

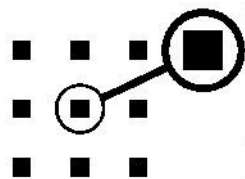
22C5

**22CX unitrol**

# 22C5

## INSTALLATION & OPERATION INSTRUCTIONS

22CX **unitrol** series



**FARMSCAN**

PART No: AM – 22C5V1

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# 1.0 Introduction

## 1.1 General Outline

The 22C5 spray controller will automatically maintain the selected target spray rate regardless of speed or pressure variations within the limits of the sprayer **pump capacity and nozzle size**.

Rates can be changed under GPS control when the 22C5 controller is connected via the serial port to a Farmscan canlink 3000 terminal or another computer-based product with GPS rate mapping and appropriate controlling software.

The 22C5 controller operates using a DC motorised valve to control spray rates. The 22C5 also provides the ability to interface with a 3 section switch box on a 3 section sprayer.

The 22C5 requires calibration of a flow sensor and a wheel sensor, which after installation is easily done with the unit's in-built test function.

The 22C5 provides a "DUMP" function, which flushes the remainder of the tank. The flush rate (L/min or G/min) can be controlled and set.

The 22C5 automatically opens a path for liquid to be returned to the tank. This occurs automatically whenever the sprayer is stationary and the unit is put on hold.

The 22C5's built in trip meter keeps records for up to 10 trips. Each trip will record the area covered and the amount of product sprayed. The "TOTAL" key displays overall area and distance covered as well as the total amount of product sprayed.

The latest feature of the 22C5 is language support. At present the 22C5 can support English, German and Danish. More languages will be added in updated software versions.

### About this Manual

This manual contains the necessary instructions to install, operate and calibrate the 22C5 spray controller.

## 2.0 Installation

### 2.1 Controller Installation

When installing the monitor use the brackets, securing knobs and mounting hardware supplied to mount the controller. Keep the following points in mind when finding the best location for the controller.

- The controller should be installed in the cab, clearly visible to the operator but not subject to intense heat or moisture.
- Keep the unit away from radios or other electronic equipment to minimize any risk of interference. As a precaution all connection cables should take an alternative route to other cables in the cab, especially antenna cables or clutch, solenoid and engine kill switch cables.
- Mount the unit firmly on the bracket using securing knobs supplied (AH-861). Don't use substitute bolts into the controller.
- When installing the wiring loom, ensure the green 12 way connector is inserted into the back of the 22C5 with the screws in the connector facing upwards.

**DO NOT force the connector. If it does not connect easily check that the connector is being inserted the correct way.**

- When running the tractor loom through the cab to the back of the controller it may be easier if the green plug is removed so the cable can be inserted through a smaller diameter hole in the cab wall etc.
- **Take note of the wiring of the green plug before removal. Refer to the back panel to make sure the cable colours correspond when rewiring the plug.**
- Use the cable ties supplied to secure the cable away from risk of damage.

## 2.2 Power connection

Do not connect power until all other installation is complete.

Connect **power cable** from tractor loom **direct** to 12-volt DC vehicle battery terminals to ensure a clean uninterrupted source of power.

**DO NOT** connect power cable to alternative power source such as the starter solenoid as damage may result.

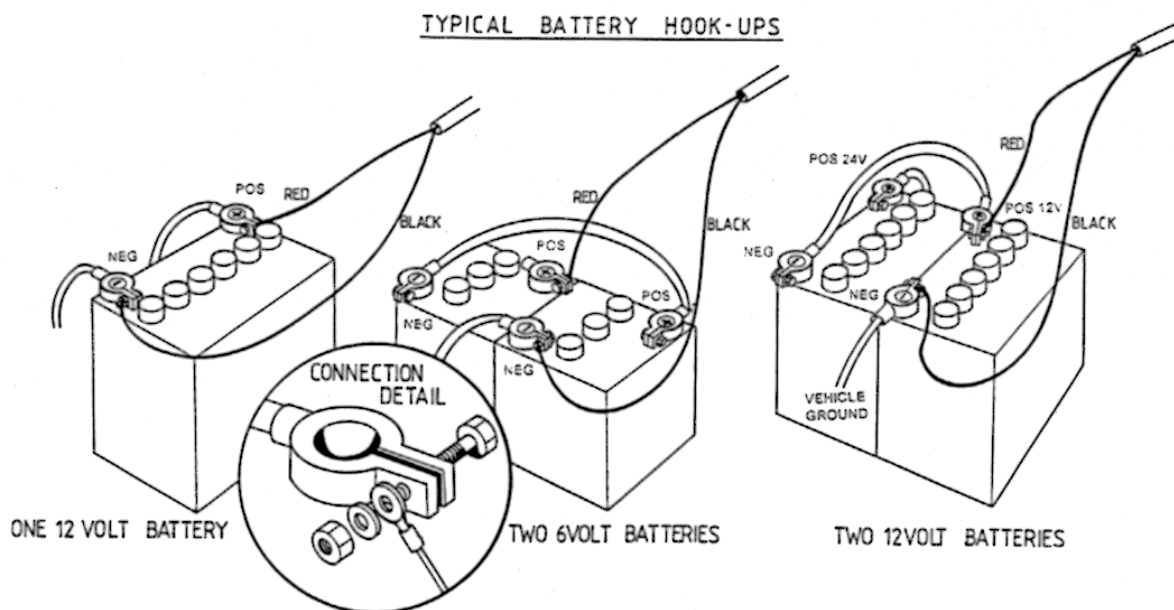
**DO NOT** connect other electrical equipment to the controller **power cable**.

Run the **power cable** away from radio antenna leads and mobile phones or wiring to solenoids or electric clutches.

Use cable ties supplied to secure power cable away from risk of damage.

Connections to battery terminals must be clean and tight.

**! WARNING** - Disconnect power cable when arc welding!



## 2.3 Wiring Loom Installation

- Lay the implement loom out down the length of the machine and fasten with cable ties along the body of the machine.
- Don't tighten the cable ties at this stage. This allows the loom to be adjusted so that the connectors align properly with the sensors (wheel and flow) and the spray section valves.
- When the sensors have been installed and connected to the loom, align the loom so that there is the least amount of excess cable near the sensors and the section valves. When correct tighten the cable ties.

## 2.4 Wheel Sensor Installation

The wheel sensor supplied, consists of a reed type sensor and magnet to be fitted onto **any undriven** ground wheel. The sensor is activated every time the magnet sweeps past the sensor. Follow the procedure below to install the wheel sensor.

### Wheel Sensor Installation Procedure:

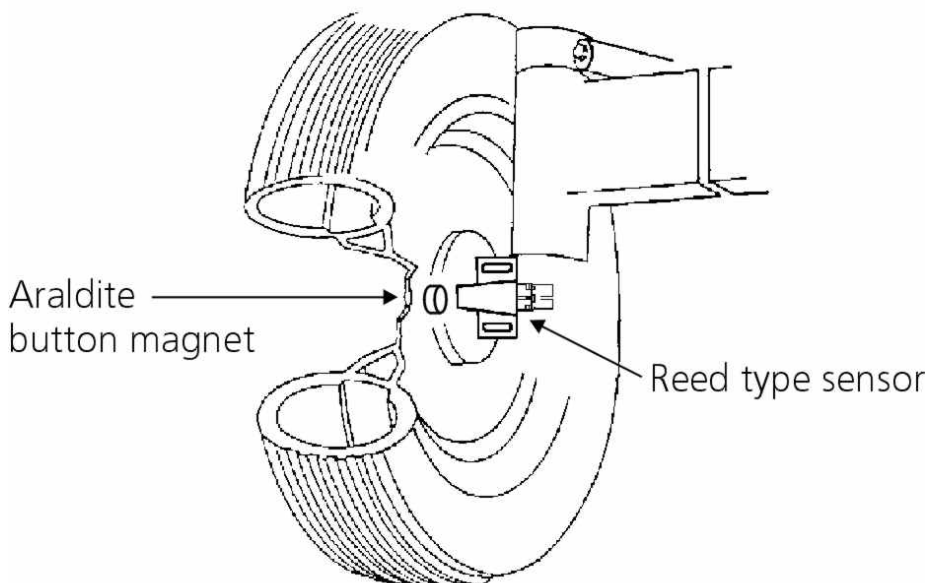
Araldite the supplied button magnet onto the wheel in a position that allows it to sweep directly past the wheel sensor within 10-15 mm on every rotation (fit both button magnets if required).

