

# **2400P Spray Controller**

# **Installation and Operation Instructions**

**Version 3.0**

# CONTENTS

## 1.0 INTRODUCTION

1.1	General Outline	3
1.2	Standard and Optional Parts List	4
1.3	Standard Parts Drawing	5
1.4	Optional Parts Drawings	6

## 2.0 INSTALLATION

2.1	Control Console Installation	10
2.2	Power Connection	11
2.3	Servo Control Valve Installation	12
2.4	Servo Control Valve Wiring	13
2.5	Flow Sensor Installation	14
2.6	Wheel Sensor Installation	15
2.7	Boom Control Linking Installation	16
2.8	Second Spray Line Installation	18
2.9	Misting Control Installation	19

## 3.0 OPERATION

3.1	General Outline	20
3.2	Power ON / OFF key	21
3.3	Servo Valve Switch	21
3.4	Second Spray Line Operation	23
3.5	Misting Control Operation	23
3.6	Calibration Warning	23
3.7	Memory Backup	24
3.8	Imperial Metric Key	24
3.9	Total Area Key	24
3.10	Trip Area Key	24
3.11	Tank Key	25
3.12	Rate Selection (High, Normal, Low)	26
3.13	Flowrate, Speed & Pressure keys	26
3.14	Alarm Functions	26
3.15	Test Key	28
3.16	Printout Operation	28
3.17	GPS Compatibility	29

<b>4.0</b>	<b>CALIBRATION</b>	
4.1	General Outline	30
4.2	Rate Calibration	30
4.3	Wheel Calibration	31
4.4	Slow Speed Hold Calibration	32
4.5	Second Sprayline Calibration	33
4.6	Width Calibration	36
4.7	Flow Sensor Calibration	37
4.8	GPS Calibration	39
4.9	Tank Calibration	39
4.10	Misting Calibration	39
4.11	Pressure Calibration	40
4.12	Clock Calibration	41
4.13	Data Calibration	41
<b>5.0</b>	<b>SPRAYER ADJUSTMENT AND TEST</b>	
5.1	Sprayer Pressure Adjustment	43
5.2	System Components Test	43
5.3	Control System Field Test	44
5.4	Second Spray Line Test	44
5.5	Preventative Maintenance	45
5.6	Servo Control Valve Parts Breakdown	46
5.7	Pressure Sensor Service Procedure	46
5.8	Flowsensor Servicing Procedure	47
<b>6.0</b>	<b>TROUBLESHOOTING GUIDE</b>	48
<b>7.0</b>	<b>WARNING MESSAGES</b>	59

# 1.0 INTRODUCTION

## 1.1 GENERAL OUTLINE

Your new FARMSCAN 2400 SPRAY CONTROLLER System is the result of extensive infield development and will give many years of dependable service.

Once installed and calibrated, the system will automatically maintain the selected spray rate regardless of speed or pressure variations within the limits of the sprayer **pump capacity and nozzle size**.

It is therefore important to select a nozzle size that will deliver the intended rate at varying ground speeds within the intended working range.

To gain extended working speed range, the controller is also able to automatically control a second Spray line to enable up to twice the original speed variation under automatic control.

The basic 2400 Spray Controller kit includes an incab control console, connected to a servo control valve, flow sensor and wheel sensor with most necessary components for adapting onto a self propelled or trailed sprayer.

Optional Farmscan 2403 or 2405 BOOM CONTROL kits can also be added to activate or shutdown up to three (2403) or five (2405) sections of spray boom, using a set of solenoid valves.

The 2405 can also control a second spray line and left and right foam marker solenoids.

Solenoid valves are supplied separately by ordering one of three solenoid types suitable for your application.

Other speed sensing options and a printer are also available as explained in section 1.4. Please read this manual front to back then plan the layout **before** proceeding to install.

## 1.2 STANDARD AND OPTIONAL PARTS LIST

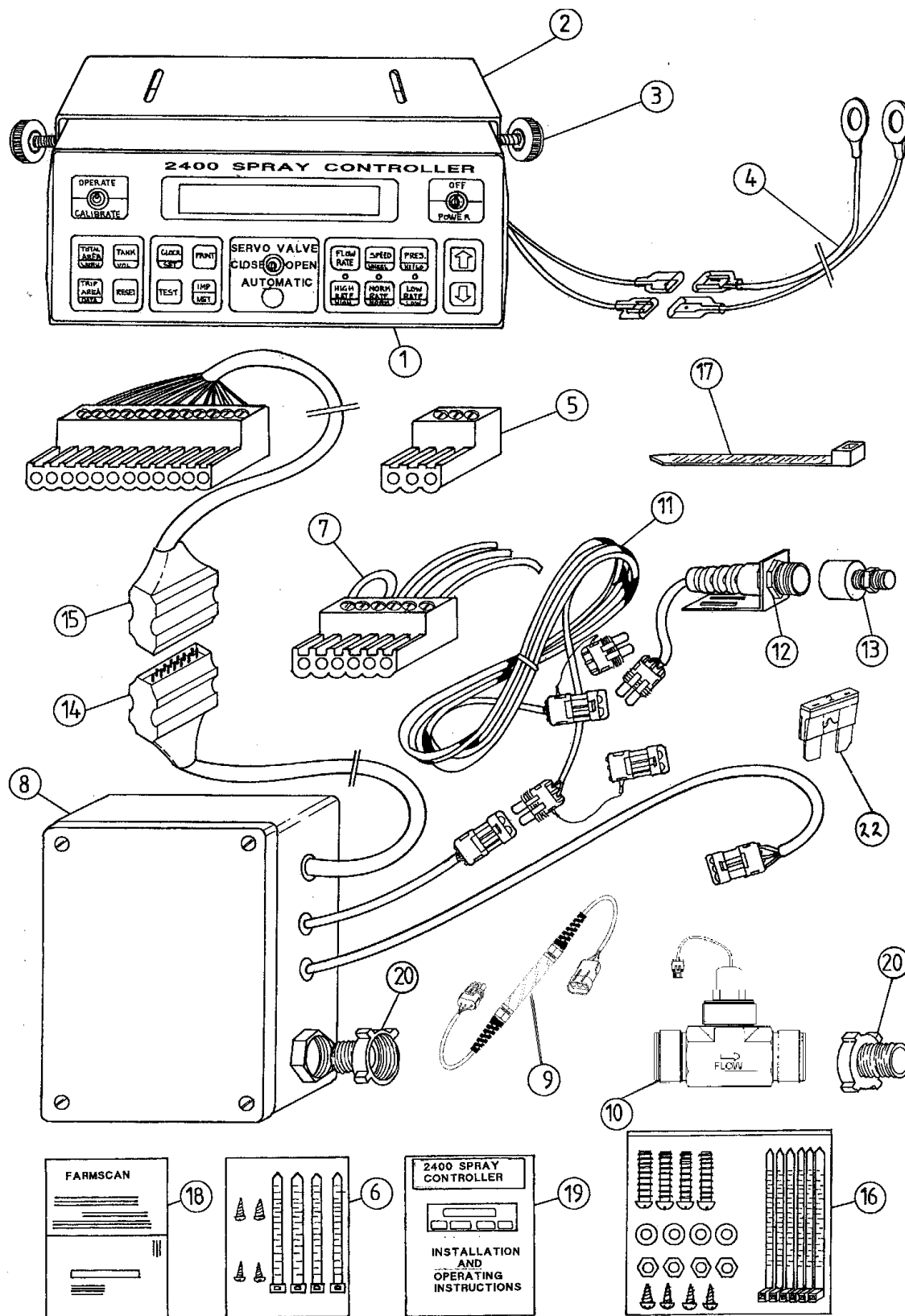
### STANDARD PARTS LIST:

REF	PART No.	DESCRIPTION	QTY
1	A-2400	SPRAY CONTROLLER	1
2	AH-405	MONITOR MOUNTING BRACKET	1
3	AH-861	SECURING KNOB 1/4" TRIWHEEL	2
4	AC-101	8M POWER CABLE	1
5	P-002	3 PIN PHOENIX TERMINAL BLOCK	1
6	AH-408	UNIVERSAL HARDWARE PACK	1
7	AP-176	6 PIN SOLENOID LINKING CABLE	1
8	A-2480	SERVO CONTROL VALVE & 12m CABLE	1
9	A-2090	ADAPTER	
10	AA-230	FLOW SENSOR	1
11	AC-205	2 WAY 5M PACKARD EXTENSION CABLE	1
12	AA-110P	REED TYPE SENSOR (PACKARD)	1
13	AA-132	WHEEL MAGNET AND NUT	1
14	AP-105	12 PIN BRYLITE PLUG	1
15	AP-106	12 PIN BRYLITE SOCKET	1
16	AH-417	SERVO VALVE MOUNTING HARDWARE	1
17	HG-706	CABLE TIES 290mm x 5.0mm	40
18	AM-200	FARMSCAN WARRANTY CARD	1
19	AM-2400/3	2400 INSTRUCTION MANUAL V 3.0	1
20	AH-430	BRASS NUT AND TAIL ADAPTER	2

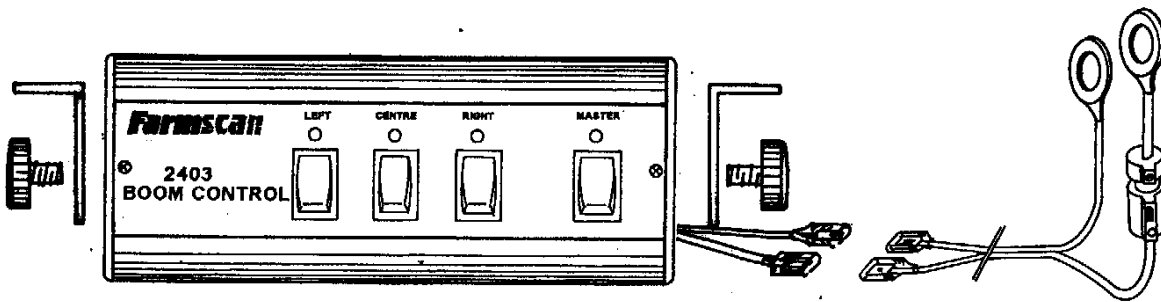
### OPTIONAL PARTS LIST:

