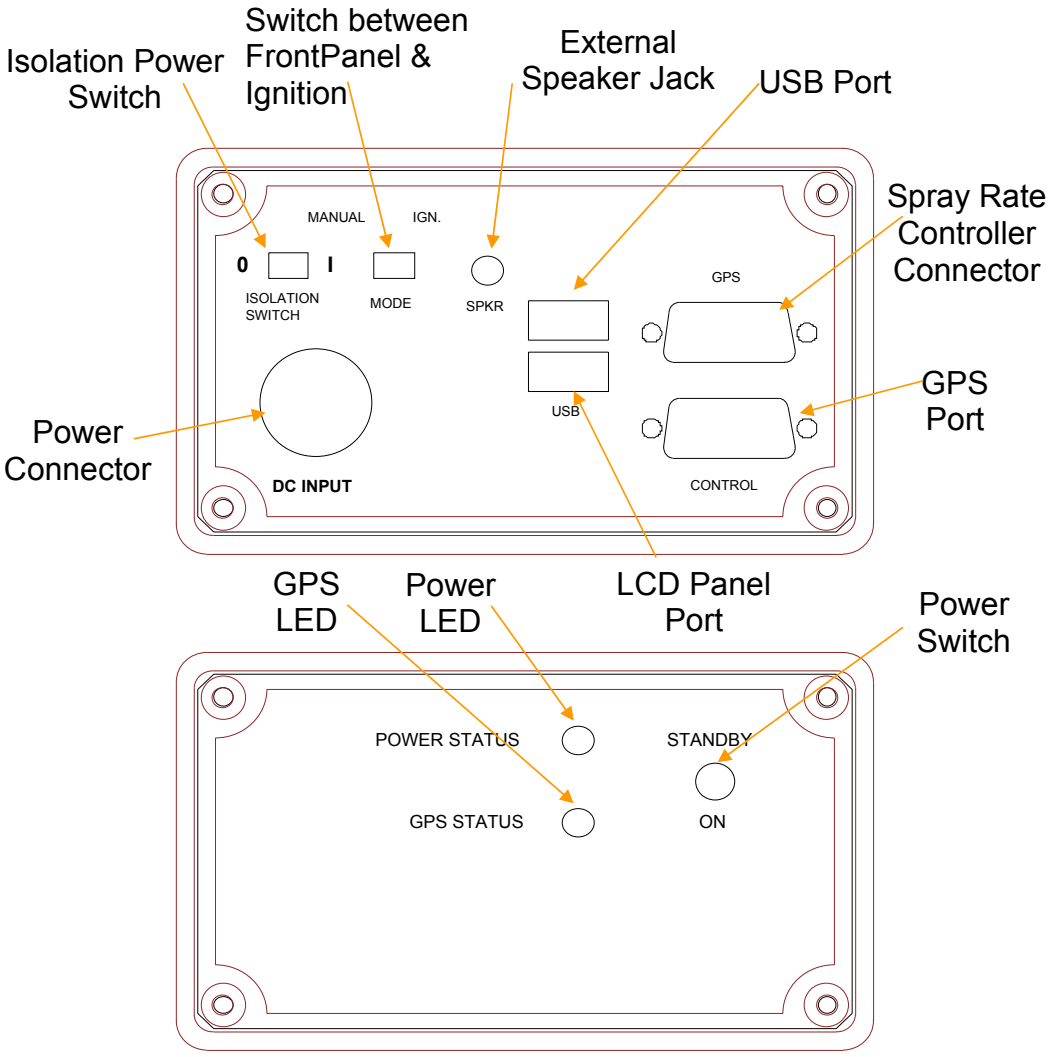


Figure 3-3: The AutoSPRAY 6100 Back Panel

Component	Description
GPS Port	Used to connect external GPS input.
USB Port	Used to connect USB devices such as memory drives or the RINEX button box used turn the Master switch ON or OFF.
Isolation Power Switch (IPS)	The IPS totally removes power from the controller; if the vehicle is started the AutoSPRAY 6100 will not start.
Spray Rate Controller Connector	Used to connect to the spray controller.
Power Connector	Used to connect to power input (12vDC).
LCD Panel Port	Used to connect LCD Display.
Switch between FrontPanel & Ignition	Used to turn power switch from FrontPanel Switch to Ignition and back.
FrontPanel Power Switch	Used to switch the AutoSpray 6100 on.

3.4 Configuring the GPS

Configuring the GPS Baud Rate

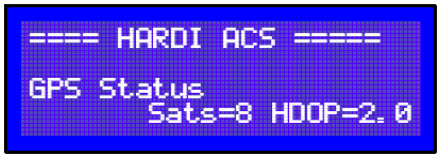
It is important that the AutoSPRAY 6100 is configured with the correct GPS baud rate. Select the correct baud rate according to the you GPS receiver by editing the Baud value in the GPS Menu.

Connecting GPS

The GPS is connected via a serial cable from the GPS receiver to the GPS port on the Back Panel of the AutoSPRAY 6100. See Figure 3-3 on page 18.

GPS Status

The GPS Status displays the current number of satellites that are available and the current HDOP (Horizontal accuracy indicator).



For Good GPS, the number of satellites must be greater than 4.

For Good GPS the HDOP should be less than 10.0. A HDOP of greater than 10.0 will result in Poor GPS.

DGPS Requirements

The AutoSPRAY 6100 by default requires differentially corrected GPS (DGPS) data which provides a more accurate position and enhances the overall performance of the system. However the AutoSPRAY 6100 can be configured to operate on GPS data only, which is done by editing the DGPS Required Menu.

GPS Health

The GPS Health is constantly indicated on the GPS status LED as denoted by the colour of the LED. Further information on the GPS health is also provided on the screen by a series of status messages.

GPS Status Messages

Status	LED	Description
Good GPS	Green	Good DGPS data being received.
No DGPS	Red	Good GPS data is being received but no differential correction signal is received.
Poor GPS	Orange	Poor DGPS data is received, < 4 satellites or PDOP > 10. AS6100 will not function
No Time	Blank	Correct data type & baud rate, no GPS time or position.
No Pos	Blank	Correct data type & baud rate, no GPS position.
No NMEA	Blank	Invalid data being received.
No Data	Blank	There is no data being received through the GPS port.

In order for the AutoSPRAY 6100 to be operational the GPS LED must be Green if the DGPS required option is set to YES. If the DGPS required option is set to NO the GPS LED must be Red.

GPS Alarms

The AutoSPRAY 6100, when in the OPERATIONAL mode will provide an audible alarm in the following situations.

- **DGPS Required YES**

  Whenever the LED changes state from GREEN
- **DGPS Required NO**

  Whenever the LED changes state from RED

The cause of the alarm should be investigated, and rectified, before continuing to use the AutoSpray 6100.