The magnet should be located as near the hub as possible to get the best ground clearance.

The sensor must be rigidly bolted to an existing structure, ideally in a protected position.

If mounting the sensor to a steered wheel, make sure the sensor turns with the steering mechanism to maintain equal clearance between the magnet and the sensor from lock to lock.

Connect sensor to cable supplied and use cable ties to secure cable away from potential damage points. Allow enough slack cable for axle movement and steering.



### NOTES:

#### Different Magnet Mounting Ideas using a AA-133 wheel magnet and nut.

1. Drill through rim and bolt magnet on using a Farmscan AA-133 magnet. If bolt in AA-133 magnet is too long or short replace with a M8 or 5/16 bolt to best suit.
2. Braze nut onto rim and screw magnet into nut.
3. Knock out a wheel stud and make up a piece of flat bar with suitable holes each end. Bolt the magnet to one end and secure the flat bar under the wheel stud adjusted to the required position.

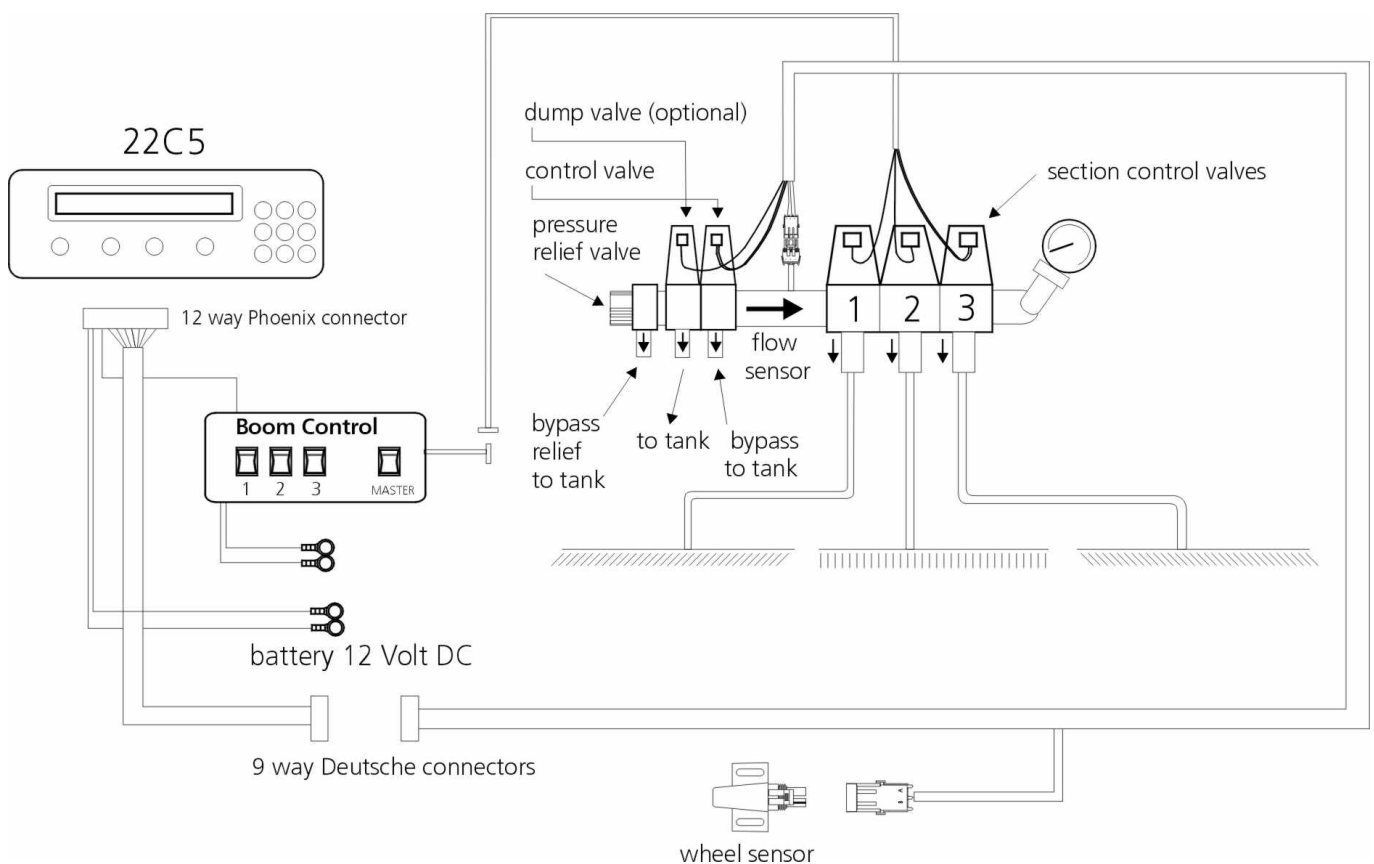
## 2.5 Proportional Control Valve Installation

The DC proportional control valve operates on the bypass line to automatically regulate the sprayer pressure to attain the selected rate.

As ground speed increases the control valve closes to increase sprayline pressure. As ground speed decreases the control valve opens to decrease the sprayline.

The bypass control must be plumbed to take off before the flow sensor and section valves as shown in the diagram.

An adjustable pressure relief valve must be fitted before the proportional control valve bypass line to provide a secondary relief path if the proportional valve is closed and sections are switched off (see drawing below of Arag setup only).



### NOTES:

#### PUMP HAMMER

Some diaphragm or piston pumps will hammer the liquid through the spray lines if the pulsation damper on the pump is not working correctly. This is immediately obvious because you will see the spray lines or mechanical pressure gauge vibrate a lot.

This vibration can severely upset the operation of the spray controller and will result in control errors or erratic control behaviour.

The solution is to either fix the existing pulsation dampener (normally this means adjusting the air pressure on top of the dampener until the hammering stops) or replace the device completely. Adjustment of the dampener should be done when the sprayer is working at the **normal pressure**.



## 2.6 Flow Sensor Installation

The flow sensor is installed on the main delivery line **after** the proportional control valve but **before** section control valves to provide flow rate to the controller.

All material passing through the flow sensor must go to the sections and must not return to the tank. Take care to install the flow sensor with the arrow pointing in the direction of flow.

There are two models of flow sensor available for your spray controller to suit different applications.

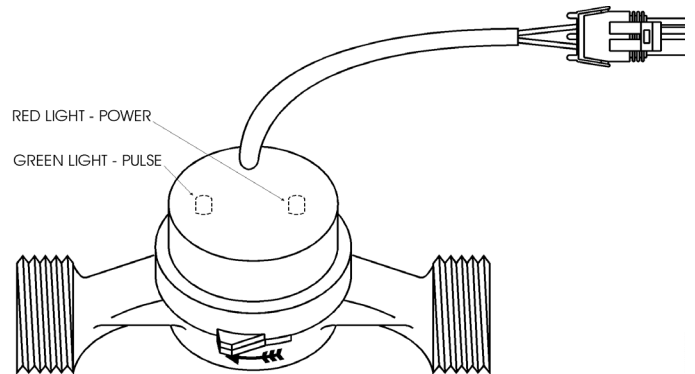
### 1. AA-121 1" Farmscan flow sensor

(low pressure low flow rate)

flow range: 2 - 90 L/MIN (0.5 – 20 G/min)

PPL factor: 45.6 (Fixed)

Max pressure: 100kPa (145 psi)



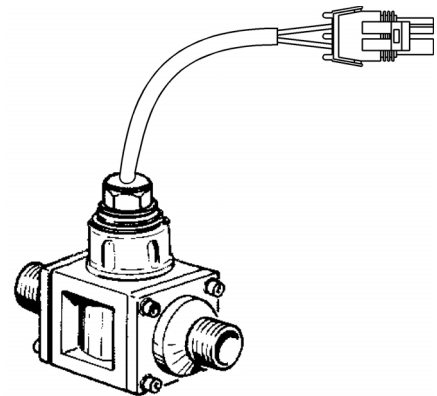
### 2. AA-230 1" Rapid Check flow sensor

(low pressure high flow rate)

flow range: 10 - 100 L/min (2 – 22 G/min)

PPL factor: marked on meter tag see note below.