PART No.	DESCRIPTION
2403	3 SECTION BOOM CONTROL KIT
2405	5 SECTION BOOM CONTROL KIT
2040	PRINTER KIT
2004	RADAR SPEED SENSOR KIT
2004A	RADAR SPEED SENSOR ADAPTER
2007	SPEEDO CABLE SENSOR KIT
1009	TAILSHAFT SENSOR KIT
AH-489	BLUE SOLENOID VALVE
AH-490	BLACK SOLENOID VALVE
AH-492	LARGE SOLENOID VALVE
AH-491	¾" PRESSURE RELIEF VALVE

### 1.3 STANDARD PARTS DRAWING



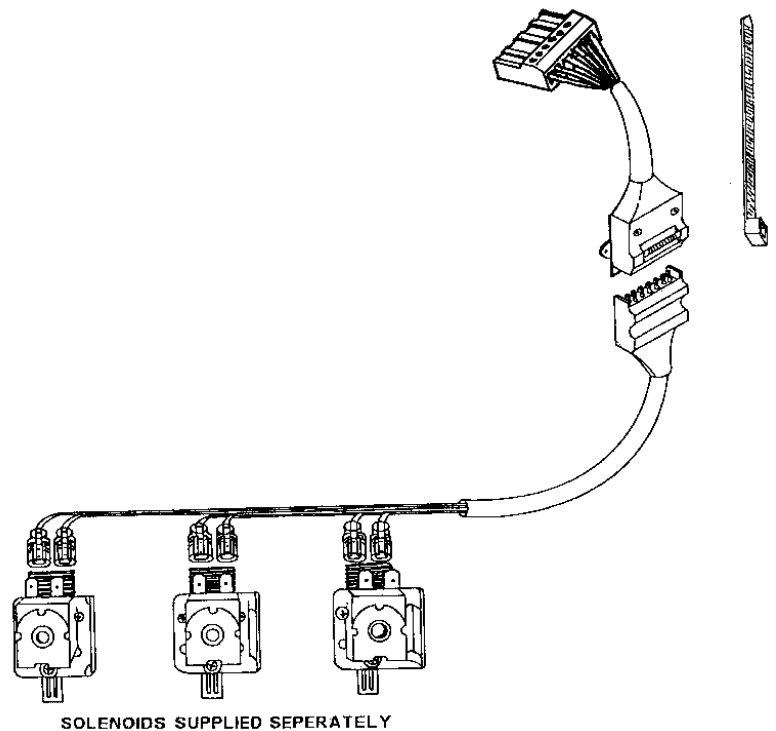
## 1.4 OPTIONAL COMPONENTS DRAWINGS



### 2403 BOOM CONTROL CENTRE KIT

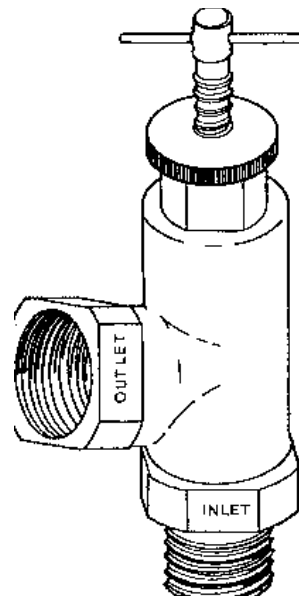
Allows control of up to 3 Boom Section Solenoid Valves up to 3 Amps each.

17 M Cable and Breakaway Plug & Socket included with 2403



### AH-491 PRESSURE RELIEF VALVE

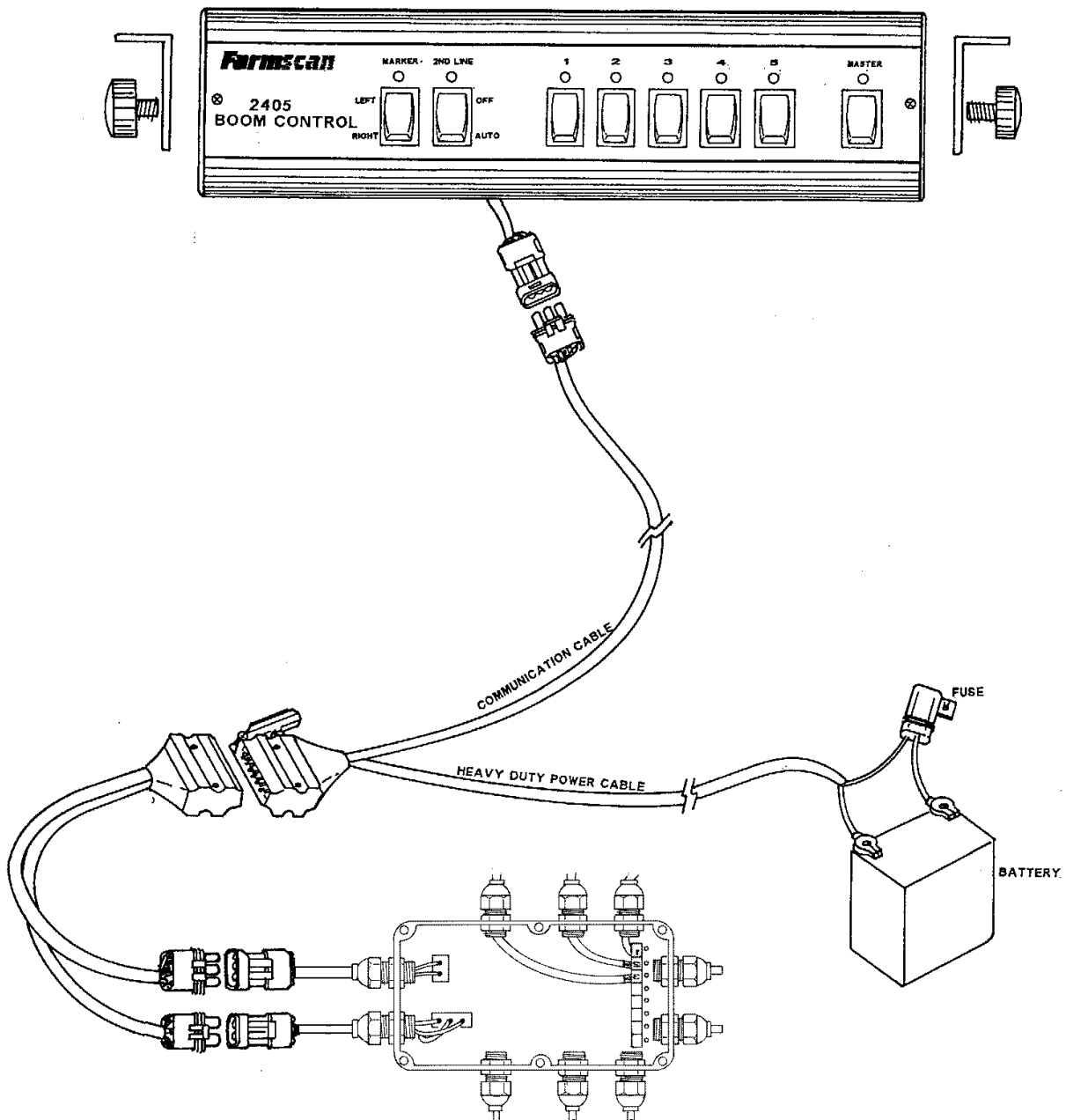
Fits before servo control valve to provide pressure relief back to tank when servo valve shuts down spray line.



## 1.4 OPTIONAL COMPONENTS DRAWINGS continued...

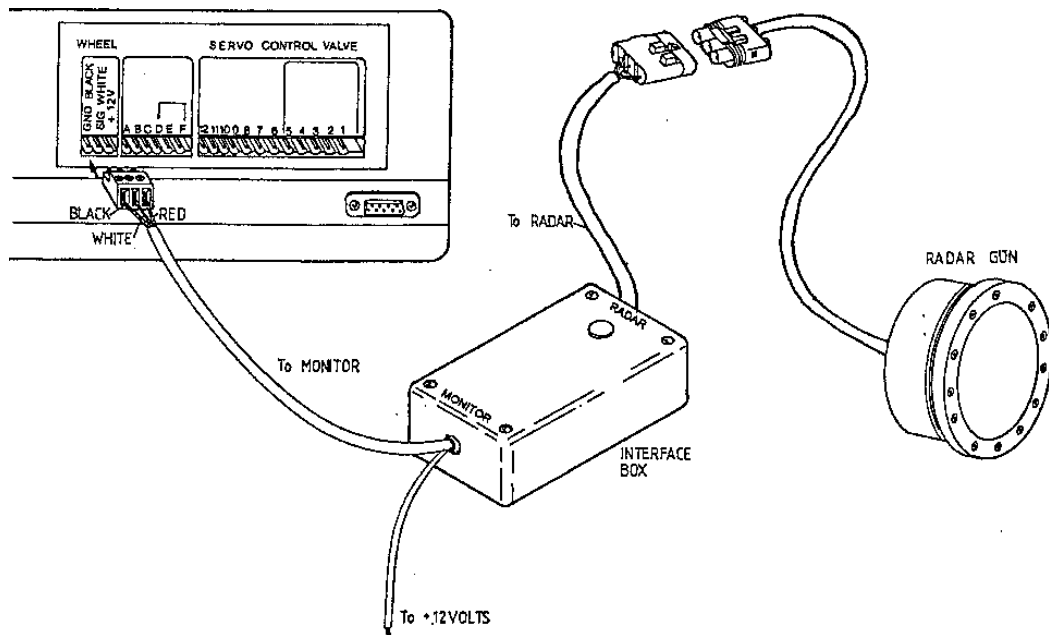
### 2405 BOOM CONTROL KIT

Allows control of up to 5 boom section solenoid valves up to 3 Amps each, second spray line facility solenoid up to 1 Amp and LEFT & RIGHT boom markers up to 1 Amp each. 20m heavy duty power cable and 17m communication cable supplied.