3.5 Configuring the Spray Rate Controller

The spray rate controller will not necessarily need to be configured to operate with the AutoSpray 6100. However it is necessary that one switch is selected as the Master switch, which controls when both the AutoSPRAY 6100 and the spray rate controller should be ON or OFF.

When the AutoSPRAY 6100 is in Operational Mode (it controls the section switches) then the individual boom sections switches are to be in the OFF position.

Selecting the Spray Rate Controller

The AutoSpray 6100 can be configured to work with different types of spray rate controllers. From the Parameters menu, select the required controller from the options available.

Master Control

The Master Control setting is used to determine which device will be used to control the master on/off. The selections are as follows:

Control Setting	Device Used
Toggle	The Toggle Switch (optional device), is connected to the Communication port for Spray Rate Controller on the back panel. ☞ *(Does not function with John Deere spray controller)*
External	The Master switch on the spray rate controller.
Front Panel	The Standby Button on the front panel of the AutoSPRAY 6100 controller.
Button Box	The RINEX Button Box (optional device), is connected to the USB port on the back panel. ☞ *(After connecting the button box, press any control button to update the LCD.)*

Select the appropriate device via the Control setting in the Parameters Menu.

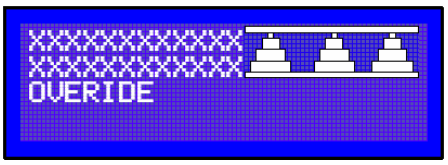
OVERIDE Function

The OVERIDE Function is used to override the status of the system so that selected sections are fixed to ON or OFF and are not controlled by the AutoSPRAY 6100. OVERIDE allows fixing sections to OFF on one side of the boom as the boom hangs over a boundary that is not required to be sprayed.

OVERIDE status can be changed via Overide setting in Setup menu.

Overide Status	Action
Disabled	Used to switch OVERIDE Function off. It is default status.
OFF	Allows user switching boom sections to OFF
ON	Allows user switching boom sections to ON.

To activate OVERIDE Press Enter button, in Main Menu. Now OVERIDE can be controlled by pressing buttons.



Press Enter again to save changes.

Press Standby to reset all changes.

Press to leave OVERIDE Menu, all changes, not saved by will be cancelled.

OVERIDE Function is accessible only after turning the Master on.

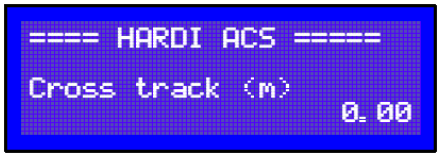
3.6 Configuring the Vehicle and Boom

When setting up the AutoSPRAY 6100 for the first time or for use in a new vehicle, there are various settings that must be configured for AutoSPRAY 6100 to function correctly and accurately.

The AutoSPRAY 6100 models the movement of the entire spray rig, whether it is a self propelled boom spray or a trailed boom spray. This allows the true position of the spray boom and its orientation to be accurately computed for precise control when switching the boom sections ON and OFF.

The measurements as described in the following section and depicted in Figure 3.4 are to be accurately measured on the spray rig and should be recorded in the Table 3.1 for future reference.

GPS Offset (Cross Track)



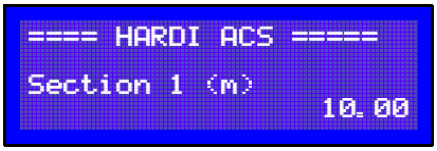
The distance between the centreline of the vehicle and the GPS antenna must be entered as the Cross Track value. Measure the distance and enter a positive value if the antenna is to the right of the centreline of the vehicle as viewed from the rear of the tractor facing forwards. Enter a negative value if the antenna is to the left of the centreline of the vehicle as viewed from the rear of the tractor facing forwards. The Cross Track value can be edited in the GPS Menu.

GPS Offset (Longtrack)

The distance from the GPS antenna to the centreline of the front axle on the spray vehicle. If a front boom is used the Longtrack measurement is to the flow point of the boom and not the front axle.

Boom Settings

The Boom Settings determine the overall width of the spray boom being used. Enter the number of boom sections and the width of each section in the Boom Width Menu.



Link and Axle Distances

The Link and Axle distances are used when determining the path of the spray rig as it moves around the field.
The Link and Axle distances should be measured as follows:

Link Setting	Measurement
Link 1	Link 1 is measured from the front axle centreline to the vehicle hitch point.
Axle 1	Axle 1 is measured from the rear axle of Link 1 to the hitch point of Link 1.
Link 2	Link 2 is measured from the hitch point of Link 1 to the hitch point or the flow point if it is the last link. (See Figure 3-4)
Axle 2	Axle 2 is measured from the rear axle of Link 2 to the pivot point of Link 2.
Link 3	Link 3 is measured from the hitch point of Link 2 to the flow point. (See Figure 3-4)
Axle 3	Axle 3 is measured from the rear axle of Link 3 to the flow point.

See Figure 3-4 for an illustration of the Link Settings, an expanded view is shown on page 26.

The number of Links and the Link and axle distances can be edited in the Vehicle Menu

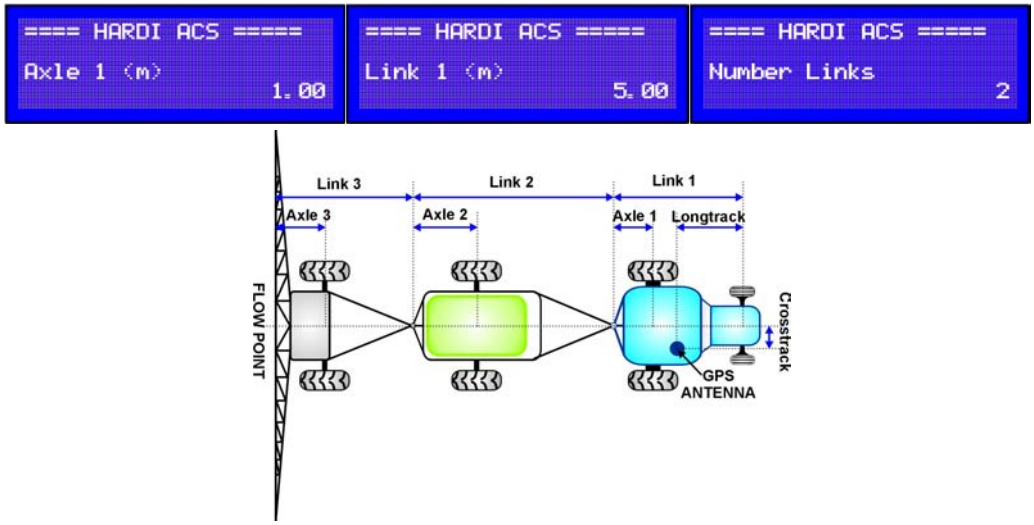


Figure 3-4 – Vehicle Measurements

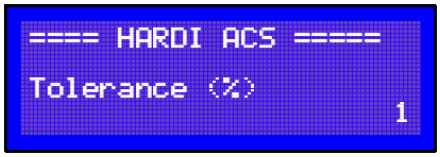
3.6 Configuring the Boom Spray Parameters

The following parameters are used when determining when to turn the spray valves on and off. To optimize the usage of AutoSPRAY 6100 it is important that these settings are configured correctly.