Max pressure: 500kPa (725 psi)



#### NOTE:

If the PPL factor on the tag reads 642, when entering the flow PPL in calibration mode enter as 64.2. That is divide by 10.

To calculate the flow rate use the following formula:

$$\frac{\text{MAX L/HA} \times \text{Kph} \times \text{Boom Width (M)}}{600} = \text{L/MIN}$$

eg.  $\frac{30 \times 15 \times 12}{600} = 9 \text{ L/MIN}$

If your flow rate is outside the limits contact your dealer to arrange an alternative flow sensor to suit your application.

## 2.7 Section Control Installation (22C5)

The 22C5 version can control a three section sprayer using an external 3 section control panel such as the Farmscan 2403.

The 22C5 is able to calibrate and adjust for various widths of active sections by detecting which section switches are turned **on** or **off**.

### If you are using the Farmscan 2403 section control switch panel:

Remove the green 6 way plug running out of the 2403. Connect the wires from the 2403 to the following ports at the rear of the monitor. The loom will come standard with port 5 looped to ground.

#### 2403 Wires

White (LEFT section)  
Black (CENTRE section)  
Red (RIGHT section)

#### 22C5 Ports

Port 3  
Port 5  
Port 7

### For any other brand of section control switch panel:

Connect the **left**, **centre** and **right** section wires direct to ports **3,5** and **7** respectively at the rear of the monitor. These wires need to have +12V on them when the corresponding section is switched on. Refer to the section control switch panel instruction manual to determine which wires correspond to sections 1,2 and 3.

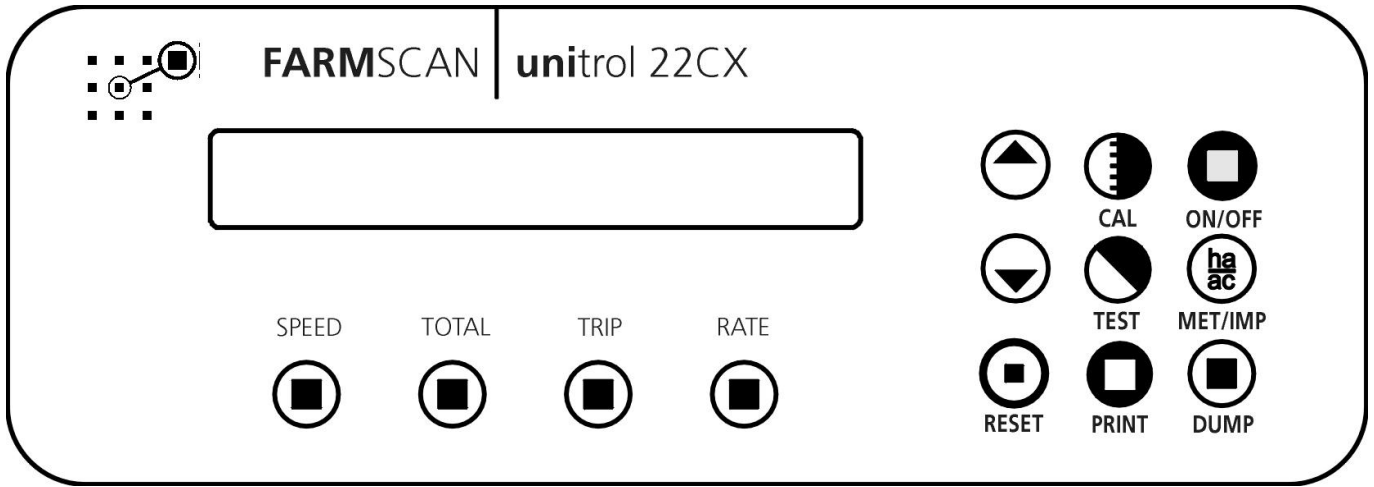
Follow the instructions that come with the section control switch panel to wire the panel to the section valves.

If you only require left and right sections only, then the centre section (port 5) needs to be grounded.


## 2.8 22C5 Port Connections

Port Number	Function
1	DC Motor Valve
2	DC Motor Valve
3	Section 1
4	Flow Sensor
5	Section 2
6	Wheel
7	Section 3
8	12 Volts OUT
9	Ground
10	0 Volts Battery IN
11	12 Volts Battery IN
12	Dump Valve

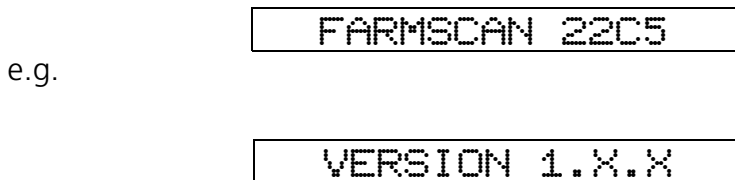
### 3.0 Operation



#### 3.1 Power On/Off Key

To switch the unit **on**, press the  key.

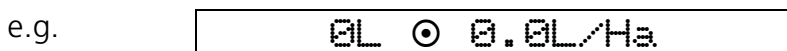
Whenever the unit is switched **on** the display will run through a start up routine displaying the version of software and the program the unit is running.



The version number indicates which generation of functions and features are programmed into your unit.


If an upgraded program is installed, a new version number e.g. "VERSION 1.1.1" will be displayed.

After momentarily displaying the current program and version number, the controller will then display the litres used and the target rate.



If stationary the controller will immediately go into '**hold**' mode when first switched on, see section **3.12 Run/Hold Function** for an explanation of this alarm.

### 3.2 Imperial / Metric Key

Press the  key to change any readout on the display between metric and imperial.


e.g.



AREA 10.0Ha

AREA 25.0Ac


**NOTE:** "IMP/MET" key is not active during calibration. All calibration factors must be entered in metric values.

### 3.3 Dump Key

Press the  key to flush the tank at any time.


The flush rate in the 22C5 can be increased or decreased from 0 (slowest) to 99 (fastest) L/min using the  or  keys.

### 3.4 Cal Key

Pressing the  key will step through a series of set up factors that need to be entered for the controller to work correctly. The calibration section of this manual explains each of these set-up factors in greater detail. Press and hold the "CAL" key to set the display language: English, German or Danish.

### 3.5 Test Key


The "TEST" key provides a means of testing that the sensors are working correctly. The test function is also used in the calibration procedures.

Press the  key and the "DISTANCE TEST" will appear.


e.g.

DISTANCE TST 0

The distance test enables the operator to test the wheel sensor mounted on the wheel. Each time the magnet passes the sensor the controller will beep and count the pulse.

To reset the pulse-count back to zero press the  key.

## Test Key cont'd

Pressing the  key again will display "FLOW TST".


e.g.

FLOW TST 0

The "FLOW TST" display should increment together with a regular beep that becomes faster as the flow rate increases until the beep becomes an almost constant tone.


### NOTE:

To test the flow sensor at least one section must be turned on and liquid is ready to flow.

To reset the flow count press the  key



## 3.6 Print Key



The print facility will print out trip area, and the litres or gallons sprayed for each trip (1-10) or all trips. Use the optional 2040 Printer Kit connected to the adapter cable provided in the kit.

Press the  key and the controller will display the current trip to be printed.

e.g.

PRINT TRIP 1 ?

To print another trip e.g. trip 2, press the "TRIP" key and use the  or  arrow keys to select the required trip then press "PRINT" again.

To print all the trip information, select "PRINT" then use the  or  arrow keys to change the display to "PRINT ALL TRIPS".

e.g.

PRINT ALL TRIPS?



When the correct option is displayed press  key again and the display will say "PRINTING..." and the printer will begin to operate.

If there is no trip data the monitor will display "NO TRIP DATA" and printing will cease.


### NOTE:

Each trip data takes **approx. 16 secs** to finish printing. "PRINTING ALL TRIPS" will take **approx 3 mins**.

## 3.7 Reset Key

To reset total area & litres or gallons sprayed, distance, trip area & litres or gallons and timer, press the  key and follow the prompts on the screen. The  key can also be used to return the controller to the base target rate quickly. See section **3.11** **Rate Key** for further details.

### 3.8 Speed Key


Press the  key to display the current working speed and flow rate.

e.g. 

### 3.9 Total Key

The "TOTAL" key is used to display total area covered, total liquid sprayed and the total distance travelled.

Area, amount sprayed and distance readings are only incremented when the unit is off hold.