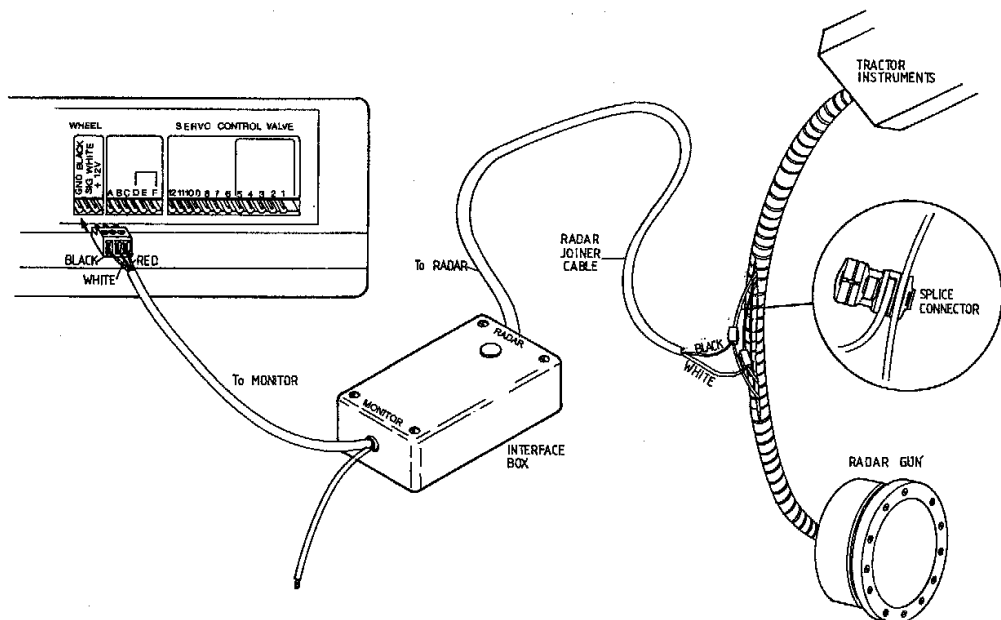


## 1.4 OPTIONAL COMPONENTS DRAWINGS continued...



### 2004 RADAR SPEED SENSOR

Fits onto any vehicle to give accurate ground speed signal regardless of wheelslip.

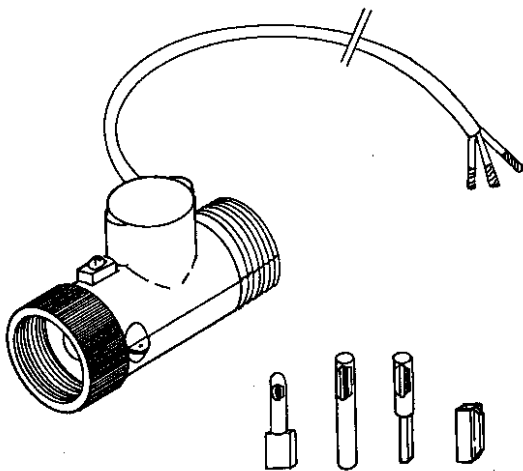


### 2004A RADAR SENSOR ADAPTER

Adapts existing radar sensor to give true ground speed for 2400 spray controller.

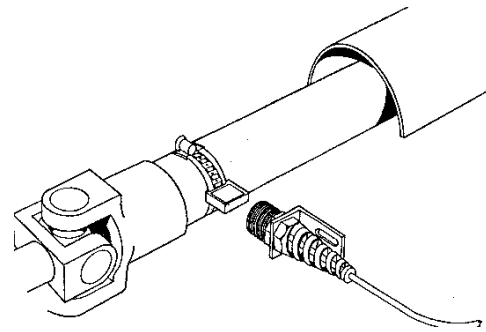


## 1.4 OPTIONAL COMPONENTS DRAWINGS continued...



### 2007 SPEEDO CABLE SENSOR KIT

Screws inline with existing speedo drive cable to provide ground speed signal instead of wheel sensor. Suits JAP 4WD. (M22 x 1.5 THREAD)

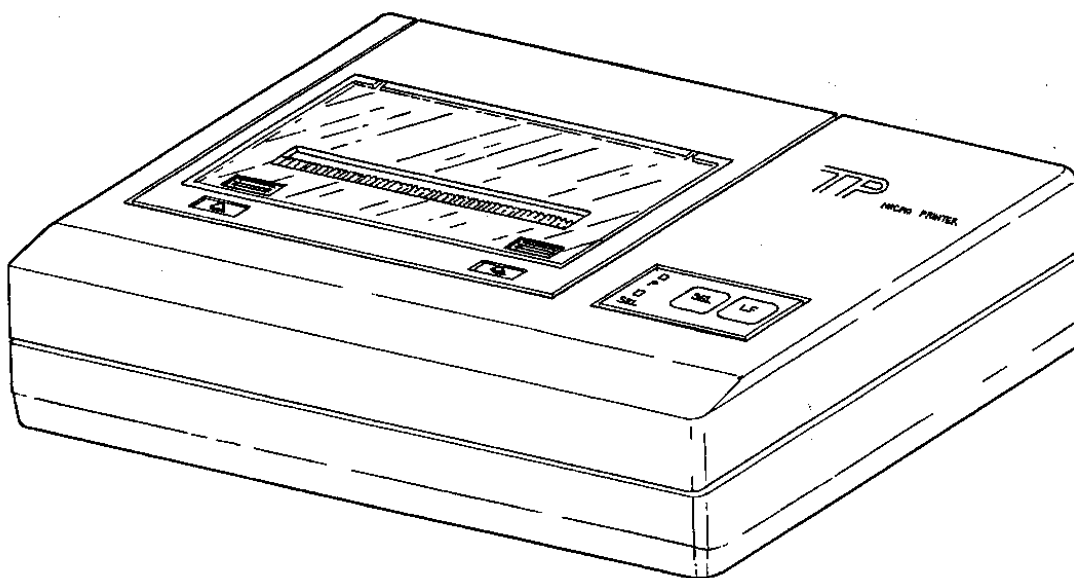


### 1009 TAILSHAFT SENSOR KIT

Alternative to wheel sensor for ground speed sensing on truck tailshaft.

### 2040 PRINTER KIT

Plugs into spray controller to provide hardcopy printout of spray data for up to ten areas. Includes cable & protective pouch.



## 2.0 INSTALLATION

### 2.1 CONTROL CONSOLE INSTALLATION

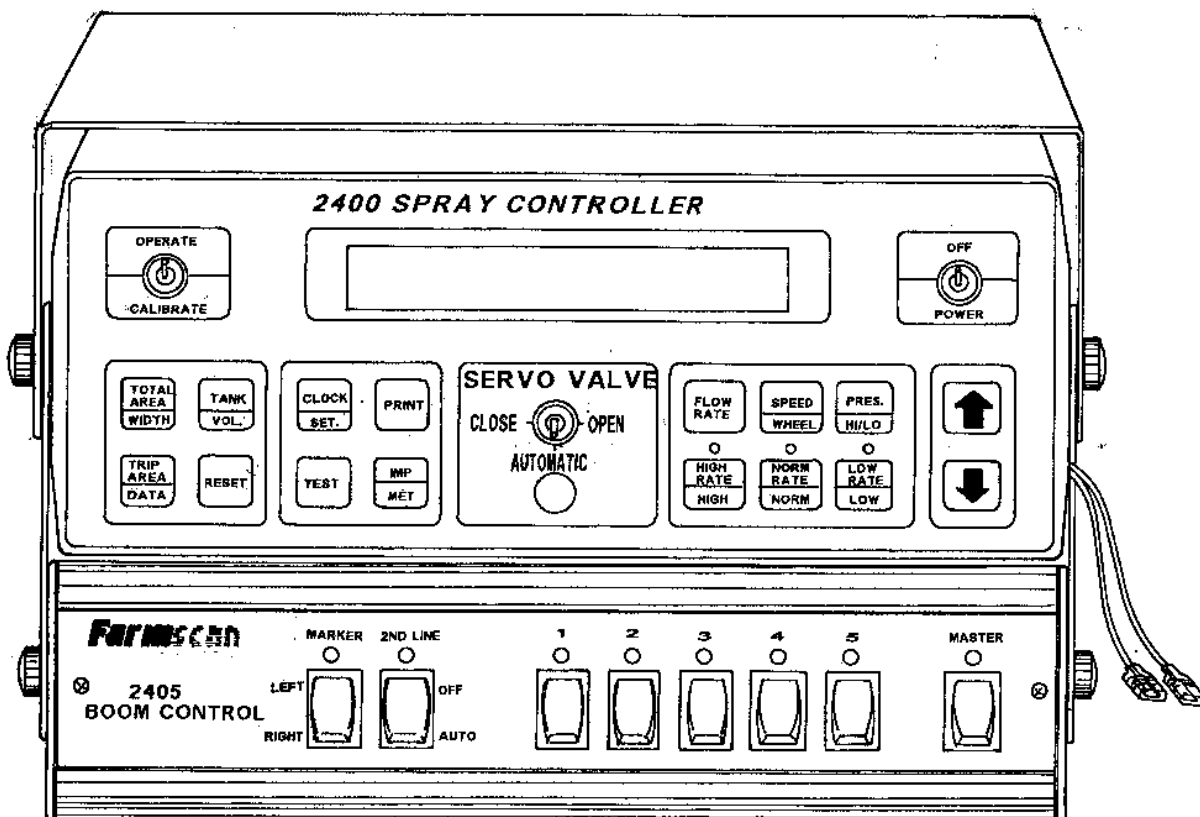
The spray control console should be installed in the cab, clearly visible to the operator but ideally not subject to intense heat or moisture.

If the 2403 or 2405 boom control option is used, it can be mounted separately on its own bracket in a handy position for operator convenience.

Alternatively, the 2405 can be slung above or below the 2400 on special extension brackets supplied in the 2405 kit.

Install the spray controller away from two way radios to minimise any risk of electrical interference. All connection cables to the controller should take an alternative route to other electrical cables in the cab, particularly petrol engine kill switch cables.

Mount the spray controller firmly on brackets supplied. It is designed to withstand normal amounts of vibration.



## 2.2 POWER CONNECTION

*Do not connect power until all other installation is finished.*

The 8m Power Cable must be used to connect **DIRECT** to 12 volt DC battery terminals.

DO NOT connect power cable to starter motor, alternator etc, this may cause interference.