Miss Tolerance

The Miss Tolerance is used to decide when to turn valves on or off. When set to its default of 1%, the system will turn the valves on whenever any part of the sensed area has not been sprayed. It is effectively the percent of miss that the system will tolerate. If the value is increased, the system will not turn the valves on when traversing over a small missed area such as a line between two spray swaths.

The Miss Tolerance value can be edited in the Parameters Menu.



Search Width

NOTE: This is an advanced tuning parameter and should only be changed from its default value under instruction from authorized support personnel.

This value defines the amount of overlap allowed for when turning the valves on before leaving a sprayed area such as an end zone. Hence if the value is set to 2m (default) the spray section should turn on 2m before any part of the section reaches and unsprayed area. This can be used to decrease errors caused by inaccurate GPS positioning. When entering a previously sprayed area, the system will attempt to turn OFF at exactly the correct time.

The Search Width value can be edited in the Parameters Menu.

Latency ON

Latency ON is used to compensate for any time delay between the time the system requests the solenoids to open and the actual time that this takes place. For example, if it takes one second for a valve to open, a latency on of one second should be entered. In this case the signal to open the valve will be sent to the solenoid a second before the valve needs to open.

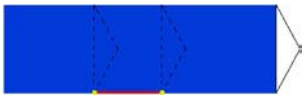
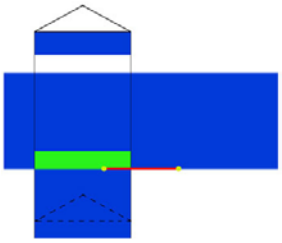
Latency OFF

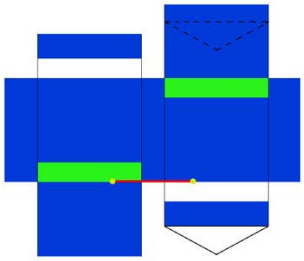
Latency OFF is opposite to Latency ON and is used to compensate for any time delay between the time the system requests the solenoids to close.

Measuring Latency

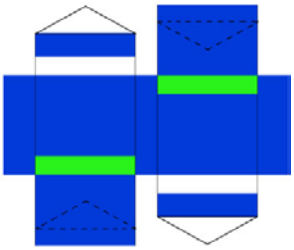
The quickest way to estimate the latency of the sprayer is to use a stop watch, turn a spray section on and time the delay between this action and when spray is coming out the nozzle onto the crop. This may be a very small value (a few tenths of a second and hard to measure accurately).

For a more accurate measurement, use the following procedure

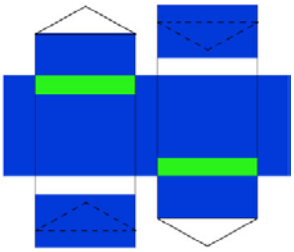
Step	Instruction	Diagram
1	Drive slowly in a straight line down the field for 200m with the sprayer on. The tank should have water only for the purpose of this exercise. Have another person mark the end nozzle of the boom with two pegs and a rope half way along the spray run.	
2	At right angles to the pervious spray run, spray at 20km/hr across the spray mark with one end of the boom crossing over the rope. Ensure that you have allowed enough distance before crossing over the line for the boom trailer to straighten up behind the tractor. Have someone measure the distance from the rope to where the sprayer actually reacted.	

Step	Instruction	Diagram
3	Repeat step 2 in the opposite direction.	
4	**Metric Calculations** If Speed(km/h) = The speed of the vehicle in kilometres per hour Distance (m) = The distance from the rope to where the sprayer reacted in metres. Calculate the latency using this formula: **Latency(s) = Distance(m) ÷ Speed(km/h) x 3.6** For example Assuming the operator was travelling at 20km/hr and the distance from the rope to where the sprayer reacted is 5 metres: Latency(s) = 5(m) ÷ 20(km/h) x 3.6 = 0.9 seconds.	
5	**Imperial Calculations** If Speed (mph) = The speed of the vehicle in miles per hour. Distance (ft) = The distance from the rope to where the sprayer reacted in feet. Calculate the latency using this formula: **Latency(s) = Distance(ft) ÷ Speed(mph) x 0.68** For example Assuming the operator was travelling at 12mph and the distance from the rope to where the sprayer reacted is 16ft: Latency(s) = 16(ft) ÷ 12(mph) x 0.68 = 0.9 seconds Often the latency time for the sprayer to switch on will differ from the time to switch off. Currently a compromise needs to be made and averaging the two results is the best figure to use.	
6	Repeat steps 1 to 4, altering the latency figure by plus or minus 0.1 seconds, until the optimum result is achieved.	

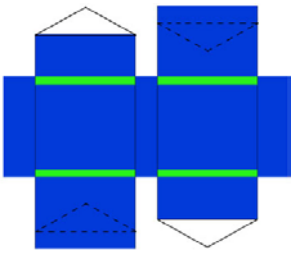
The following examples show possible scenarios and how to resolve the latency settings for optimum control of the AutoSPRAY 6100.