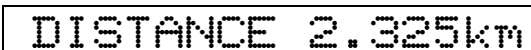
Press  key once to display total "AREA".

e.g. 

Press  key again to display total amount sprayed.

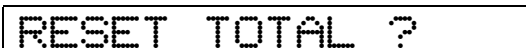
e.g. 


Press  key again to display total "DISTANCE"

e.g. 


**TO RESET TOTALS** Press  key once to start reset process.

Total area, total amount sprayed and total distance are reset simultaneously; this can be done at the start of a spraying program to keep overall records.

e.g. 

Press  again to complete reset process OR **to abort reset process**, press any other key.

After reset of totals you will have the **option** to reset all trip memories at the same time

e.g. 

Press  again to reset all trips OR **to abort reset of all trips**, press any other key.


## 3.10 Trip Key

The "TRIP" key allows the display of a sub total for area covered and litres applied. The "TRIP" function has 10 resetable memories to keep a tally of the areas and litres for 10 different plots or loads.

To display the current "TRIP AREA" press  key once.

e.g.


TRIP 1 12.5Ha

Press  key again to display "TRIP 1" litres.

e.g.


TRIP 1 0.85L

### TO RESET TRIP MEMORY

Press  key to start reset process

e.g.

RESET TRIPS 1?

Press  key again to complete reset process OR **to abort reset process**, press any other key.

To change to another trip memory, press the  or  arrow keys to change the current trip number on display.

e.g.

TRIP 2 0.00L

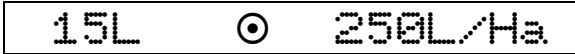
### **NOTE:**

Previously engaged trips can be viewed or reactivated by using the 'UP' and 'DOWN' keys to display and hence activate any one of the 10 trip memories 1-10. Whichever trip number is displayed will be active when working.

## 3.11 Rate Key

The rate readout is the amount of liquid being sprayed per hectare or acre.



Press the  key to display the rate readout.

e.g. 

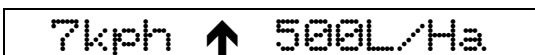
or





The rate that is displayed is the target spraying rate. Based on the **width** of the sprayer and the **speed**, the controller will increase or decrease the flow rate by controlling the proportional valve to attain the target rate. See section **4.4.1 Target Rate** for information on setting the target rate.

To increase or decrease the spraying rate while operating use the  or  keys. The amount of change in the rate from each press of the arrow keys can be set to any amount, e.g. 20, 100, 250 L/HA per step up or down from the standard target rate. This is referred to as the **STEP SET**. See section **4.4.2 Step Set** for instructions on changing the step set.

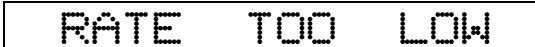
When the rate has been changed an arrow will appear on the display. This arrow reminds the operator which way the rate has been adjusted from the target rate.

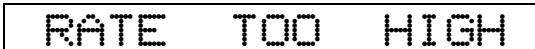
e.g. 

To return back to the base target rate quickly, press the  key.

e.g. 

If the controller cannot achieve the desired rate, the controller will display one of the following alarms.





e.g.

### Tank Function

The rate readout also shows the amount of liquid sprayed from the tank. This reading starts at 0L and counts up as more liquid from the tank is sprayed.

The 22C5 has a tank alarm function that is activated when 90% of the tank volume entered in the calibration menu has been sprayed. When activated the 22C5 will beep for 3 seconds.

### RESET TANK

Reset the tank reading by putting the unit on hold and pressing the "RESET" key. "RESET TANK?" will be displayed, press "RESET" again to confirm.



### 3.12 Run/Hold Function

The run / hold function is activated whenever the speed is zero (wheel is stationary) or all sections have been turned off.

When 'on hold' trip, total and distance functions will stop accumulating.

The "UNIT ON HOLD" message will re-appear every thirty seconds accompanied by an alarm to remind the operator that the monitor is not accumulating.

e.g.

UNIT ON HOLD

The monitor will go "OFF HOLD" and the trip and total functions will begin to accumulate as soon as speed is detected.

e.g.

UNIT OFF HOLD

If driving and all sections are turned off the monitor will go 'on hold'.

While moving turning sections back on will take the monitor off hold and return it to the normal spray mode and de-activate the dump valve (optional).

### 3.13 Section Switching

Sections can be switched on or off using an external switch panel, such as the Farmscan 2403. When sections are switched on or off the unit will automatically compensate by opening or closing the proportional valve to maintain the same spray rate.

#### Note

A dump valve can be installed before the flow meter. When 'on hold' the dump valve will be activated opening a path for product to be pumped back to the tank.

## 4.0 Calibration



### 4.1 General Outline



The 22C5 spray controller contains three levels of calibration menus:


1. Level 1 calibration menu – Easily accessible and used to change settings that may vary frequently.
2. Level 2 calibration menu – Changes the display language. Default language is English.
3. Level 3 calibration menu – Accessible through a simple sequence of key presses and used to calibrate the DC motor control valve.

All calibration factors in levels 1 and 3 must be entered before operation.

All calibration factors must be entered in **metric** units only. To adjust the factor displayed, use the

 or  arrow keys to change the displayed value.

Holding the  or  arrow keys will cause the numbers to change faster.

To save a calibration figure into memory, press the  key after the required figure is set. The controller will then proceed to the next calibration function in that menu.

To exit from the calibration routine, press any other operation key (e.g. "RATE") to return the controller to normal operation.

### 4.2 Memory Backup

An inbuilt memory backup system will hold all calibrations and accumulated totals in memory whenever the power is switched off.

Memory will last for at least 3 months after disconnection from the 12 Volt DC power source.



### 4.3 Calibration Warning

A calibration checking system incorporated into the system will warn you if any calibration factors are lost from memory or change value without your knowledge.


If for any reason a calibration factor does change value, a continuous series of beeps will sound and the display will indicate which calibration factor has altered.

e.g.



CHECK CALS!

In this case the operator must press the  key to check and re-enter the correct factor. Save this factor by pressing  "CAL" key again. Press any other key (e.g. "SPEED") to return to the normal display.

## 4.4 Level 1 Calibration Menu


Press the  key at any time during operation to go into the calibration menu.

### 4.4.1 Target Rate

With target displayed, the  or  arrow keys can be used to set the base target spraying rate.

e.g.

TARGET 100L/ha

Press the  key to set the slow hold speed.

### 4.4.2 Step Set

The step set is the amount the target rate can be changed up or down when using the arrow keys to change the rate on the go. e.g. 20L/HA, 100L/HA, or 250L/HA steps.


Use the arrow keys to set the step size as desired.

e.g.

STEPSET ↑↓ 100L/ha

#### NOTE:

If operating under GPS Rate map control, the step set may be used but your selection will be automatically overridden anytime the computer commands the rate to change.

Press the  key again to proceed to the width factor.

### 4.4.3 Width

Follow the procedure below to enter the section widths one at a time.

#### Procedure for 3 Sections

1. On section control panel switch master switch 'on'.
2. Switch **all** sections 'off'.
3. Switch section 1 'on'. "SECTION1" will be displayed, press "RESET" key to clear "L-WIDTH" value and enter a width using the up and down arrows.

SECTION1 10.00m

5. Switch 'off' section 1.
6. Switch centre section 'on'. "SECTION2" will be displayed, enter a width.

SECTION2 10.00m

7. Switch 'off' section 2.
8. Switch right section 'on'. "SECTION3" will be displayed, enter a width.


SECTION3 10.00m

### Procedure For Single Section Boom.

1. "T-WIDTH" will be displayed, press the "RESET" key to clear the value.
2. Enter the width of the boom using the up and down arrow keys.

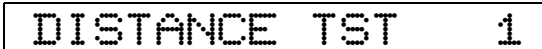
#### 4.4.4 Wheel

The Wheel factor is the distance covered per rotation of the wheel. Carry out the procedure below to establish this value.


Press the  key until "DISTANCE TST" is displayed.

e.g. 

Crawl the sprayer forward and stop when the "DISTANCE TST" beeps and counts up. (When the wheel magnet and sensor are aligned)

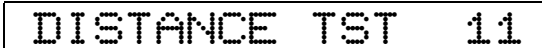
e.g. 

Peg the ground at the bottom centre of the sprayer main ground wheel tyre.

Press the  key to reset the "DISTANCE TST" counter to 0.