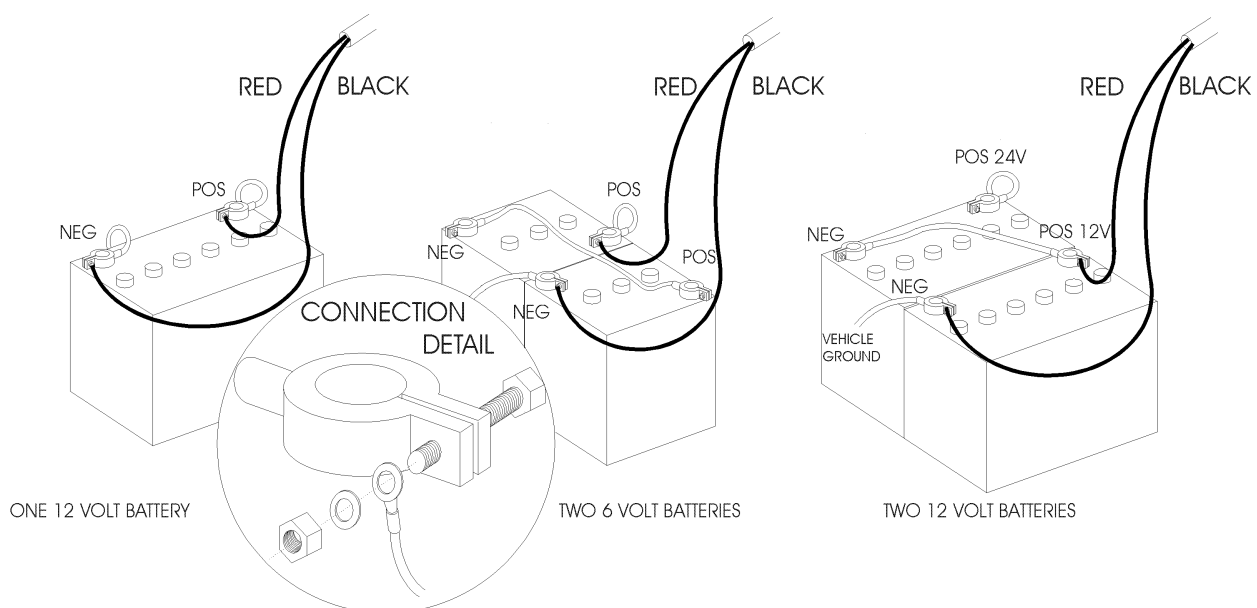
DO NOT connect power cable negative direct to chassis of machine - must be battery terminal negative.

DO NOT power other instruments off the spray controller power cable. Such as boom control or two way radio.

Use cable ties to secure power cable safely away from hot or moving parts.

Connection to battery terminal bolt must be kept clean and tight.

TYPICAL BATTERY HOOK-UPS



**! WARNING: Disconnect spray controller from power cable when arc welding.**

## 2.3 SERVO CONTROL VALVE INSTALLATION

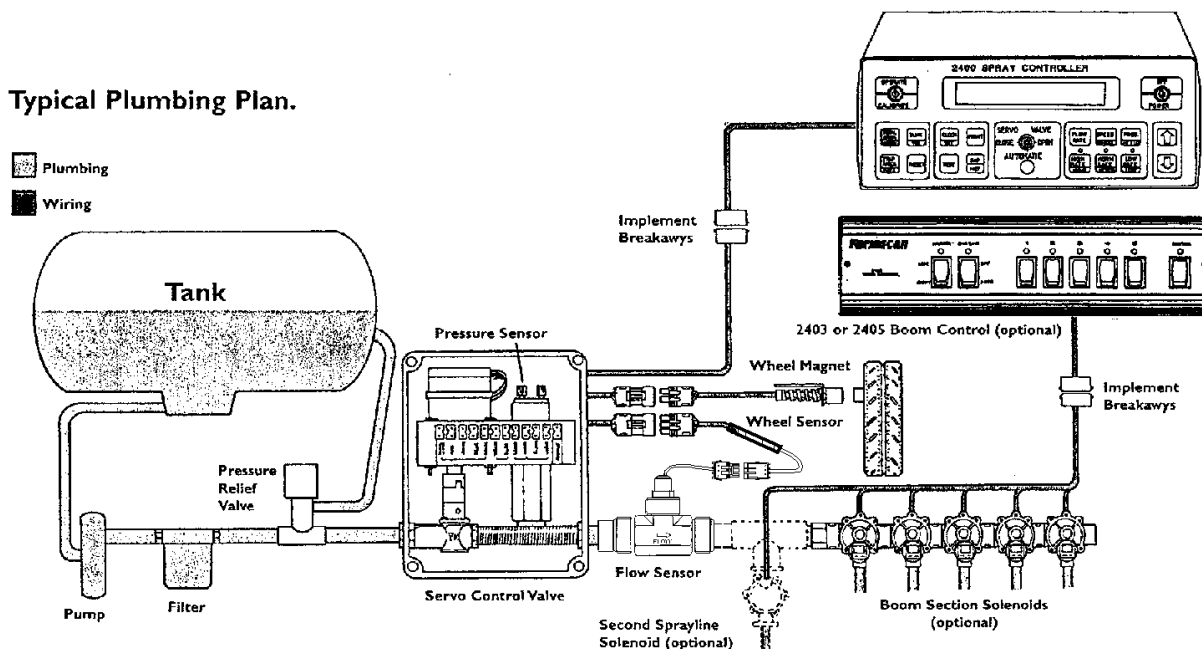
The servo control valve box houses the servo motor, control valve and pressure sensor as well as providing a connection point for the flow sensor, wheel sensor, and 2nd sprayline solenoid (if used).

The wheel sensor may be connected directly into the rear of the spray controller - this may be more convenient if you decide to use the front tractor wheel for ground speed pick up or the optional speedo sensor, tailshaft sensor or radar speed sensor.

The servo control valve regulates the overall delivery of spray to the nozzles, so must be installed in the **main delivery line** to the spray boom, not on the bypass line. The spray delivery line to the boom must be connected to the servo valve **INLET**.

All bypass or agitation return lines to tank must be taken **before** the servo control valve **INLET**, so there is no return path to tank **after** the servo control valve and flow sensor.

The flow sensor is connected to the servo valve **OUTLET** to measure the exact quantity of liquid being delivered to the spray boom. Make sure the arrow on the flow sensor is pointing in the direction of flow.



The servo valve box should be firmly bolted to the sprayer chassis and positioned so the lid can be removed for easy access at any time. The box may be mounted anyway that suits, so long as the **INLET** and **OUTLET** direction is correctly observed.

A 5mm drain hole should be drilled in the underside of the servo control valve box to allow drainage and circulation of fresh air in the event of leaks or condensation.

The rubber seal on the box lid will provide adequate protection against weather and spray drift - leave the lid off until the system is fully tested. See Section 5.0 "Sprayer Adjustment and Test".

After fitting the lid **do not** seal up the box with silastic as this will cause condensation and corrosion of the wiring inside. Fresh air is better.

**IMPORTANT:** When tightening external plumbing fittings, ensure internal fittings are not being twisted.

## NOTES:

### PRESSURE RELIEF VALVE

An adjustable pressure relief valve (not supplied) must be plumbed to tee off the main delivery line **before** the servo control valve. This is essential with positive displacement pumps because as you reduce ground speed the servo will shutdown causing back pressure that must be able to escape back to tank. The relief line should be at least 3/4" hose back to tank.

### 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.

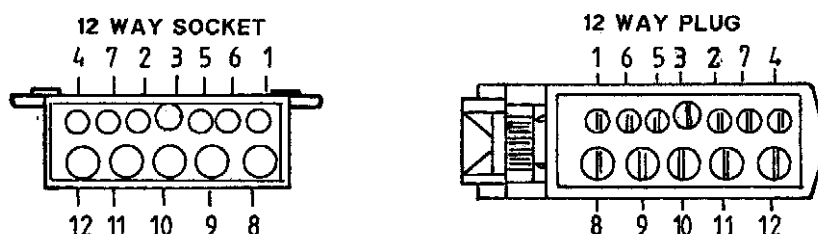
The solution is to either fix the existing pulsation dampener (normally this means adjusting the air pressure on top of the dampener until the hammering stops) or replace the device completely. Adjustment of the dampener should be done when the sprayer is working at the **normal pressure**.

## 2.4 SERVO CONTROL VALVE WIRING

A 12 metre 12 core cable provides all necessary connections from the spray controller to the servo control valve. Each of the cables are numbered (1-11) and number 12 is green. All external sensors are connected to a terminal strip inside the servo control valve box.

A 12 way plug and socket set supplied with the kit may be used to create an implement breakaway point. When wiring the servo control valve to a trailed sprayer, hitch up to the towing vehicle and run the 12 way cable from the servo valve box to the drawbar, allowing enough slack cable for turning.

Ensure power is **off**, then cut the 12 core cable at the appropriate point and wire up the 12 way plug to the sprayer side.



The 12 way plug and socket are both numbered inside, so ensure wire No 1 goes to pin No 1, wire 2 to pin 2 etc.

Before fitting the 12 way socket onto the towing vehicle side, plug green connector into socket at rear of spray controller marked **servo control valve** making sure screws in green plug face upwards, then run cable to rear of towing vehicle.

If cable is too short, order a complete new length to suit (Order by the metre as Part No. C-412 12 way cable). Fit the 12 way socket onto the cable and mount the socket at the rear of the vehicle to face back towards the sprayer. In this way the plug will breakaway if you forget to disconnect.

## NOTES:

### WIRING HINTS

When wiring up, make sure to strip off sufficient insulation to enable the twisted ends to be doubled up for extra gripping under the screws.

Beware not to screw down onto the insulation.

Beware not to mix up wire 6 and wire 9.

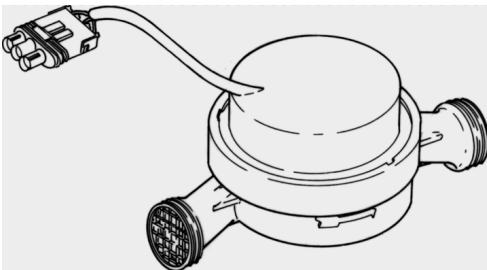
DON'T OVER TIGHTEN SCREWS - THEY CAN BREAK.

### WIRING FUNCTIONS

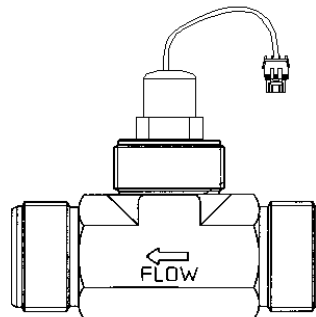
1. Stepper +12V
2. Stepper Winding No. 1
3. Stepper Winding No. 2
4. Stepper Winding No. 3
5. Stepper Winding No. 4
6. Pressure ground
7. Pressure signal
8. Wheel signal
9. Common ground
10. Flow signal
11. Flow +12V
12. 2nd line ground

## 2.5 FLOW SENSOR INSTALLATION

There are two styles of flow sensor available for use with your spray controller.