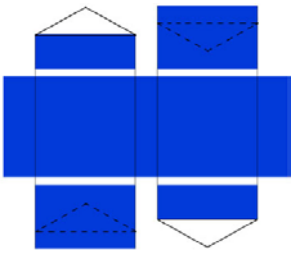
Latency set too low



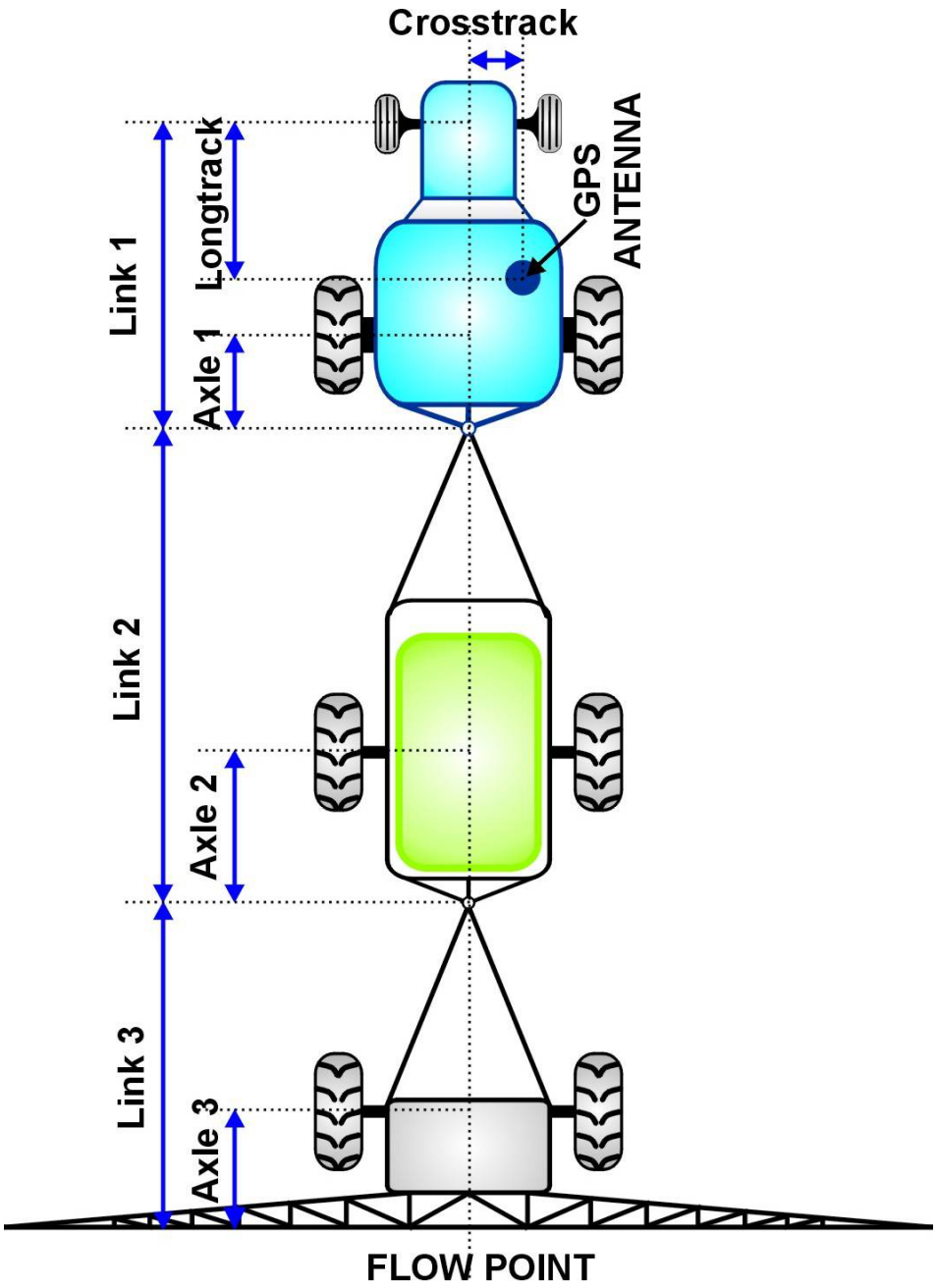
Latency set too high



Optimum Latency setup



Abnormal situation, increase search width



Record the settings for the spray rig as shown above on the following page as necessary to ensure that the AutoSPRAY 6100 will be as accurate as possible.

Spray Rig Settings

Cross Track	_____
Long Track	_____
Number of Links	_____
Link 1	_____
Axle 1	_____
Link2 (if applicable)	_____
Axle 2 (if applicable)	_____
Link 3 (if applicable)	_____
Axle 3 (if applicable)	_____
Nō of boom sections	_____
Section 1	_____
Section 2 (if applicable)	_____
Section 3 (if applicable)	_____
Section 4 (if applicable)	_____
Section 5 (if applicable)	_____
Section 6 (if applicable)	_____
Section 7 (if applicable)	_____
Section 8 (if applicable)	_____
Master Control	_____
Miss Tolerance	_____
Search Width	_____
Latency	_____

Table 3.1 Vehicle Settings

4

Using AutoSPRAY

This section describes the modes of operation when using the AutoSPRAY 6100 and also contains a guide on how to spray a field using the AutoSPRAY 6100.

4.1 Modes of Operation

The AutoSPRAY 6100 has two modes of operation, STANDBY and OPERATIONAL. In addition to this the AutoSPRAY 6100 has two non-operational modes, OFF and NON-POWERED.

The Power LED on the front panel of the AUTOSPRAY 6100 will indicate the mode of operation. The following notes describe the various modes.

Mode	LED	Operation
NON-POWERED	Blank	The AutoSPRAY 6100 is not powered at all when the unit is either not connected to a DC power supply or the Isolation Power Switch is OFF.
OFF	Red	The AutoSPRAY 6100 is connected to a power supply and the Isolation Power Switch is ON. Once the AutoSPRAY 6100 senses 12vDC on the ignition wire the unit will switch ON to the OPERATIONAL mode.
STANDBY	Orange	When the system is in STANDDBY mode, the spray controller can be used to manually control the sections. The AutoSPRAY 6100 will ignore any spraying completed when in this mode. STANDBY mode is used when the operator wishes to manually override the AutoSPRAY 6100. The LCD will display STANDBY MODE. Press the Standby Button on the front panel to enter STANDBY Mode. Press it again to enter OPERATIONAL mode.
OPERATIONAL	Green	When the system is not in STANDBY mode, it is in OPERATIONAL mode. When in OPERATIONAL mode, the AutoSPRAY 6100 records treatment data as the field is sprayed and uses this information to turn the boom sections ON and OFF accordingly. The LCD will display the menus which can be navigated. When the Master switch is ON and treatment data is being recorded, configuration settings cannot be edited.

4.2 Using AutoSPRAY to Spray the Field

The following is a step by step guide to getting the AutoSPRAY 6100 up and running.

Step	Instruction
1	Start the AutoSPRAY 6100 by turning the vehicle ignition ON. Wait until the LCD on the front panel is alight and displays the menu (This may take approximately one minute.).
2	Check that the Power and GPS LEDs on the AutoSPRAY 6100 front panel are green.
3	Turn the spray rate controller ON, all boom section switches are to be in the OFF position.
4	Turn the spray rate controller Master switch to the ON position.
5	Start to move the vehicle. The boom sections will automatically switch ON as the vehicle moves over a non-treated area and will switch OFF over a treated area which has been recorded by the AutoSPRAY 6100.
6	As the field is being treated, various status information can be viewed from the Display Menu. Information such as area treated and the percentage of overlapped area can be viewed in this menu. 
7	When the field has been treated, turn the master switch OFF.
8	If you wish to stop working, simply turn the vehicle ignition off to shutdown the AutoSPRAY 6100.
9	If you wish to continue working in a different field, see section 4.3 on starting a New Field.