Drive forward in a straight line until the monitor has counted to approximately 10, stopping exactly on a beep count.





***(If you go past a beep don't reverse; go forward to the next beep.)***

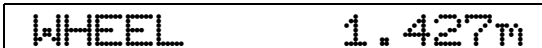
e.g. 


Measure the distance from the peg to the bottom centre of the same tyre.

Divide the distance travelled by the number displayed on the screen.

e.g.  $15.7\text{m} \div 11 = \underline{1.427}$  wheel factor

Press the  key to enter the calibration menu. Press the  key four times to display wheel and use the  or  arrow keys to enter the wheel factor.

e.g. 

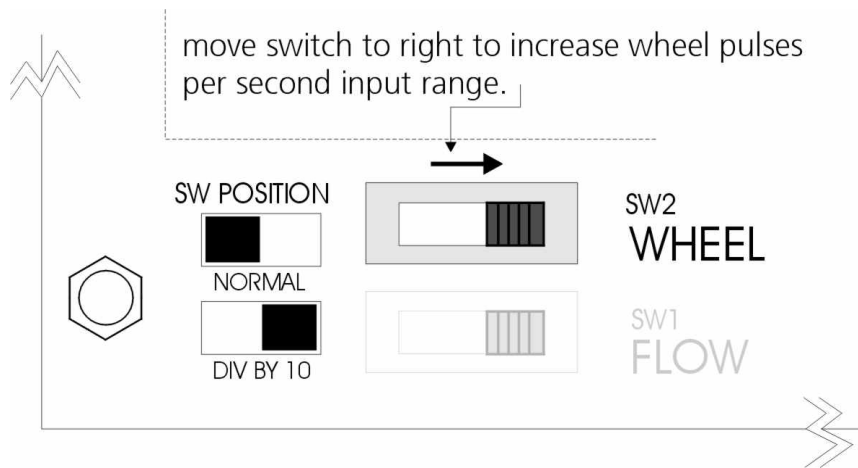
Press the  key to set the slow hold speed.

### Note! Jumper Setting for Wheel

At any point in the operating speed range of the vehicle, the wheel sensor generates more than 50 pulses per second then the wheel sensor jumper switch on the back board of the unit must be set. Follow the procedure below to set the jumper switch.

#### Procedure

1. Remove the front panel and lift the front circuit board to see the back board screwed to the back cover.
2. Locate the switches on the bottom left corner of the circuit board joined to the back of the unit.
3. Move the switch labelled "WHEEL" (top) to the right to the "/10" side.
4. The unit will now accept up to a maximum of 500 pulses per second from the wheel sensor.

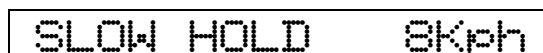


### 4.4.5 Slow Hold Speed

When the sprayer is forced to travel too slow, a loss of full spray pattern can occur due to low pressure at the nozzles.

The resulting stripping effect can be avoided by setting a **slow hold speed**, which will make the controller hold pressure when ground speed falls below a set point.

If slow hold is set for 8kph,  
e.g.



for speeds below 8kph the spray pressure is held constant.

**Warning:** Operating below the **slow hold speed** will result in over application and activation of the "RATE HIGH" alarm.

#### To Determine SLOW HOLD SPEED

1. Calibrate 22C5 as normal for the required rate.
2. Start spraying at normal speed then slow down until nozzle fan pattern begins to deteriorate. Take note of the ground speed readout when this happens and use this point for the slow hold speed.

Use the or arrow keys to enter the desired slow hold speed.

**To disable** the slow hold function set the slow hold speed to **zero**.

Press the key again to calibrate the flow sensor.

## 4.4.6 Flow Sensor Calibration

The flow sensor calibration factor relates to the number of pulses per litre (PPL) generated by the flow sensor. The PPL factor of every flow sensor is unique and will vary slightly depending on liquid viscosity.

Attached to every flow sensor is a tag, which gives the PPL factor for that sensor. Enter this PPL factor into the "PULSES/L" screen.

**Important:** After installing the system, the PPL factor should be checked before operating the controller by measuring into a known container. Disconnect a hose after the flow sensor that can be directed into a bucket. Preferably after a solenoid valve or another valve that can be used easily to stop and start the test. Follow the procedure below to test the flow sensor's PPL calibration factor.

### Test Procedure:

1. Switch the 22CX on. Press the "DUMP" key and use the 'UP' and 'DOWN' arrow keys to set a dump rate in "L/MIN" or G/MIN". Fully prime the flow sensor and hose before starting.
2. Press the "TEST" key on the 22CX front panel to display "TEST FLOW" on the screen. Press the "RESET" key to clear accumulated pulses.

eg

TEST FLOW 0

3. Start pump, activate section control, and hold measure flow coming out using a measuring bucket. Usually 10 – 20 litres is plenty. Shut off flow exactly at the desired point using section control. The test flow counter should stop counting, eg

eg

TEST FLOW 568

4. Take the "TEST FLOW" pulse reading from the 22C5 and divide it by the total litres. For example: **1425 pulses + 22.1 L = 64.4 pulses per litre** or a PPL factor of 64.4.
5. Repeat steps 1 –4 at least 3 times to verify the accuracy of the final result.
6. See below to enter the pulses per litre flow calibration factor into the controller.

### Important:

Perform calibration with the actual product for accurate results.

Recheck calibration when changing nozzles or if operating at significantly higher or lower pressures

### Note:


On "TEST FLOW" you can increase or decrease flow by using the 'up' and 'down' arrow keys.

## To Set Pulses/L Flow Cal Factor

1. Press "CAL" key a to display "PULSES/L" factor.

eg 

2. Use '▲' and '▼' keys to set correct the "PULSES/L" factor.

eg 

3. Press the "RATE" or "SPEED" key to return to the normal display.

### IMPORTANT:

Metal body flow sensors type AA-121/P use a factor of 45.6 PPL when factory adjusted.

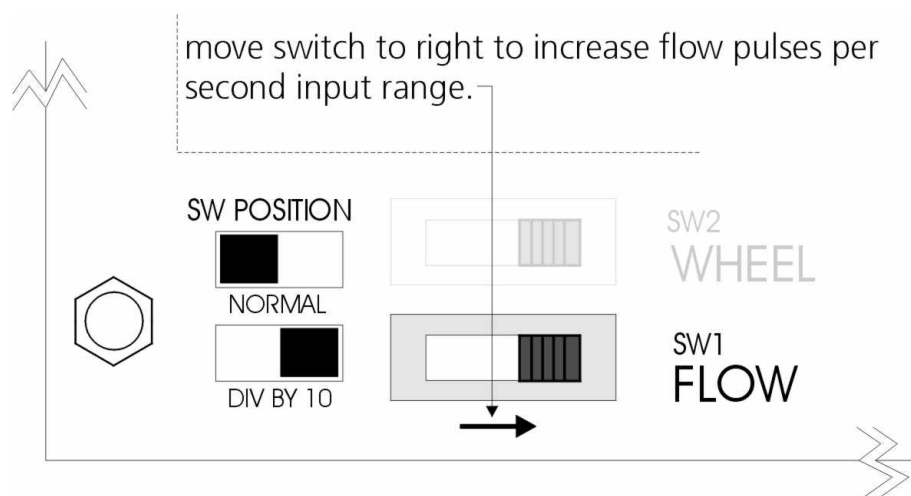
Check calibration into a bucket before use.

## Note! Jumper Setting for Flow

At any point in the operating flow range of the sprayer, the flow sensor generates more than 200 pulses per second then the flow sensor jumper switch on the back board of the unit must be set. Follow the procedure below to set the jumper switch.

### Procedure

1. Remove the front panel and lift the front circuit board to see the back board screwed to the back cover.
2. Locate the switches on the bottom left corner of the circuit board joined to the back of the unit.
3. Move the switch labelled "FLOW" (bottom) to the right to the "/10" side.
4. The unit will now accept up to a maximum of 2000 pulses per second from the flow sensor.



## 4.4.7 Tank Volume Calibration

Entering a tank volume in this screen enables the tank alarm function. When 90% of the tank volume entered in this screen has been used the tank alarm will sound.

Enter the volume of the tank typically used. For example if only 200 litres is used in a 500L tank enter 200L. Volumes as small as 1L and as large as 15000L can be entered.