AA-120P flow sensor  
flow range: 2 - 90 L/MIN  
PPL factor: 45.6 (Fixed)



AA-230 flow sensor  
flow range: 10 - 100 L/MIN  
PPL factor: marked on meter tag

The AA-230 flow sensor is supplied standard in the spray controller kit. The maximum rated capacity of your flow sensor is 100 litres per minute. Flow rates in excess of 100 L/Min or less than 10 L/Min will result in spray errors.

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.

Fit the flow sensor to the **OUTLET** side of the servo control valve using the nuts & tail adaptors supplied. Connect the flow sensor to the corresponding 3 way connection tail hanging from the servo valve box.

## 2.6 WHEEL SENSOR INSTALLATION

The wheel sensor supplied, consists of a **reed** type sensor and magnet to be fitted onto any **undriven** ground wheel. The wheel sensor may be installed either on a trailed sprayer wheel and connected at the servo control valve or may be installed on a front tractor wheel and connected directly into the rear of the spray controller console.

If you intend to use the spray controller as an area meter with other implements, then the front tractor wheel is the best choice.

If it is impractical to fit the wheel sensor to an undriven wheel, for example when using a 4WD vehicle or truck, you have three alternative methods.

- 1 Speedo Cable Sensor Kit screws inline with speedo drive cable to produce pulse output. Connects directly into rear of spray controller. (Suits most JAP 4WD / trucks M22 x 1.5 thread).
- 2 Tailshaft Sensor Kit - magnet clamps onto tail shaft with sensor pickup and connects directly into rear of spray controller.
- 3 Radar Speed Sensor Kit: - 2004 Radar Speed Sensor- fits onto any vehicle and reads true ground speed directly off ground without wheel slip. 2004A Radar Speed Adaptor - adapts existing radar sensor to suit spray controller.

### WHEEL SENSOR INSTALLATION PROCEDURE:

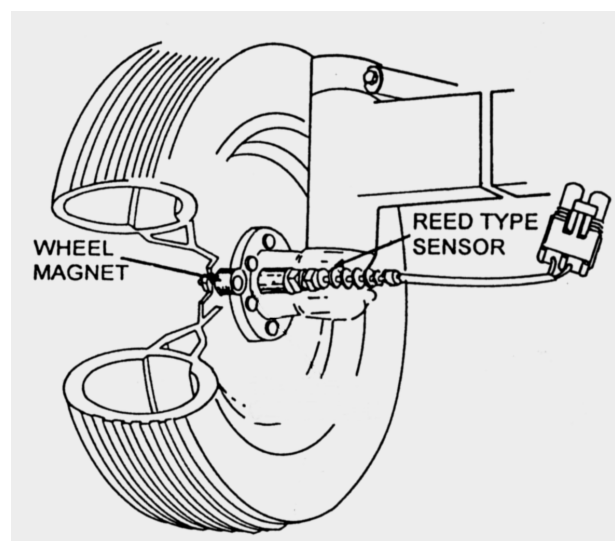
Bolt the Wheel Magnet onto the wheel in a position that allows it to sweep directly past the wheel sensor within 10-15 mm every rotation.

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 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:****FOUR DIFFERENT MAGNET MOUNTING IDEAS**

1. Drill through rim and bolt magnet on.
2. Braze nut onto rim and screw magnet into nut.
3. Cut thread off magnet and araldite magnet to rim.
4. 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.

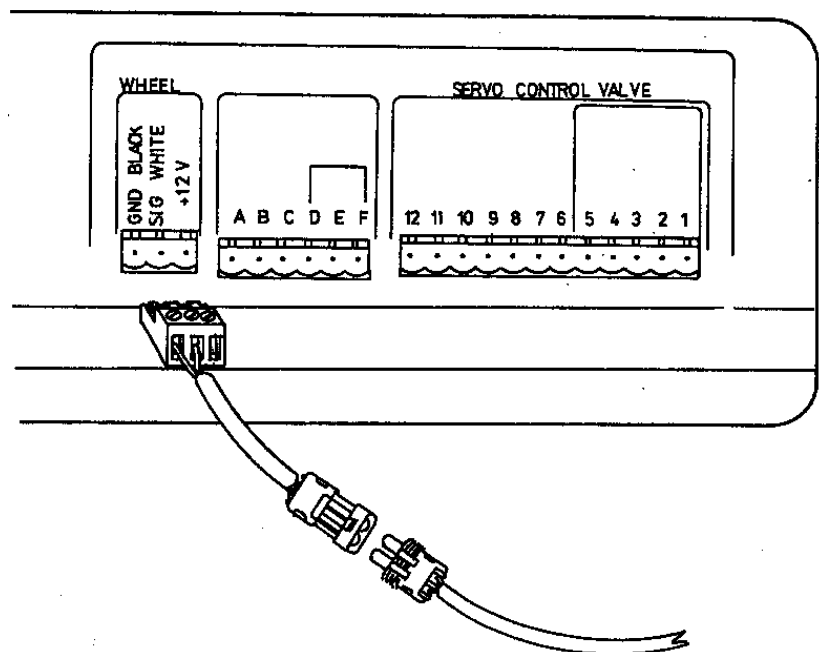
**WIRING WHEEL SENSOR**

The wheel sensor cable may be connected either at the servo control valve to the matching 2 pin plug from the grey box or wired directly into the 3 pin plug marked **WHEEL** at the rear of the spray controller.

If connecting to the rear of the spray controller, unscrew the black and white wires of the 2 pin tail from the grey box and block the cable exit hole in the grey box.

Connect the 2 pin tail to the corresponding (GND) **black** and (SIG) **white** termination points on the 3 pin speed sensor input plug at the rear of the spray controller then connect the wheel sensor directly into the spray controller.

The third wire (+) **red** of the speed sensor input plug is only used with the 2007 speedo cable sensor.

**2.7 BOOM CONTROL LINKING INSTALLATION**

The spray controller can control either a one section boom or a multi section boom using the separate Farmscan 3 or 5 section boom control panel, or any other brand of switch panel to a maximum of 3 sections.

The spray controller is able to calibrate and adjust for various widths of active boom sections by detecting which boom switches are turned "ON" or "OFF".

The following boom control panel options are available:

1. **If you are using the Farmscan 2403 Boom Control** connect the **green** 6 pin plug from the boom control to the spray controller rear panel socket marked "BOOM CONTROL" making sure screws are facing upwards.
2. **If you are using the Farmscan 2405 Boom Control** then a choice of long or short ribbon cable connection is used to connect between corresponding 9 Pin sockets on both the spray controller and the boom control panel.
3. **If you are linking the 2400 to an existing Switch Panel** from another supplier, then you must use the spare 6 pin solenoid linking cable supplied in the kit. You can monitor up to 3 boom sections using this cable. Simply connect cable to spray controller socket marked 'Boom Control' and follow wiring link instructions below.
4. **If you are not using a boom control switch panel**, then do not plug anything into the spray controller socket marked "BOOM CONTROL".

### WIRING LINK CONNECTIONS ( for "other supplier" switch panel)

The 6 pin solenoid linking cable has 3 colour wires at 1 metre lengths that correspond to the LEFT, CENTRE, and RIGHT boom control switches.

A =	Left Boom	Purple Wire
B =	Centre Boom	Orange Wire
C =	Right Boom	White Wire

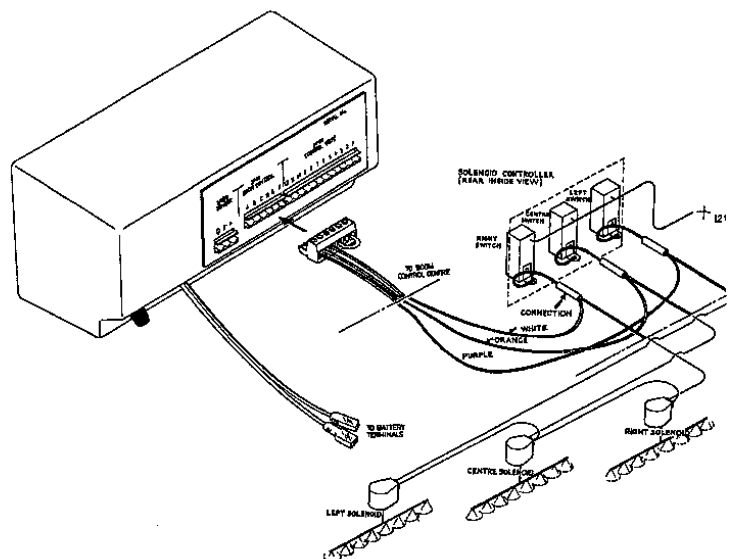
The link between D and F must remain in place.

Each of the purple, orange and white wires must be connected onto the terminal of each controlling switch that becomes live when the boom is operating, use a Voltmeter or test light to check for the Correct point. You can solder or join into existing wiring.

If only two switches are used you must use left and right inputs.

If only one boom is used under solenoid control, you must use centre.

To test boom control links - See section 4.6 "Width Calibration".



## 2.8 SECOND SPRAY LINE INSTALLATION

Use of the second sprayline function is optional.

A second sprayline will allow up to twice the available driving speed range normally possible with a single sprayline.

For most effective coverage, the second row of nozzles should be positioned at half centres to the first spray line. ie Each second line nozzle positioned half way between two first line nozzles.