4.3 Starting a New Field

When a field has been sprayed, it is important that the field is reset to begin spraying a new field.

To reset the field, hold down the Standby Button on the front panel for a few seconds until the screen displays “Clearing…”. The message “Treatment Clear” will be displayed when the field has been successfully cleared.

☞ *All data in the field will be lost when the field is reset*

.

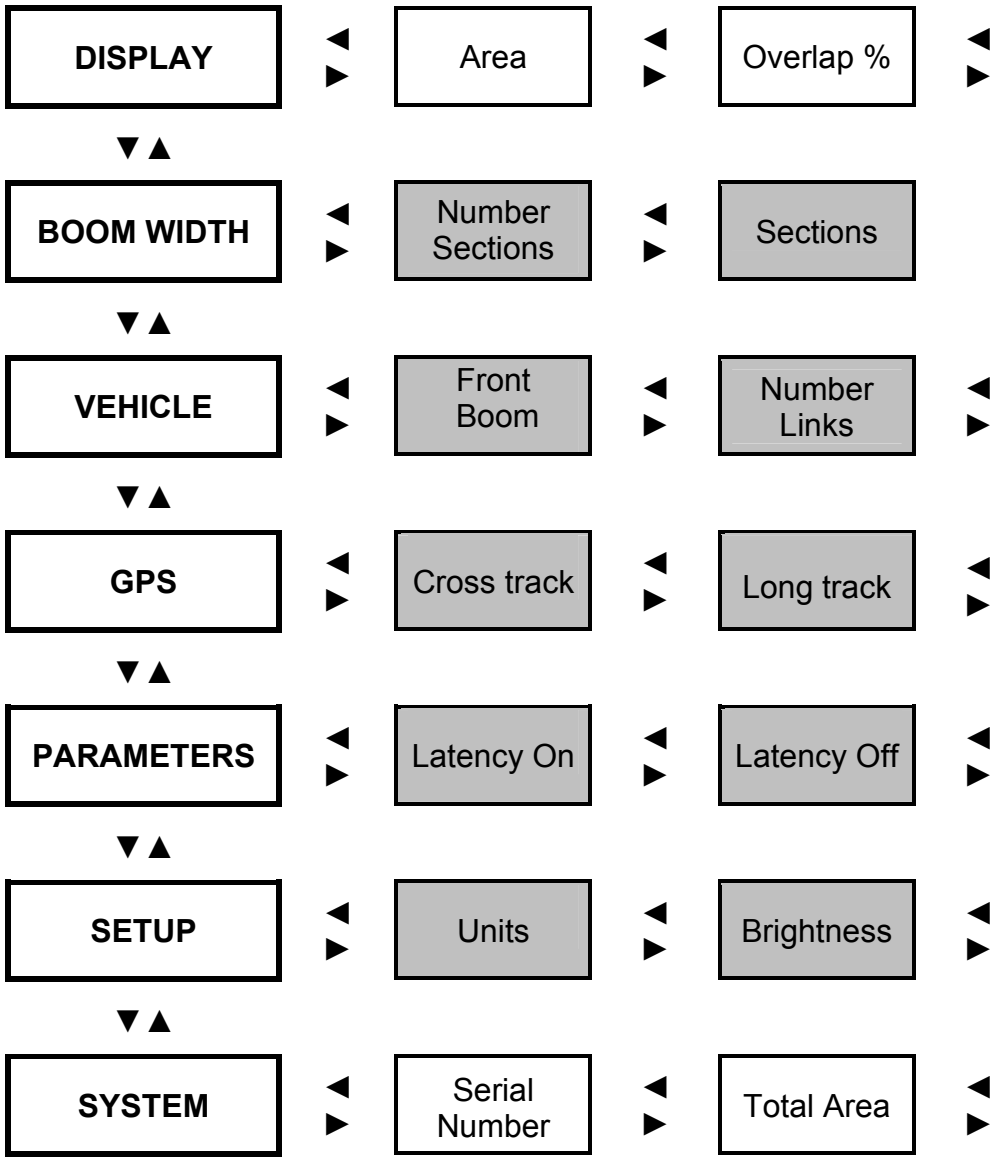
5

The Menu System

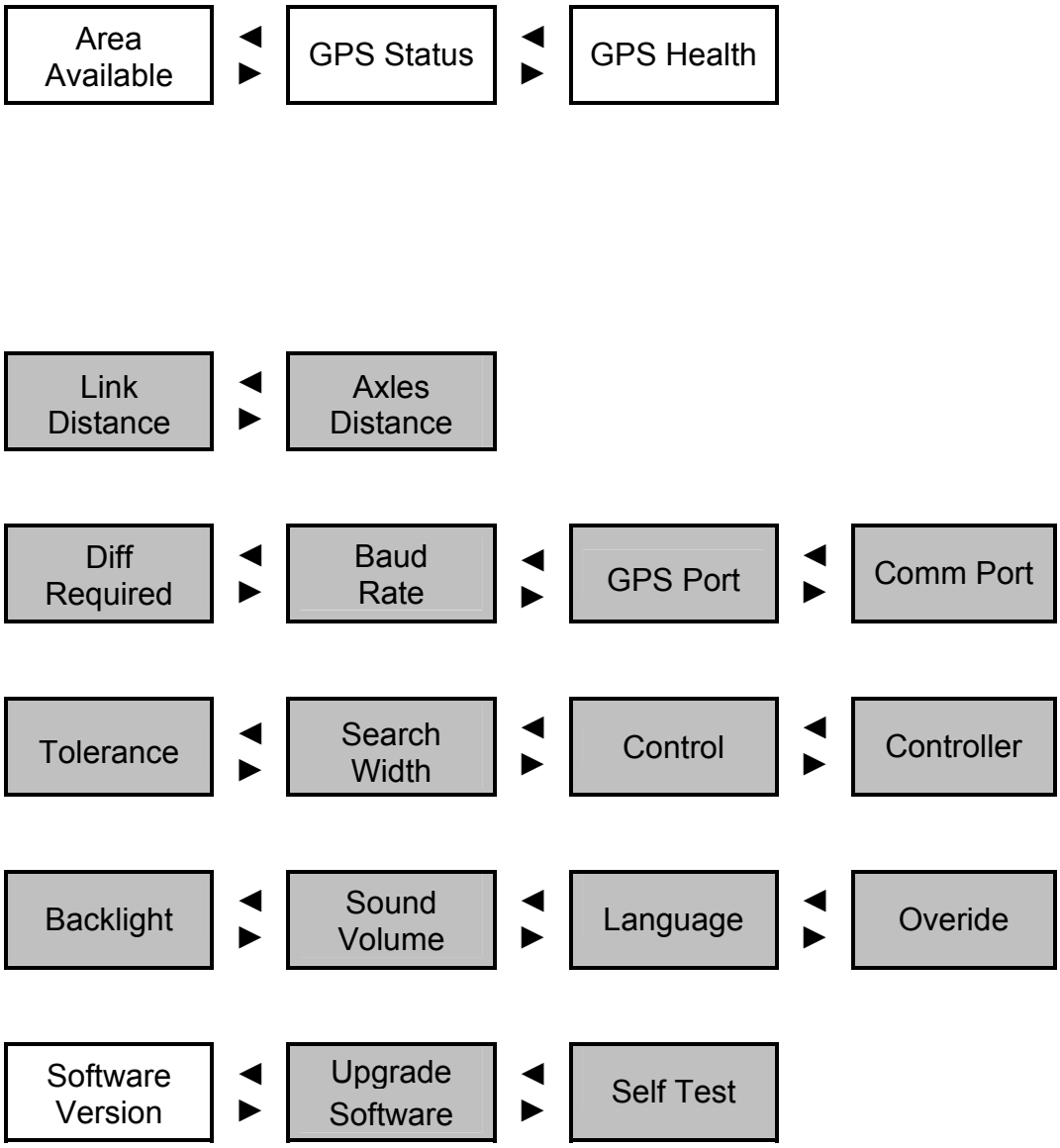
This section describes how to navigate the menus of the system.