## 4.5 Level 2 Calibration Menu

In this menu the display language and printer are set up. At present the display language can be set to Danish, English (default) and German. The header on the dockets the 22C5 prints can be customised.

### To Change Language Setting

Press the "CAL" key to display the "TARGET" screen as seen in section 4.4.1. Then press and hold the "CAL" key and the following screen will be displayed.

LANGUAGE ENGLISH

Press the up and down arrow keys to select a different display language. The display will be set to this language when pressing any other key such as "RATE" to exit the level 2 calibration menu.

### Selecting the Printer

After setting the display language press "CAL" to display the following screen.

PRINTER FARMSCAN

The above is the default setting if you are using a printer supplied by Farmscan. If you are using an OEM printer press the up or down arrow key to display "PRINTER OEM".

### To Customise the Printer Header

Once the printer has been selected press "CAL" to display the following screen.

HEADER FARMSCAN

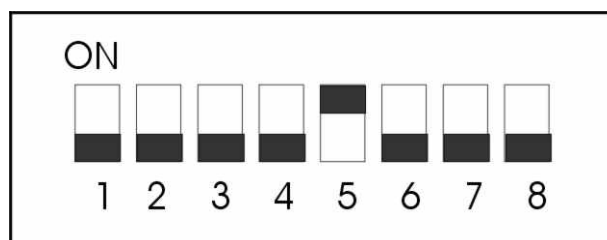
A header with a maximum of 9 characters can be set in this screen.

When entering this screen the cursor will be under the "F" in "FARMSCAN" use the up and down arrow keys to change the letters and press the "CAL" to move the cursor to the right. The "RESET" key clears the header text allowing you to start again.

Press and hold the "CAL" key to return to the language setting screen. Press any other key to exit. Upon exiting the screen the header set will be appear on the top of the docket when trips are printed.

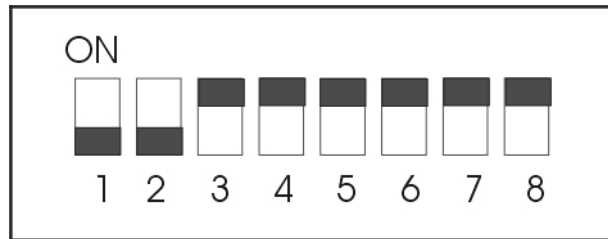
### Printer Dip Switch Setting

To print from the OEM printer (KYOSHA) make sure the dip switch under the paper roll on the printer is set as shown below.





To print from the printer (TP Micro Printer) supplied by Farmscan make sure the dip switch is set as shown below.



## 4.6 Level 3 Calibration Menu

This menu is used to set the proportional control valve response time.

### To Set Control Valve Response Time:

Press the "CAL" key to display the "TARGET" screen as seen in section 4.4.1. Then Press the "SPEED", "TEST" and "PRINT" keys simultaneously to access the valve calibration menu. The "VALVE RESP" screen will be displayed.

VALVE RESP 7

This value controls how quick the valve is driven to reach the set point. The default value is 7. If after setting the response time you find that the system takes too long to reach the set rate (L/Ha), increase this value, or if it over shoots continuously, decrease this value.

## 5.0 Parts List

ITEM	PART No.	DESCRIPTION	QTY
1	A-22CX	CONTROLLER	1
2	AH-406	MOUNTING BRACKET	1
3	AH-861	SECURING KNOBS	2
4	AC-22C5DCT	TRACTOR LOOM	1
5	AC-22C5DCS	IMPLEMENT LOOM	1
6	AA-110P	WHEEL SENSOR	1
7	HM-102	WHEEL MAGNETS	2
8	AM-22C5	22C5 MANUAL	1
9	AM-200	2 YEAR WARRANTY CARD	1

### 5.1 Flow Sensor Service Procedure

#### To be Followed Daily After Work is Finished

1. Unscrew the red cap and lift the turbine assembly out of the green sensor body.
2. Use clean water to wash away any foreign particles from the turbine assembly.
3. Use compressed air or simply blow without direct mouth contact into the turbine assembly to ensure the propeller spins freely.
4. Insert the turbine assembly into the housing and tightly fasten the red cap.

#### To be Followed After Every 50 hours of Operation

1. Unscrew the red cap and lift the turbine assembly out of the green sensor body.
2. Unscrew and lift out the yellow sensor from the turbine assembly.
3. Place the turbine assembly unit in a detergent bath for a few hours.
4. Remove the turbine assembly from the detergent bath and use compressed air to check that the propeller spins freely.
5. Reassemble the flow sensor making sure the yellow sensor and turbine assembly are tightly fastened.

## 6.0 Troubleshooting Guide

PROBLEM		POSSIBLE CAUSE / REMEDY
1.	CONTROLLER DOES NOT TURN ON.	<p>a) A fuse has blown. The controller uses internal poly-fuses which cut out if the monitor is drawing too much current and will automatically restore power when the fault has been repaired.</p> <p>b) Disconnect power cable at controller and test voltage is 12-13.8V DC from battery. Reconnect power to the controller and check that there is 12V between pins 10 &amp; 11 on the green plug at the back of the controller.</p> <p>c) Check connections at battery are <b>clean</b> and tight at terminals, try with engine running.</p> <p>d) Check that <b>red</b> wire is to positive and <b>black</b> wire is to negative.</p> <p>e) Check that no other electrical device is connected to the same power cable - the power cable must be completely independent. Do not share power with other devices such as foam markers, using the 22C5 loom.</p> <p>f) Connect controller direct to another 12 Volt battery known to be in good condition.</p> <p>g) Unable to locate fault – contact nearest Dealer.</p>
2.	LCD DISPLAY DROPS OUT OR GREY SQUARES APPEAR ON HALF THE READOUT	<p>a) If display rectifies when engine running this indicates battery is in poor condition or connections to battery are poor.</p> <p>b) If problem persists when engine running, then voltage supply is low or low current is a problem due to poor connections at battery or corroded inline fuse holder on loom.</p> <p>c) Clean battery terminals and power cable connections.</p> <p>d) Connect spray controller directly to an independent battery to prove if controller is OK.</p> <p>e) Disconnect proportional control valve - if problem goes away then this confirms insufficient current available from power cable.</p>
3.	CONTROLLER LOSING CALIBRATION VALUES.	<p>a) Controller not connected directly to battery. Connect black from loom directly to negative and red to positive side of battery. Do not share power with any other devices such as foam markers, using the 22C5 loom.</p> <p>b) If problem occurs regularly, then it is probably caused by outside interference. See "Interference Causes and Remedies" "Troubleshooting" section 20.</p>
4.	SPEED READOUT TOO FAST OR TOO SLOW	<p>a) Recheck "WHEEL" calibration is measured correctly and entered in metres. eg. 2.445 metres.</p>

PROBLEM		POSSIBLE CAUSE / REMEDY
5.	SPEED READOUT JUMPY	<p>a) Make sure magnet is facing sensor correctly as shown in "Wheel Sensor Installation" section 2.4. Use of an alternative magnet may cause problems due to wrong orientation of magnet.</p> <p>b) Check that wheel magnet is present and the magnet is 15 - 20 mm away from wheel sensor as they pass. Magnet too close can cause jumpy speed.</p> <p>c) If the readout is jumpy, it indicates that the pulses from the wheel sensor are inconsistent. Check for poor or intermittent connections to sensor.</p> <p>Check sensor cable for physical damage, making sure cable has not rubbed through to the chassis due to sharp edges.</p> <p>d) If fault can not be found, press "TEST" key on controller until "TEST WHEEL" is displayed. Drive slowly forward and listen to the beeps. The sound should be rhythmic at a fixed speed. If the sound is jumpy, and wiring is OK, then replace sensor.</p> <p>e) If the beeps can be heard whilst stationary, then vibration or interference could be the cause. See 'Troubleshooting Section' 20 " Interference Causes and Remedies".</p>
6.	SPEED READOUT INTERMITTENT OR STAYS AT ZERO	<p>a) Fault is probably a broken or intermittent connection to wheel sensor or perhaps a faulty sensor. Check all connections first.</p> <p>b) Make sure clearance between wheel magnet and wheel sensor is 15-20 mm. Check for the correct sensor, it should be black.</p> <p>c) Press "TEST" key until "TEST WHEEL" is displayed</p> <p>Disconnect wheel sensor from cable and use a short length of wire to short circuit across connector plug to wheel sensor cable (black &amp; white wires).</p> <p>Controller in cab should 'beep' continuously whilst wires are short circuited. Now wriggle all connections from wheel sensor plug back to controller to try and make beep sound fail thereby isolating cause of fault.</p> <p>d) If wiring and controller can not be faulted, replace sensor.</p> <p>e) If no audible response from shorting out wiring at wheel sensor connection, short out progressively between wires 6 &amp; 9 at all points back to controller to isolate broken section of cable.</p> <p>NOTE: pin 6 is white, pin 9 is black and correspondingly breakaway pin D is white and pin A is black.</p> <p>f) Remove green 12 way plug at rear of controller and short circuit directly across pins 6 &amp; 9. If still no result return controller to dealer for repair.</p>