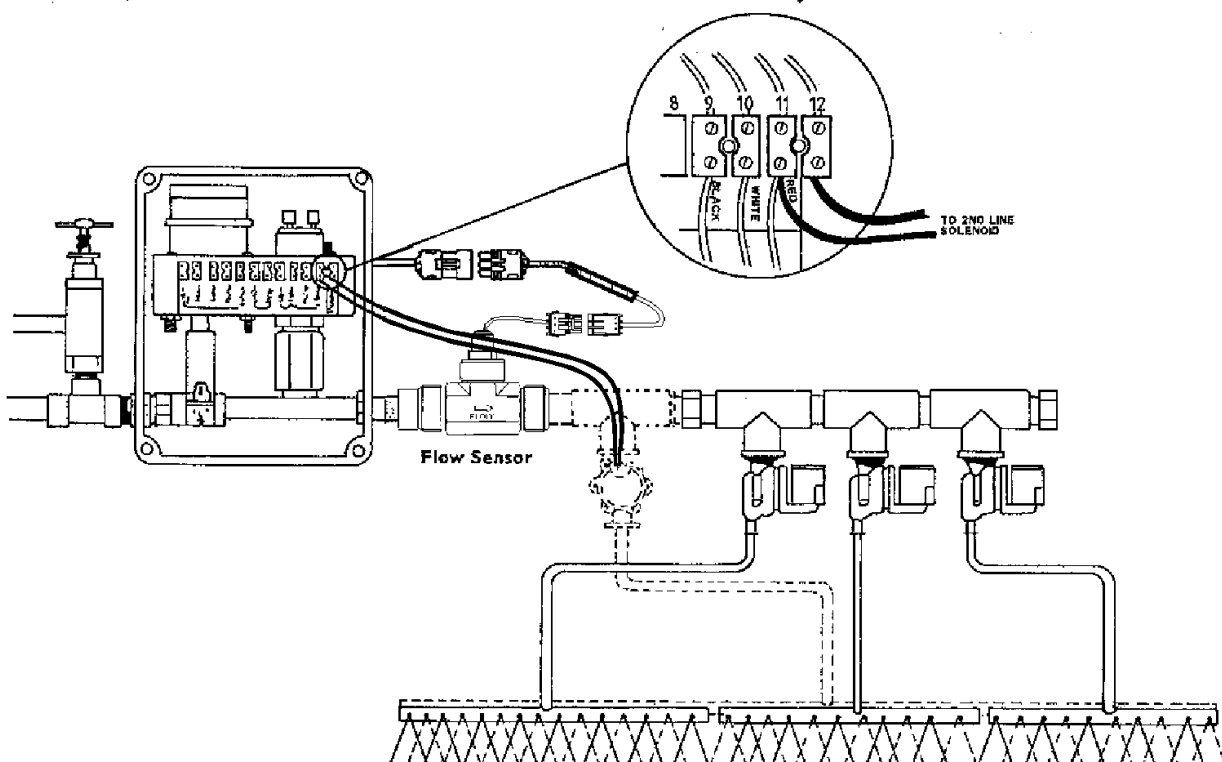
All the second spray line nozzles must be inter connected on **one** independent hose with multiple infeed points to equalise pressure over the whole width. The second spray line **can not** be split into separate sections.

**NOTE:** If any one of the first sprayline sections are switched off when the second spray line is active, the second spray line will be instantly de-activated by the spray controller.

When the second spray line is installed, run the feed hose back to one 12 volt solenoid valve capable of delivering sufficient volume for the whole second line, eg. a 25mm (1") solenoid valve AH-492.

The second spray line solenoid must tee off the main delivery line **after** the flow sensor and servo control valve but **before** the first spray line solenoid valves (if used).

- For 2405 Boom Control connect second spray line solenoid to connector marked "2nd" in solenoid junction box as detailed in 2405 manual.
- If not using 2405 Boom Control (ie. if using 2403 Boom Control or "other supplier" switch panel or none) connect the second spray line solenoid to Pins 11 and 12 inside the servo control valve grey box.



## 2.9 MISTING CONTROL INSTALLATION

The misting control function is intended for use with single nozzle blower type spray misting machines only.

Typically a machine of this type will produce an effective spray swath of 40 - 60 metres. The operator is required to travel through the crop in straight runs and to travel down wind along the fence line a distance equal to one swath width before turning back into the crop to complete the next run.

Due to the very low flow rates (2-5 Lpm) involved with using a misting machine the INLET orifice of a metal body flowsensor, type AA-120P must be reduced to approximately 4mm diameter.

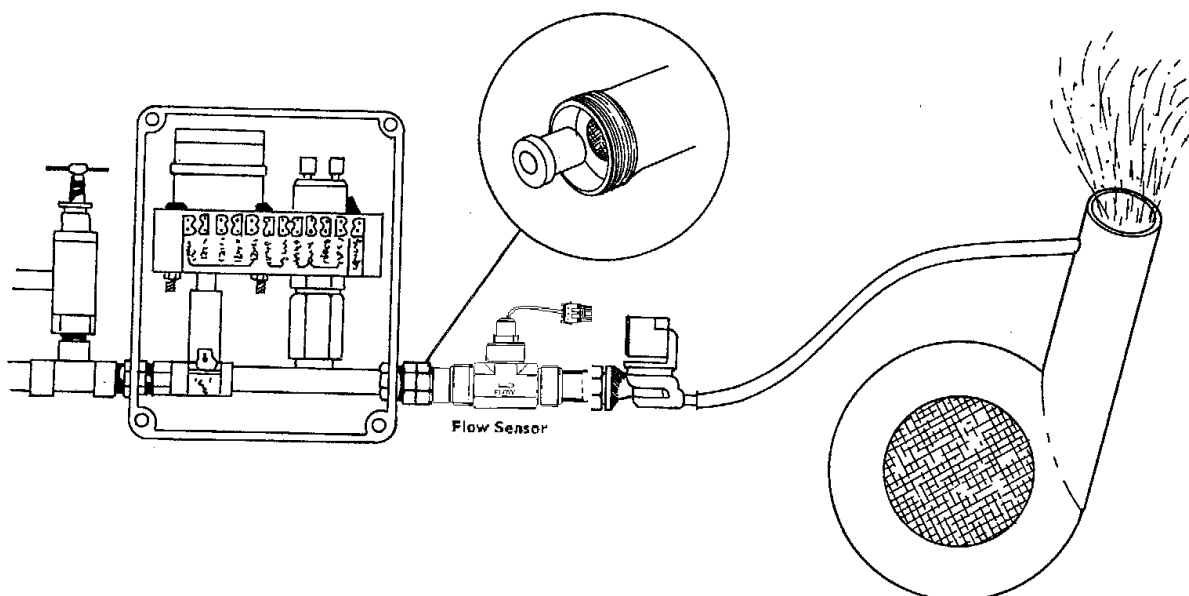
Metal body flow sensor and reducing plug is available from Farmscan (Computronics).

A single solenoid valve must be fitted downstream of the modified flow sensor to Start / Stop the misting operation.

### MISTING INSTALLATION.

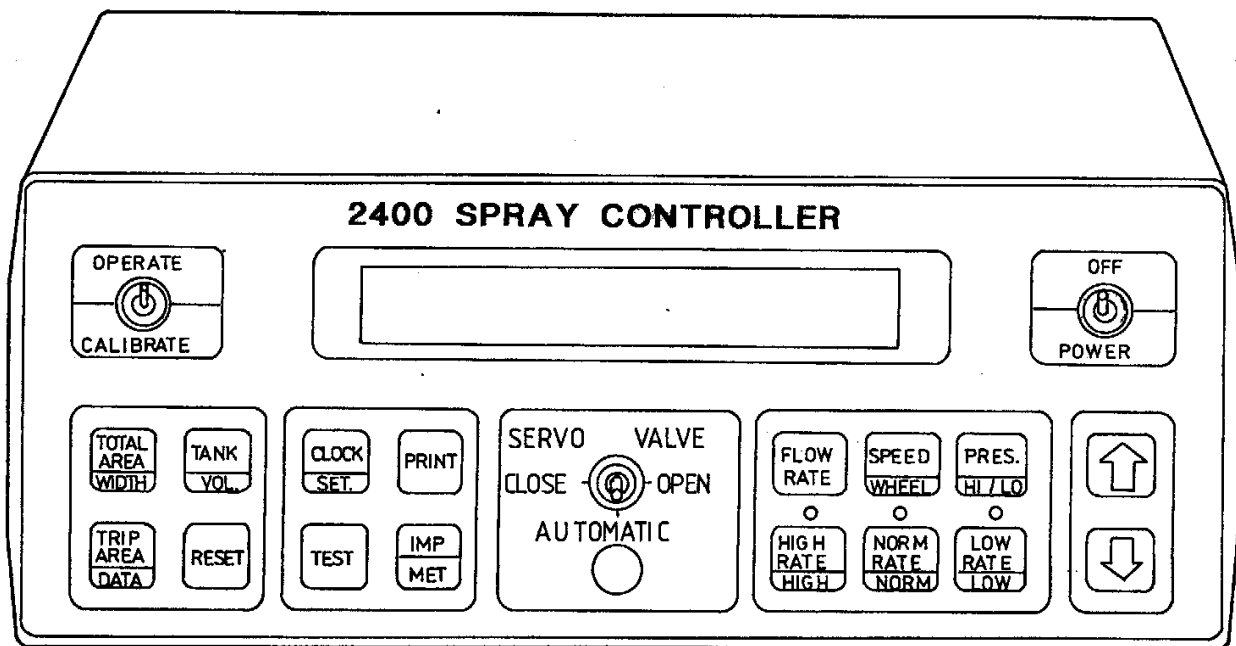
1. Install the Farmscan servo control valve in the main delivery line with, modified flow sensor downstream and solenoid valve after flow sensor.
2. A wheel sensor, speedo cable sensor, tailshaft sensor or radar speed sensor must be connected to the spray controller.
3. Connect the single solenoid valve to the "CENTRE" boom control switch wires (if used).

Alternatively, if an independent switch is already provided, you must make a single wire connection from the side of the switch which is "LIVE" when operating to the spray controller rear panel plug marked "**Boom Control**" Pin B using the solenoid linking cable See section 2.7. This provides the necessary signal to activate the fence line distance counter when the solenoid valve is switched "OFF".



## 3.0 OPERATION

### 3.1 GENERAL OUTLINE



#### OPERATE / CALIBRATE SWITCH

Allows overall selection of the key functions.

In "OPERATE" mode, all key functions printed in "YELLOW" are active.

In "CALIBRATE" mode, all key functions printed in "RED" are active.

#### '↑' / '↓' KEYS

Used to vary the calibration factors, change the trip area numbers or to manually adjust the pressure.

#### LIQUID CRYSTAL DISPLAY

Illuminated for night use, gives readouts in response to function keys and calibration selections.

#### FUNCTION KEYS

Allows displayed information to be changed from one function to another.

#### RATE SELECTION KEYS

Allows the pre-programmed spray rates to be selected on the run.

#### SERVO VALVE SWITCH

Allows the servo control valve to be overridden.

## 3.2 POWER ON / OFF

Whenever the power switch is turned "ON" the controller goes through the start up procedure, firstly displaying the product version number

Eg 

VERSION 3.0
-------------

Then the last function selected when the unit was previously switched off.

Eg 

10.6 kph 51.0 Lha
-------------------

At start up, the servo control valve will reset itself according to the servo valve switch position.

## 3.3 SERVO VALVE SWITCH

The Servo Valve Switch has three positions:

### SERVO VALVE OPEN

The "OPEN" position over rides the automatic function and allows full pressure and flow rate to the spray nozzles regardless of sprayer speed.

If solenoids are used, then switch solenoids "ON" to allow spray delivery. In "OPEN" position, a red light will indicate which of the 3 rates is selected (HIGH, NORM, LOW).