Furthermore this section describes each menu, the individual menu items and their usage.

5.1 The Menu Hierarchy



☞ *Master and Section status information is shown on each sub-menu title screen.*



☞ *Menu Items shaded in grey can be edited when not spraying.*

☞ *For activating Self Test Status Master should be ON.*

5.2 Navigating the Menus

The AutoSPRAY 6100 Menu system is used to view and change settings.

Use the buttons to move between menus.

Use the buttons to move between sub-menus.

Press the Enter button to select a sub-menu item for editing.

The following is an example on how to change the number of boom sections.

Step	Action	Result
1	Press	==== HARDI ACS ===== Boom Width
2	Press	==== HARDI ACS ===== No. Sections 3
3	Press	==== HARDI ACS ===== No. Sections
4	Press	Value changes
5	Press	Value Saved

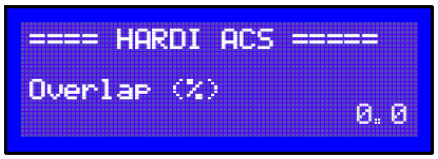
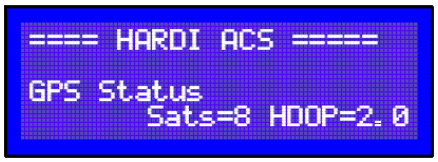
☞ *Sub-menus cannot be edited when spraying. The System Message will be displayed.*

==== HARDI ACS =====
Turn Master Off

☞ *To change the digit being edited, press the keys until the correct digit is highlighted.*

5.3 The Display Menu

The Display Menu contains information related to the field that is being currently worked.

Menu Item	Edit	Description
	☒	The menu title.
	☒	The area treated in the current field.
	☒	The percentage of overlapped area in the current field.
	☒	The area available on the system before the field must be reset (maximum is 800 Ha when then field is reset).
	☒	Displays GPS status information. **Sats** = The number of GPS satellites available. There must be at least 4 satellites for the system to be operational. **HDOP** = The horizontal accuracy indicator. The HDOP must be less than 10.0 for the system to be operational.
	☒	The GPS Health indicator. See Section 3.4

5.4 The Boom Width Menu

The Boom Width Menu displays the current boom settings and allows them to be edited.

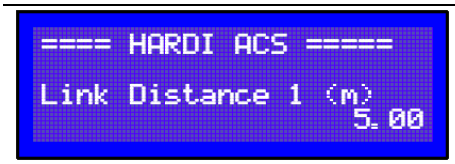
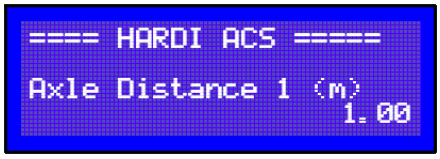
Menu Item	Edit	Description
	☒	The menu title.
	☑	The number of boom sections. This setting will determine the number of section widths displayed in the following menu items (3 boom sections are shown in this example). Default = 1 Maximum = 30
	☑	The width of boom section 1. Default = 0m Maximum = 100m minus other section widths.

NOTE: The number of sections widths to be entered is determined by the number of sections entered. Only one section width is shown in the Boom Width Menu above.

☞ *The maximum total width of all boom sections is 100 m.*

5.5 The Vehicle Menu

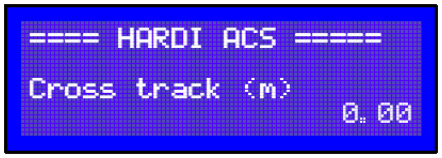
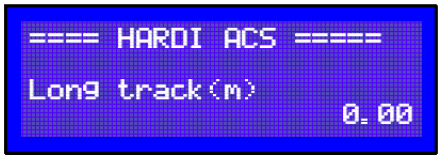
The Vehicle Menu displays the current vehicle settings and allows them to be edited.

Menu Item	Edit	Description
	☒	The menu title.
	☑	Allows including front boom to vehicle. Default=No. (Not Hardi)
	☑	The number of links on the vehicle. This number will determine the number of link and axle measurements required in the following menu items. (2 Links are shown in this example) Default = 1 Maximum = 3 (Not Hardi)
	☑	The length of link 1. See Figure 3-4 for link 1 measurement points. Default = 5m Maximum = 40m
	☑	The length of axle 1. See Figure 3-4 for axle 1 measurement points. Default = 1m Maximum = Length of Link 1

NOTE: The number of Links and Axles is determined by the number of Links. Only one Link and Axles width is shown in the Vehicle Menu above.

5.6 The GPS Menu

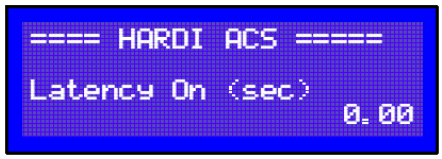
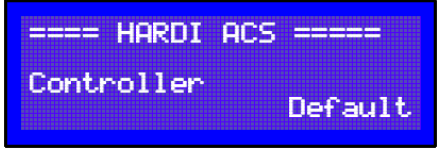
The GPS Menu displays information related to GPS and allows the GPS settings to be edited.