PROBLEM		POSSIBLE CAUSE / REMEDY	
7.	WHEEL SENSOR TEST PROCEDURE		USE A MULTIMETER ONLY TO TEST THE WHEEL SENSOR.  a) Disconnect wheel sensor from cable. b) Switch Multimeter "ON: and select "OHMS" scale. c) Touch test probes together and meter needle should read zero "0 Ω" resistance. d) Connect test probes to wheel sensor pins. If meter goes immediately to zero without magnet, then sensor is short circuit (faulty). If meter stays to left of scale, hold wheel magnet in front of sensor, meter should go straight to zero. If meter fails to change, then sensor is open circuit (faulty).
8.	SPEED CAN'T GO HIGHER	a)	If receiving more than 50 pulses per second then set jumper setting on back circuit board to "/10" ie divide by 10. See section "4.4.4 Wheel Calibration".
9.	TOTAL AND TRIP AREA INCORRECT	a)	Check "SPEED" readout is correct and steady - if not, this will affect the area totals. See Troubleshooting sections 4, 6 and 7.
		b)	Recheck "WIDTH" calibration is set correctly in <u>metres</u> .
		c)	If section controls used, it must be connected to the correct input at rear of controller see section 2.7.
10.	TOTAL AND TRIP AREA WON'T RECORD	a)	Check that "SPEED" readout is working. If not see Troubleshooting Section 6.
		b)	At least one section valve must be switched on. (if used)
		c)	Flow sensor must be working OK.
		d)	With liquid flowing, press "SPEED" key and check if L/min readout is working. If not see flow sensor test procedure.
11.	RATE READOUT FLUCTUATES MORE THAN +/- 2%.	a)	Big fluctuations may be normal for 2-5 seconds only when changing speed or rates.
		b)	Check "SPEED" readout is stable at a constant driving speed. If not, follow Troubleshooting Section 6.
		c)	Check <b>all</b> calibrations are set correctly.
		d)	Check if flow sensor is giving a stable pulse rate as follows: * Activate section controls * With pump running, and stationary, press the "DUMP" key . * Adjust the flow in "L/MIN" or "G/MIN" using the up and down arrows to set a small rate such as "10L/MIN". Place a container under the section to capture spray. Start timing for a minute. After a minute measure the volume of liquid it should be 10L. If not the flow sensor is either faulty, requires cleaning or is subject to outside interference. Eliminate external causes as a possibility before servicing.
		e)	Press "TEST" key and select "TEST FLOW", slow the pump down and listen to the pulse rate. The beeps should be rhythmic and steady.

PROBLEM		POSSIBLE CAUSE / REMEDY													
11.	RATE READOUT FLUCTUATES MORE THAN +/- 2% continued...	f)	Check the nozzle manufacturers spray chart to see if the rate selected is compatible with the nozzles and driving speed. If nozzles are too large for the intended rate and speed, then the proportional valve will hunt for the right setting. Increase rates or get the right nozzles for the job.												
		g)	If "SPEED" and "L/MIN RATE" not fluctuating, follow section flow sensor service procedure.												
		h)	Fluctuation could be caused by a faulty pressure relief valve that dumps pressure prematurely, this will cause a continuous self defeating response from the spray controller as it tries to compensate.												
		i)	Water hammer could be the reason - See 2.5 "Proportional Control Valve Installation - Notes".												
		j)	Electrical interference could be causing the flow sensor to pulse erratically - this would result in the controller trying to compensate. See "Interference Causes and Remedies". Troubleshooting Section 20.												
		k)	Check if air is entering the system.												
12.	RATE READOUT STAYS AT ZERO	a)	Check "SPEED" readout. If no speed follow Troubleshooting Section 7.												
		b)	Check top of flow sensor when power is on – red light must be "ON". If no red light, check connections back to controller in cab. <b>Not applicable for AA-230 Flow sensor.</b>												
		c)	Use a multimeter to check for + 12 volts between red and black wires (on loom) to flow sensor. Check for +12 volts between pins 8 and 9 at rear of spray controller and through Pins B & A of breakaway plug at rear of towing vehicle.  AA-230 flow sensor wiring:  <table border="0"> <tr> <td><b>Flow sensor wiring</b></td> <td><b>Loom wiring</b></td> <td><b>+12 V</b></td> </tr> <tr> <td>Brown</td> <td>Red</td> <td><b>Ground</b></td> </tr> <tr> <td>White</td> <td>Black</td> <td><b>Signal</b></td> </tr> <tr> <td>Green</td> <td>White</td> <td></td> </tr> </table>	<b>Flow sensor wiring</b>	<b>Loom wiring</b>	<b>+12 V</b>	Brown	Red	<b>Ground</b>	White	Black	<b>Signal</b>	Green	White	
<b>Flow sensor wiring</b>	<b>Loom wiring</b>	<b>+12 V</b>													
Brown	Red	<b>Ground</b>													
White	Black	<b>Signal</b>													
Green	White														
		d)	If voltage OK to flow sensor but no red light, replace flow sensor and observe if green light is flashing. <b>Not applicable for AA-230 flow sensor.</b>												
		e)	If red light is "ON", then start liquid flowing slowly through the flow sensor and observe if the green light is flashing. <b>Not applicable for the AA-230 flow sensor.</b>												
		f)	If no response from green light, then follow flow sensor servicing procedure section 5.1 ( <b>Not applicable for AA-230 flow sensor</b> ). After servicing the controller does not register pulses then.												

PROBLEM		POSSIBLE CAUSE / REMEDY
12.	RATE READOUT STAYS AT ZERO continued...	<p>g) If green light OK, then follow (h) below <b>(not applicable for AA-230 flow sensor)</b>. Below corresponds to the AA-230.</p> <p>h) Press "TEST" key until "TST FLOW" is displayed.</p> <p>i) Disconnect flow sensor plug and use a short length of wire or long nose pliers to short out between the pins corresponding to the white and green wires of the flow sensor connector plug feeding back into the loom. Loom wires are black/white and black wires.</p> <p>j) A continuous beep should be heard from the spray controller. Now wriggle all wiring and connections from flow sensor plug to rear of spray controller and listen if the beep can be made to drop out.</p> <p>k) If no beep heard, then repeat test by shorting out progressively across pins 9 &amp; 4 at all points back to controller until faulty cable section is isolated. <b>Note:</b> pin 9 is black, pin 4 is white/black and correspondingly breakaway pin J is white/black and breakaway pin A is black.</p> <p>l) Test directly across pins 9 &amp; 4 of controller.</p> <p>m) If no audible response directly into controller then return controller to your nearest dealer for service.</p>
13.	<b>RATE LOW "SLOWER" ALARM OR CAN'T REACH MAXIMUM SPEED.</b>	<p>a) Indicates target rate selected is not achievable.</p> <p>b) Check manufacturers spray chart to see what rates should be achievable at maximum pressure.</p> <p>c) Check inline filters and nozzle filters which may be blocked causing restriction to available flow rate.</p> <p>d) Check flow sensor <b>inlet</b> for debris causing restriction</p>
14.	FLOW SENSOR INACCURATE	<p>a) Make sure flow direction arrow points in direction of flow.</p> <p>b) If diaphragm or piston pump, make sure pump is not hammering. See 2.5 "Proportional Control Valve Installation- Notes"</p> <p>c) Remove flow sensor and check <b>inlet</b> strainer on flow sensor is clear.</p> <p>d) Follow flow sensor calibration test procedure 4.7 and <b>make sure correct flow cal factor is set.</b></p> <p>e) Follow "FLOW SENSOR SERVICING PROCEDURE 5.1".</p> <p>f) If receiving more than 200 pulses per second then set jumper setting on back circuit board to "/10" ie divide by 10. See section "4.4.6 Flow Calibration".</p>