The readout will **display** the spray rate if mobile, but will not **control** the rate.

The rate alarm will activate if the selected rate "HIGH", "NORM", or "LOW" is not reached and maintained within +/-5%.

All the accumulating information such as Area and Litres used will update in the "OPEN" position.

If the 2nd spray line function is enabled, the 2nd spray line solenoid will open when servo valve switch is set to "OPEN" position.

If using 2405 boom control when the servo valve is in the open position, the second spray line switch on the boom control marked "2ND LINE" becomes an "ON/OFF" switch.

### MANUAL OPERATION

To use the spray controller as a spray monitor select "RATE" and switch the servo valve to "OPEN" then adjust the pressure by pressing the '↑' or '↓' arrow keys until the required Rate is displayed.

To disable the rate alarm, set the target rate to zero - see Calibration 4.2.

**NOTE:** If you switch the controller power "OFF", then the servo valve will have to be manually adjusted again.

## SERVO VALVE AUTO

In the "AUTO" position, a red light above the "HIGH", "NORM" or "LOW" rate keys indicates all systems ready to go for automatic spray control. The red light will not illuminate if solenoids are "OFF" or if the wheel, width, rate or flow calibration factors are at zero.

The servo valve will remain shut if speed is below 1 km/h. The servo valve will automatically begin to open at 1 km/h (the faster you travel the more it opens to achieve the target rate selected).

If solenoid valves are used, the servo valve **will not operate** until at least one valve is "ON", regardless of speed.

**NOTE:** boom control linking connection must be done when solenoid valves are used to control boom sections.

When in "AUTO" position, the area, distance and litres used readouts will only accumulate after flow has commenced.

The second sprayline will automatically activate and deactivate at the pre-programmed 2nd sprayline speed point (if used).

## INSTANT ON / OFF AT HEADLANDS

When spraying in "AUTO" position, the sprayer can be instantly stopped or started by using the master solenoid switch on the boom control to turn all boom sections "OFF" or "ON" in one shot. This should be done whilst still travelling at normal speed to hold the working pressure.

The servo valve will hold the pressure and stop counting "AREA" until the master switch is re-activated. Alternatively, a single controlling switch can be connected to one solenoid valve placed in the main delivery line to instantly stop / start the whole spray boom.

**NOTE:** boom control linking connection must be done See section 2.7.

## SLOW HOLD FUNCTION

Loss of spray pattern can be a problem when under automatic control if ground speed becomes too slow. A "Calibration" function is available to make the controller automatically hold the pressure when ground speed falls **below** a set point.

Automatic control will resume when ground speed is above the pre set point. See calibration Section 4.4.

**NOTE :** Operation at speeds below the slow down hold point will result in **over application** that may damage crops.

## SERVO VALVE CLOSED

The servo valve will shut off all spray within 6 seconds regardless of ground speed or solenoid "operation".



When in “CLOSE” position, the area, distance and litres used totals will not accumulate. The second spray line will instantly deactivate (if used).

### 3.4 SECOND SPRAY LINE OPERATION

Before operating, the 2nd Line function must be set through calibration see section 4.5.

1. For automatic second spray line activation, the servo valve switch must be set to “AUTO”.
2. The second spray line will activate immediately the 2nd line speed point is reached.
3. On deceleration, the second spray line will deactivate 1 km/h below the 2nd line speed point.
4. If using a boom control, turn off the “MASTER” switch to instantly shutdown both spray lines at any speed or switch to “CLOSE” position using servo valve switch.

### 3.5 MISTING CONTROL OPERATION

See special instructions for installation and calibration of misting function.

1. Switch servo valve to “OPEN” position, switch solenoid valve “ON” and adjust pressure to achieve 400 - 450 kPa at spray controller.
2. Flick servo valve switch to “AUTO” position and drive at target speed. Rate readout should stabilise in a few seconds.
3. Now vary the speed slightly up and down to see how the controller reacts.  
If controller reacts OK proceed to 4.  
If controller can not control rate properly, flick servo to “OPEN” position and drop pump pressure back to achieve the desired rate at a fixed speed. (Failure to control the rate means the flow rate is too small to control).
4. While still moving, switch master solenoid “OFF” and watch spray controller count distance travelled along fence line.

eg. 

DISTANCE 43 m
---------------

When the distance counted equals the swath width, an audible beep will be heard.

5. Now turn back into the crop and switch master solenoid back “ON” to resume spraying.

### 3.6 CALIBRATION WARNING

When the controller is first switched on, **All Calibration Factors must be checked and set** - follow every calibration step carefully the first time!

Once calibration factors have been set the controller keeps check that all the factors remain the same until altered by the user.

If the controller detects any change to the factors, perhaps as a result of electrical interference, then an audible warning will activate and spraying will cease.

eg

CHK WHEEL CAL
---------------

The operator must check and restore the calibration factor before controlling can resume.  
See Troubleshooting section 3 if problem persists.

### 3.7 MEMORY BACKUP

The controller has a built in memory chip that will last 3-5 years. **All calibration factors** and stored totals such as area covered and volume used are kept in the memory even when the controller is totally removed from the 12 volt power source.

If the memory chip fails the controller will still function normally whilst the power switch is turned "ON". If you turn the power switch "OFF", the "CHECK CAL" message will appear when the controller is switched "ON" again. Then when convenient, you must return the controller to your dealer for a replacement memory chip.

### 3.8 IMPERIAL / METRIC KEY

The "IMP / MET" key allows all the readouts to be instantly converted from their metric to imperial equivalents. eg. hectares to acres, L/ha to g/ac, km/h to mi/h or kPa to psi.

Imperial Units are UK gallons. Dip Switch No. 2 inside the controller allows the selection of US gallons when in the "ON" position.

The "IMP/METRIC" key is not active in the "CALIBRATE" mode. All calibration measurements must be entered in **METRIC units**.

### 3.9 TOTAL AREA KEY

The "TOTAL AREA" key has two functions. Press once to display total area.

eg 

AREA T	175.2 ha
--------	----------

**TO RESET TOTAL AREA** Press "RESET" key for 3 seconds until display zeros.

**NOTE:** When "TOTAL AREA" is reset, all trip "AREAS 1-9" will be reset as well.

Press "TOTAL AREA" key again to display "DISTANCE"

eg 

DIST	30.15 km
------	----------

**TO RESET DISTANCE** Press "RESET" key for 3 seconds until display zeros.

**NOTE:** "TOTAL AREA" and "DISTANCE" will not accumulate if servo valve set to "CLOSE" or if "WIDTH" or wheel factor is set to **zero** or if there is no flow in when servo is switched in "AUTO" position.

### 3.10 TRIP AREA KEY

The "TRIP AREA" key has two functions. Press the "TRIP AREA" key once to display the **current** trip area.

Eg 

TRIP 1	32.6 ha
--------	---------

Press the “TRIP AREA” key again to display **current** trip litres.

eg 

TRIP 1	600.4 L
--------	---------

The trip function has 10 memories (trips 1-10) to enable separate totals for area and volume of product sprayed to be kept for later reference or print out using the optional printer.

**TO START A NEW TRIP** - press “TRIP” key to display current trip then “HOLD” ‘↑’ or ‘↓’ arrows for 3 secs to select a new memory number.

eg 

TRIP 2	0.00ha
--------	--------

Whichever trip number is displayed will be active when working. All other trip area totals are held in memory for future reference or may be reset as desired.

### TO RESET ANY TRIP AREA

First use ‘↑’ or ‘↓’ keys to display the required trip, then press “RESET” key for approx 3 seconds until display zero's.

Previous trip memories can be viewed or re-activated by using the ‘↑’ / ‘↓’ keys to select the desired trip memory. Whichever trip memory number is on display will be the **current active memory** when spraying.

**NOTE:** All Trip memories will be simultaneously cleared to zero, when “TOTAL AREA” function is cleared to zero.

## 3.11 TANK KEY

The “TANK” key has 3 sequential functions. Press “TANK” once to display “VOLUME USED”.

eg 

VOL USED	1625 L
----------	--------

Press “TANK” again to display “VOLUME LEFT”.

eg 

VOL LEFT	375 L
----------	-------

**NOTE:** “VOL LEFT” is calculated from tank capacity calibration explained in Section 4.9.

Press “TANK” again to display “AREA” covered this “TANK”

eg 

AR/TANK	44.6 ha
---------	---------

### TO RESET ALL TANK FUNCTIONS

Select any ‘TANK’ function and press “RESET” key for 3 seconds until display resets.

**NOTE:** Reset of all tank functions should be performed immediately after tank is refilled.

The “TANK LOW” Alarm will automatically activate when all but 100 Litres has been sprayed.

Eg 

TANK LOW	43 Lha
----------	--------

**NOTE:** The “TANK LOW” Alarm will not activate for a partial tank fill unless the tank capacity calibration factor is altered accordingly.

### 3.12 RATE SELECTION (High, Normal, Low)

The “RATE” selection keys may be used for changing the spray rate on-the-go. Above each “RATE” selection key is a **red light** which illuminates to indicate which rate has been selected.

Under normal operating conditions, the “NORMAL RATE” key will be selected. The “HIGH” or “LOW RATE” keys may be selected at any time. The servo valve will automatically adjust to the selected rate whilst switched to “AUTO”.

When switching from “NORMAL” to “HIGH” you may need to slow down a bit to allow the new “RATE” to be delivered likewise from “NORMAL” to “LOW” you may need to accelerate to get sufficient spray pattern.

### 3.13 FLOW RATE, SPEED & PRESSURE KEYS

The flow rate, speed and pressure keys allow any two functions to be displayed at the same time. To display application rate and ground speed at the same time press flow rate then speed key.

eg 

50 Lha	14 kph
--------	--------

The last key selected is always displayed on the right hand side and what **was** on the RHS moves left.  
eg. When “PRESSURE” key is activated.

14 kph	260 kpa
--------	---------

In this way any two functions can be displayed together. Some keys have dual functions.  
eg. “SPEED” key press once for “KPH” and press again for Hectares per hour.

eg 

260 kpa	14 kph
---------	--------

260 kpa	43 ha/hr
---------	----------

Likewise with flow rate, press once for litres per hectare and press again for litres per minute.

260 kpa	50 Lha
---------	--------

260 kpa	36 Lpm
---------	--------

### 3.14 ALARM FUNCTIONS

**RATE ALARM** - If the “SERVO VALVE” switch is set to “AUTO”, the sprayrate will automatically adjust to match whichever “NORMAL”, “LOW” or “HIGH” rate key has been selected once ground speed is detected.