Menu Item	Edit	Description
	☒	The menu title
	☑	The GPS antenna offset measured from the centreline of the vehicle. Enter a **positive** offset if the antenna is offset to the right of the centreline or a **negative** offset if the antenna is offset to the left of the centreline. As viewed from the rear of the tractor facing forwards. Default = 0m Maximum = 100m
	☑	The GPS antenna offset measured from the centreline of the vehicle. Enter a **positive** offset if the antenna is offset to the right of the centreline or a **negative** offset if the antenna is offset to the left of the centreline. As viewed from the rear of the tractor facing left. Default = 0m Maximum = 100m

Menu Item	Edit	Description
	☑	Determines whether DGPS is required to operate the system. Default = Yes
	☑	The GPS input baud rate. The available baud rates are 9600, 19200, and 38400. Default = 19200 ☞ *Ports settings: Data bits = 8, Parity = None, Stop bits = 1.*
	☑	The GPS input port from GPS receiver. The available baud ports are COM0, COM1, CAN.
	☑	The communication input port from a 3rd party controller. The available baud ports are COM0, COM1, CAN.

5.7 The Parameters Menu

The Parameters Menu displays settings that effect the operation of AutoSPRAY 6100 and allows them to be edited.

Menu Item	Edit	Description
	☒	The menu title.
	☑	The difference between electronic a mechanical switching on. Default = 0.00 seconds Maximum = 10.00 seconds
	☑	The difference between electronic a mechanical switching off. Default = 0.00 seconds Maximum = 10.00 seconds
	☑	The tolerance used for shutting the sections ON or OFF. Default = 1% Maximum = 99%
	☑	NOTE: This is an advanced tuning parameter and should only be changed from its default value under instruction from authorised support personnel. Default = 2.00m Maximum = 10.00m
	☑	Defines the method used to control the master.
	☑	Defines the external spray controller type. The supported controllers are: Hardi 5500/6500[12], BA7000[7], JD4720[7], P655[5],FlexControl[8], Hardi Mustang[7] - (Not Hardi) [] - denotes max number sections

☞ *See sections 3.5 & 3.7 for further details.*

5.8 The Setup Menu

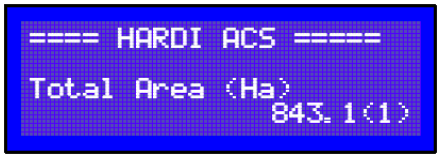
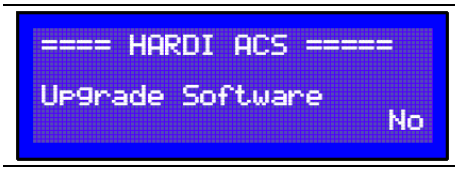
The Setup Menu displays various settings and allows them to be edited.

Menu Item	Edit	Description
	☒	The menu title.
	☑	Defines the units of the system. Default = Metric.
	☑	The brightness of the LCD backlight. 9 = Brightest. Default = 9 Maximum = 9
	☑	Turns the backlight on/off. Default = On
	☑	Used to adjust the sound volume. Set this value to zero to turn the sound completely off. 9 = Loudest. Default = 5; Maximum = 9
	☑	Defines the language of the system. The available languages are: English, Danish, French, German, Hungarian, Swedish, Finnish, Spanish. Default= English.
	☑	Defines OVERIDE status. ☞ *See section 3.5 for further details.*

☞ *Hard/Soft Reset menus are always in English.*

5.9 The System Menu

The System Menu displays various system settings.

Menu Item	Edit	Description
	☒	The menu title.
	☒	The system serial number.
	☒	Displays the total area covered by the system in its life time. This value will increase as area is treated and will not be reset when the field is reset.
	☒	The software version number.
	☑	Allows the software to be upgraded. Contact your local agent for software upgrade information.
	☑	Allows a Self Test to be run on the system. Individual boom section outputs, system volume and status LED's are exercised.

Appendix

Appendix A Glossary

Phrase	Description
AutoSPRAY	A system which can automatically control the state of the boom section switches, ie ON or OFF
Master	The switch, regardless of whether it be on the spray rate controller or not, that will control when the physical sections will commence spraying
Link	The distance measured along the length of the vehicle between Pivot points on the vehicle

Appendix B AutoSPRAY 6100 Options

Part Nō.	Description	Usage
1-2262	Button Box	Used to turn the master ON and OFF. Connect via the USB port on the back panel.
1-2263	Foot Switch	Used to turn the master ON and OFF. Connect via the USB port on the back panel.
1-2260	Toggle Switch	Used to turn the master ON and OFF. Connect via the Toggle Switch port on the back panel.
1-2207	GPS cable	DB9F – DB9M serial cable straight through connections.
1-2208	GPS cable Controller Cable *Hardi5500/6500*	DB9F – DB9F serial cable with cross-over connections.

Appendix C System Messages

System Messages will display when an event or error occurs.

Please record any message that could assist if support is required.

Message	Meaning
Turn Master Off	The master switch must be turned off before this function can be selected.
Clearing...	The current treatment is being cleared.
Treatment Clear	The current treatment has been successfully cleared.
STANDBY MODE	The system is in standby mode.
Upgrading...	The system software is being upgraded.
Upgrade Complete	The system software has been successfully upgraded.
Error: copying	An error occurred copying a file to or from the USB drive.
Error: rename	An error occurred when upgrading the software.
File not found	The file to upgrade was not found on the USB drive.
Please Reboot	Please reboot the system after changing baud rate or upgrading the software.
Copy Complete	The files were copied successfully to the USB drive.
Copying…	Files are currently being copied to the USB drive.
Width too large	The total width entered for the boom sections exceeds the maximum allowable width (100m)
RINEX	System is initializing
Soft Reset	A soft reset is being performed.
Hard Reset? No Yes	Do you want to perform a hard reset? Press arrow key beneath your choice.

Message	Meaning
Reset Failed	The reset failed.
Reset Complete	The reset completed successfully.
Loading...	The system is loading the current field.
Low Disk Space	Disk space is low.
Disk Space Full	Disk space is full.
Exiting...	The system is preparing to turn off.
Out of limit!	The system has travelled more than 10km from the starting point and is now out of limit.

Appendix D Troubleshooting

The AutoSPRAY 6100 is a robust system and should provide many years of trouble free service. In the unlikely event that something is not correct please check the following points before contacting your local dealer for service.