PROBLEM		POSSIBLE CAUSE / REMEDY	
15.	CONTROL VALVE WON'T OPEN AUTOMATICALLY	a)	1. Check "WIDTH" calibration factor is correctly entered and make sure section switches are activating "WIDTH" memories (if used). If section controls <b>not</b> used, make sure nothing is inserted into pins 3, 5 & 7 on the back connector. 2. Check "FLOW" cal factor is set. 3. Check "WHEEL" cal factor is set. 4. Check rates are set.
		b)	Check green 12-way plug at rear of spray controller is inserted properly with clips upwards and check implement breakaway connection making sure pins on male side are contacting properly.
		c)	Check ground speed readout is working correctly.
		d)	If no pressure, make sure pump is working correctly.
16.	VALVE KEEPS OPENING WHILE SPRAYING	a)	Check speed readout is working accurately. Refer Troubleshooting Sections 5 – 7.
		b)	Follow Troubleshooting 11 (c) to isolate flow sensor as cause.
		c)	Read nozzle manufacturers spray chart and make sure the intended rate can be delivered at the speed required within the minimum recommended operating pressure.
17.	VALVE RESPONSE TOO SLOW TO START SPRAYING	a)	If switching spray "OFF" regularly you must use "MASTER" section control to instantly Start / Stop spray.
		b)	You must switch 'OFF' master switch whilst <b>still travelling at working speeds</b> . If you shut 'OFF' too late the valve will have opened to bypass.
		c)	If centrifugal pump, when shutdown, pump must be able to cycle some material back to tank, otherwise cavitation may cause loss of pressure.
		d)	If ground wheel is large ie greater than 2 metres travel then additional magnets may be required to improve response at slow working speeds.
18.	RATE HI ALARM ACTIVATES FOR MORE THAN 2-3 SECONDS	a)	Check valve operation.
		b)	Press "CAL" key until slow hold function is displayed and check setting.
19.	PRESSURE TOO LOW UNDER AUTO CONTROL	a)	Check all calibration factors are correctly entered.
		b)	With air blast or low volume spraying make sure sufficient pressure is available.
		c)	Run sprayer and check hoses for split after proportional control valve.
		d)	Make certain nozzles are correct for the job.



## 20. INTERFERENCE CAUSES AND REMEDIES

CAUSES	REMEDY
Noisy wire ignition leads on petrol engine or pump motor	Replace with carbon leads. Fit suppressors to coil and distributor.
Faulty alternator	Have alternator serviced
Other electrical equipment running off spray controller power cable.	Run separate power cable <b>direct</b> to 12 V battery for spray controller.
Calibrations get corrupted when solenoids switched off.	Run separate power cable to section control centre. Fit diode across solenoid coil to clamp spike. Run cable for section control away from spray controller cable.  Separate spare cables from spray controller and section controller if coiled together.
Kill switch on pump motor upsets Controller	Run kill switch cable away from spray controller cables.
Controller upsets FM Radio	Boost aerial signal to radio – shield controller from radio – move controller and radio further apart.

### 6.1 Summary of Alarms

Alarm Type	Description
RATE TOO HIGH	Speed too slow to control to rate set
RATE TOO LOW	Speed too fast to control to rate set
UNIT ON HOLD	Monitor stopped accumulating data and product is returned to back to the tank
UNIT OFF HOLD	Monitor is returned to the normal spray mode.

# 7.0 Appendix

## 7.1 Specifications

### Supply Voltage

nominal supply voltage:	12V DC
maximum supply voltage:	14V DC
minimum output voltage at 12V supply:	11.3V
maximum current:	1A

### Wheel Input

Divide by 10 switch or jumper selectable on back board HP-B71

maximum input frequency:	50Hz
maximum input frequency /10:	500Hz
input voltage (activate):	0-4V
maximum input voltage:	14V

### Flow Input

Divide by 10 switch or jumper selectable on back board HP-B71

maximum input frequency:	200Hz
maximum input frequency /10:	2000Hz
input voltage (activate):	0-4V
maximum input voltage:	14V

## 3 Section Inputs

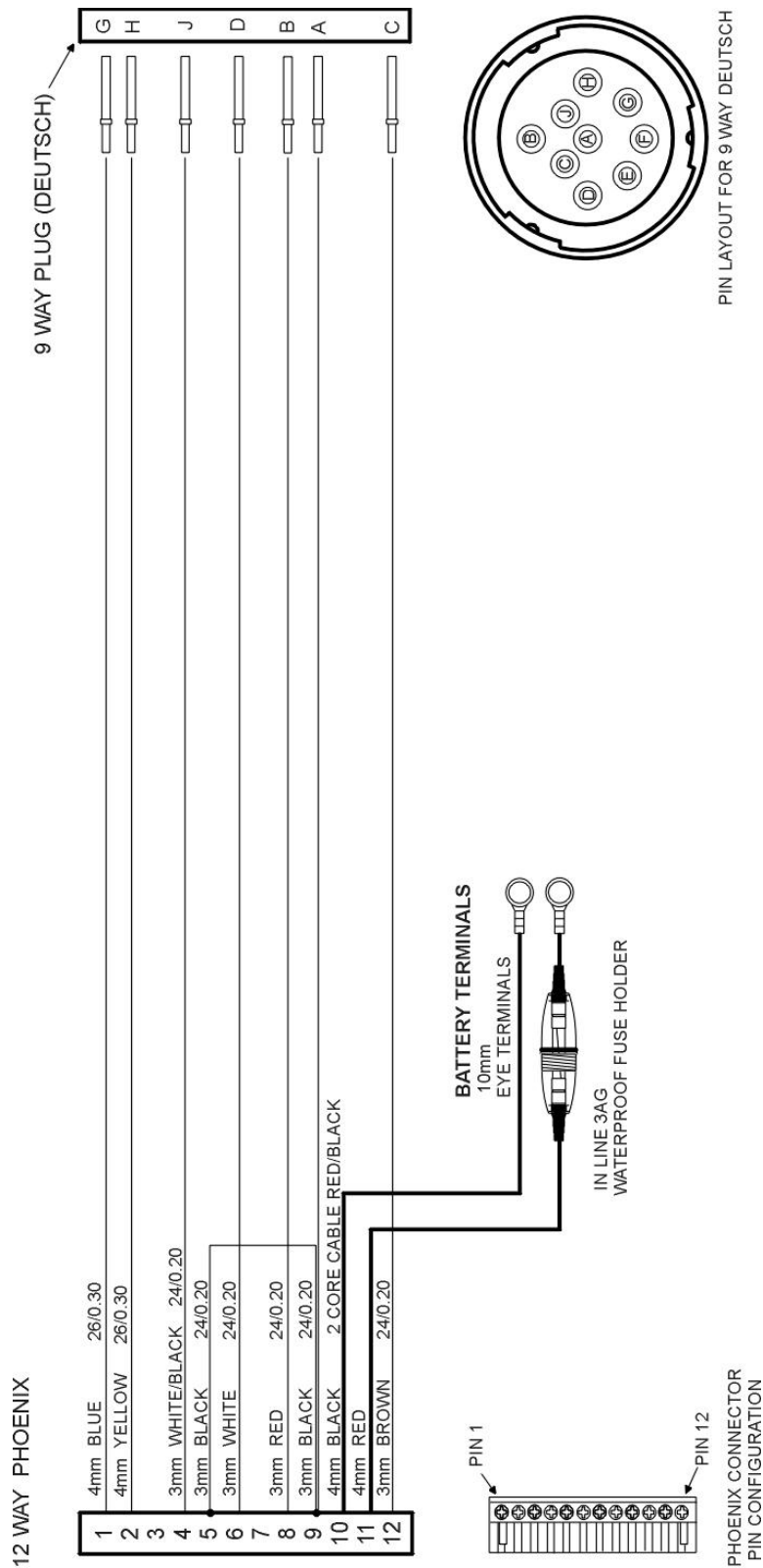
### Left, Centre & Right Section

minimum input voltage:	4V
maximum input voltage:	14V

### Dump Valve

minimum output voltage at 12V supply:	11.3V
maximum current:	1A

# 7.2 Tractor Loom Diagram



# 7.3 Implement Loom Diagram