Problem	Probable Cause	Action
Boom sections do not switch OFF	Incorrectly wired	Check wiring
	No GPS signal	Check that GPS is being received
	Boom section switches are ON	Turn section switches OFF
	Miss Tolerance set too low	Check settings on Miss Tolerance
	Search Width set too high	Check settings on Search Width
	Master Switch incorrectly set	Check settings for Master Switch
Boom sections switches switch at the wrong time	GPS is inaccurate	Check with the GPS supplier
	Latency setting is set incorrectly	Check latency settings with boom sections
	Search Width is incorrectly set	Check settings on Search Width
Status LEDS don't light up	Fuse has blown	Replace Fuse
	IPS is switched OFF	Switch IPS ON
	Incorrectly wired	Check wiring to vehicle battery & ignition

Problem	Probable Cause	Action
NO GPS signal	Check GPS Incorrect GPS settings Incorrect GPS cable	Check that the connected GPS is turned ON and working Check GPS settings match the GPS receiver Check that the correct GPS cable is being used
Boom sections do not switch OFF	Incorrect cabling	Check that the spray rate controller cable is properly connected
	Incorrect Miss Tolerance settings	Check settings for Miss Tolerance
	Incorrect Master Switch settings	Check settings for Master switch
AS6100 will not power up	Incorrect cabling	The AS6100 has not been correctly installed, check the ignition wire
	IPS is OFF	Turn the IPS switch ON
AS6100 will not save settings after restart	Incorrect cabling	The AS6100 has not been correctly installed, check the ignition wire
	Not shutting down the unit correctly	Switch the AS6100 OFF by turning OFF The vehicle
AS6100 is very slow to respond	The last data file may be corrupt	Perform a soft reset as denoted in Appendix E, the hard reset should only be done as directed by an authorised technician
It is difficult to read the LCD screen	Check that the AS6100 is operational	Turn the system ON by starting the vehicle
	Check that the brightness is fully UP	Turn the brightness Up on the AS6100

Problem	Probable Cause	Action
It is difficult to hear the AS6100 alarms	Check that the volume is up	Turn the volume Up on the AS6100
	Check that the speaker enclosure is not covered	Remove any obstructions from the speaker
Warning message that the Master cannot be switched OFF	The Master switch is ON	Turn the Master switch OFF
	Incorrect cable in GPS port and settings for the Master	Check the Master switch setting is not toggle and that the GPS cable is the one supplied with the AS6100
System constantly beeps	No GPS	Check that the GPS is correctly configured and connected to the AS6100
“File Not Found” message when upgrading software	Insufficient time to recognise upgrade media.	Wait 30seconds and then retry the upgrade operation.
System does not respond on toggle switch	Toggle switch is connected to wrong port.	Check that the Toggle switch is connected to Communication Port.
AS6100 does not respond	LCD was disconnected and then reconnected	Restart AS6100 by Oscillation switch
System stuck on loading, with USB stick connected	LCD is connected to wrong USB port	Swap the ports for LCD and USB stick

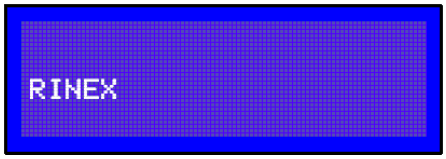
Appendix E Resetting the System

Soft Reset

Performing a Soft Reset will clear all treatment data from the system prior to the program starting.

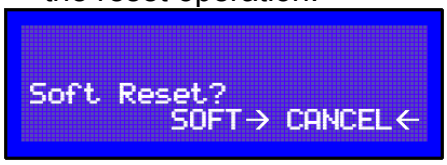
To Soft Reset the system:

1. Turn the system ON and watch the LCD display as it the system is powering up.
2. When the LCD displays RINEX, hold down the Standby Button on the AutoSPRAY 6100 front panel until a sound is heard.



3. Release the Standby Button immediately.

4. Press the arrow key.
5. "SOFT RESET?" is displayed for confirmation. Press the arrow key to carry out the reset, other key beneath to cancel the reset operation.



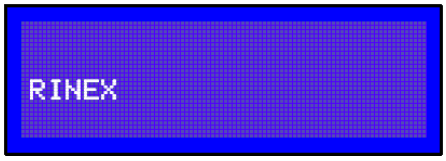
6. After the Soft Reset has been performed "Reset Complete" will be displayed and the software will continue to start with all treatment data cleared.

Hard Reset

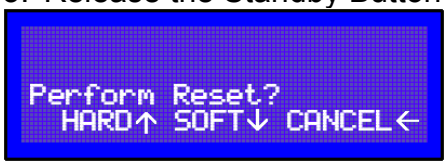
Performing a Hard Reset will clear all treatment data from the system and reset all settings back to factory defaults.

To Hard Reset the system:

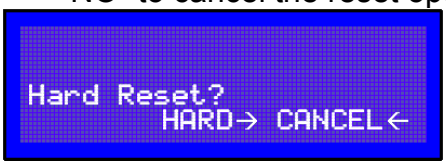
1. Turn the system ON and watch the LCD display as it the system is powering up.
2. When the LCD displays RINEX, hold down the Standby Button on the AutoSPRAY 6100 front panel until a sound is heard.



3. Release the Standby Button immediately.



4. Press the arrow key.
5. "HARD RESET?" is displayed for confirmation. Press the arrow key to carry out the reset, other key beneath the word "NO" to cancel the reset operation.



6. After the Hard Reset has been performed "Reset Complete" will be displayed and the software will continue to start with all parameters and treatment data cleared. **Note: It will be necessary to re-enter all setup parameters back into the AutoSPRAY 6100.**

☞ *Hard/Soft Reset menus are always in English.*

Appendix F Connector Pin-Outs

Spray Rate Controller Connector

Pin Number	Description
1	Not Connected
2	Receive data
3	Transmit data
4	Not Connected
5	Signal Ground
6	Not Connected
7	Reserved for CAN Bus
8	Reserved for CAN Bus
9	Not Connected

GPS Serial Port Connector

Comment: The pins which the toggle switch uses should not be shown here, or the operation of the toggle switch may be affected. Are they 1 & 9 ???

Pin Number	Description
1	Not Connected
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Signal Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Not Connected

Power Connector

Pin Number	Description
1	Battery Negative
2	Battery Positive
3	Remote Sense

Appendix G Specifications

AutoSPRAY 6100

Weight	► 1450grams
Size	► 70 (w) x 280 (d) x 110 (h) mm
Display	► Four line text with backlighting
Environment	► Casing Aluminium extrusion, environmentally robust and shock resistant
	► Operational 0° to +45°C
	► Non-operational -10° to +60°C
Data I/O	► Electrical interface ASCII serial
	► Plug types DB-9 male x 2 USB x 2 AMP 4 pin male
Power	► 11 - 14vDC @ 15W with fused 5A blade type
Cables	► Spray Controller In-line cable

Appendix I –Setting up a toggle

Toggle switch can be connected only after getting threw the following procedures.

1. Go to the **PARAMETERS** menu
   - Set **Control = TOGGLE**
   - Set **Controller = your current controller**

   It will say Please Reboot but just ignore this message and don't reboot until the end.

2. Go to the **GPS menu**
   - Set **Comm Port = CAN**. (just temporarily)
   - Then set **GPS Port = COM0**
   - Now change **Comm Port = COM1**.

3. Connect GPS and toggle switch to the controller port

4. Connect the controller (if the user has one) to the GPS port

5. Reboot system.