An audible alarm and warning display will activate after 5 seconds if the selected rate can not be achieved and maintained to within +/- 5% automatically.

eg 

RATE LO	44.2 Lha
---------	----------

After a further 2 seconds a corrective instruction will be issued.

eg 

SLOWER	44.2 Lha
--------	----------

 Tells the operator to slow down

The warnings will continue to alternate until the situation is corrected. The operator may select any function to display on the RHS of the screen during the alarm sequence by pressing the required function key.

If the servo switch is set to “OPEN”, then the operator must vary the speed or pressure manually until the correct rate is achieved.

**PRESSURE ALARM** - Pressure alarm points may be set during calibration if desired to warn of excessively high or low operating pressures as may be experienced if driving too slow or too fast for a selected rate outside the recommended nozzle limits - see Calibration section 4.11.

The Pressure Sensor positioned inside the servo control valve box gives a reading of spray line pressure in the range 0 - 500 KPA at the **OUTLET** of the servo box.

Due to line losses a test of spray line pressure at the nozzles may reveal a lower pressure than that displayed at the servo outlet.

The accuracy of spray application is not dependant on this pressure readout because the control system is volume based and works on delivering the correct litres per minute for a given width of operation at a certain speed to achieve the selected rate.

The pressure reading will automatically increase as you go faster or select a higher rate and will decrease as you slow down or select a lower rate.

If “HI” or “LO” pressure alarm points are exceeded, the readout will automatically revert to display the current pressure, regardless of whatever function was previously selected. An alarm will sound and the warning “**PR HIGH**” or “**PR LOW**” will alternate with a display of “SLOWER” or “FASTER” as may be necessary to correct the situation.

Eg 

PR HI	42 Lha
-------	--------

SLOWER	42 Lha
--------	--------

The operator should slow down for “PR HIGH” or accelerate for “PR LOW” until the alarm goes away.

Either alarm point may be disabled by setting zero for either “PR HIGH” or “PR LOW” during calibration.

**LOW TANK ALARM** - the “LO” tank warning will activate an audible alarm and visual display when all but 100 litres of product has been sprayed.

eg 

TANK LO	42 Lha
---------	--------

Press any key to clear “TANK LO” warning off the screen. After refilling tank, press “TANK” key and reset tank used display back to “ZERO” before starting out.

**NOTE:** The “TANK LO” warning will not activate for a partial fill unless the total tank size calibration is changed accordingly - see section 4.9.

### 3.15 TEST KEY

The “TEST” key allows the sequential testing of the wheel sensor, flow sensor and servo motor operation. The test Procedure is usually carried out whilst stationary.

Switch to “OPERATE” mode. Press “TEST” key to display “TEST WHEEL COUNTER”.

eg 

TEST WHEEL	0
------------	---

This test requires the vehicle to be moved slowly forward. A short beep should be heard each time a pulse counted. If no sound is heard, refer to Troubleshooting section 7.

Press the “TEST” key again to display “TEST FLOW COUNTER”.

eg 

TEST FLOW	0
-----------	---

Switch the servo valve to “OPEN” and switch at least one boom solenoid on (if used) then allow liquid to flow slowly through the flow sensor.

The test counter should increment together with a regular beep that becomes faster as the flow rate increases until the beep becomes an almost constant tone. If the flow sensor has failed, refer to Troubleshooting 12.

Press the “TEST” key again in succession to display “MOTOR WINDINGS”:

eg 

WINDING 1	OK
WINDING 2	OK
WINDING 3	OK
WINDING 4	OK

All motor windings should test OK.

If the test reads winding “OPEN” or “SHORT” then refer to Troubleshooting "Motor Windings Open or Short".

### 3.16 PRINTOUT OPERATION

Using the optional 2040 Printer, a printout of spray data for up to ten separate trip areas may be made.

The data variables explained in Section 4.13 must be set **before** starting to work in any one of the 10 trip area memories.

The printer is connected via the serial port at the left hand rear underside of the controller at anytime a print out is required. Store printer in protective pouch when not in use. If 2405 boom control installed, remove existing cable from serial port on 2400 spray controller and connect printer cable instead - comms error will be displayed until print key is activated.

## TO ACTIVATE THE PRINTER

1. The **red** power light on the printer should illuminate when the spray controller is switched on.
2. Press “SEL” key, on printer to bring the green printer light on line ready to print.
3. Press ‘PRINT’ key to display print menu.

Eg

4. Use ‘↑’ & ‘↓’ keys on spray controller to select specific trip area number to be printed or select all trips.

eg

or

5. Once the desired selection is displayed press the “PRINT” key again to start the printout. A printout message will be displayed;

eg

6. To make another print, repeat steps 4-6 as required.
7. Disconnect printer and reconnect boom control comms cable (if used).
8. Press any function key to exit print mode (area, trip, rate, etc...).

### **IMPORTANT: DO NOT LEAVE PRINTER ATTACHED WHEN NOT IN USE AS IT WILL OVER HEAT**

#### **NOTE:**

- Trips can be printed individually or together.
- If printing ‘ALL TRIPS?’ the printer will run a copy of all stored data for each trip number used and give a grand total at the end.
- Multiple copies of the printout can be made.
- The controller will not perform any other function whilst printout in progress.
- All stored data for all trips will be erased whenever total area is reset to zero.
- Trip area data will be erased if individual trip area memories are reset to zero.
- Store printer in a cool, dry dust free location.
- Order consumables from stationary store:  
Printer Ribbon      Epson ERC – 09 and Printer Roll      Epson PR 57
- Use printer “LF” key to advance paper.
- Press and hold down “SEL” key on printer for a few seconds to start printer self test.
- If “PRINT” key pressed and printer is not connected or has a wiring fault, the controller will display as follows.

Eg

## 3.17 GPS COMPATIBILITY

The 2400 Spray Controller can be slave driven on demand to automatically assume any sprayrate downloaded via the 9 pin serial communication port at the left hand underside of the controller.

Typically, the command to change rates would be derived from a preprogrammed “Rate Map” linked to a differentially corrected GPS signal controlled via a laptop computer or the new Farmscan canlink 3000 which conveniently links all these elements together.

When you are ready to start variably controlling, please contact our technical services department on +61 8 9470 1177 or [service@farmscan.com](mailto:service@farmscan.com) for assistance.



## 4.0 CALIBRATION

### 4.1 GENERAL OUTLINE

Various calibration factors must be correctly entered into the spray controller memory before the controller will operate correctly. From new, **all calibration factors must be checked before** the controller will allow normal operation.

Entry of an incorrect factor will cause the controller to make **incorrect calculations** and hence **apply the wrong rate**. All calibration factors must be entered in **metric** values.

Most of the calibration options on your controller are written in **red** on the front panel below each operating key. To proceed with calibration - switch the "OPERATE / CALIBRATE" switch to "CALIBRATE" position then select the required calibration function, as explained in the following pages.

Press '↑' or '↓' keys repeatedly to increase or decrease the displayed number. **Hold** the '↑' or '↓' keys to change numbers quickly.

Once you set the correct calibration factors they will remain correctly in memory even if the power becomes disconnected.

A special calibration checking system continuously scans and checks your calibration settings then warns you if any values become corrupted or have not been checked from new.

eg

CHK WHEEL CAL

### 4.2 RATE CALIBRATION

Before entering High, Normal or Low rate calibration, check which type and size of nozzle is installed in your sprayer, refer to the manufacturer's spray chart.

If you enter a rate calibration that is not suited to the size of the nozzles installed, you will have problems. If the nozzles are too small, the rate alarm will activate before you reach the intended speed and the pressure will be too high.

If the nozzles are too large, you won't get an adequate spray pattern and the pressure will be too low unless you travel very fast. Most nozzles will produce an acceptable spray pattern and droplet size when operated in the range of 150 - 350 KPA.

Lower pressures produce bigger droplets.

Higher pressures produce smaller droplets.

You must choose a nozzle size that will allow the target rate over a range of practical working speeds within the acceptable pressure range.

For Example - for a target rate of 50 L/Ha operating at around 200 -300 KPA for a speed of 12 - 14 km/h you would choose green jets type XR 110015

In the attached spraying systems spray chart, using XR 110015 Jets, a rate of 50 L/Ha can be achieved at speeds of around 8 kph through to approximately 16 km/h.

#### REFER TO PAGE 36 OF THIS MANUAL FOR THE SPRAY CHART EXAMPLE.

At 8 kph the pressure will be around 100 kPa at 16 km/h the pressure will be approaching 400 kPa. The spray controller will automatically work within this pressure range as you increase or decrease your speed.

If you change rates to 40 L/ha using the same nozzles, the speed range will be 10-20 km/h.

#### RATE CALIBRATION PROCEDURE

1. Switch to "CALIBRATE" Mode.
2. Select "HIGH", "NORMAL" and "LOW" Rate Calibration.
3. Use '↑' or '↓' keys to set desired L/Ha for each of the three rate memories.

Eg 

RATE N	40.0 Lha
--------	----------

#### NOTE:

"HIGH" and "LOW" rates must be achievable with the same nozzles. ie, you can't expect to double the rate unless you decrease the speed to help compensate. Set High and Low calibrations to zero if not required.

## 4.3 WHEEL CALIBRATION

This factor is the distance of forward travel per pulse from the wheel sensor, speedo sensor, tail shaft sensor or radar speed sensor.

Accurate measurement of the distance between pulses is important. The measurement should be done in real working conditions. Soft to hard ground makes a difference with some sensors.

If a wheel sensor is fitted to the sprayer wheel, half fill the tank to establish average tyre loading.

#### DISTANCE MEASUREMENT PROCEDURE.

1. Switch controller to "OPERATE" mode.
2. Press "TEST" key until "TEST WHEEL" is displayed.

Eg 

TEST WHEEL	0
------------	---

3. Drive slowly forward until "TEST WHEEL" counter **just** updates and stop exactly on a pulse / beep.

eg 

TEST WHEEL	1
------------	---

If you over shoot, go to the next count.

4. Press "RESET" key to bring "TEST WHEEL" counter to zero again.
5. Peg ground at bottom centre of any wheel.
6. Drive forward in a straight line for at least 25 metres and stop exactly on a pulse update / beep.

Eg 

TEST WHEEL	43
------------	----

If you overshoot, go to the next count **don't reverse**.

7. Measure the exact distance travelled then divide the distance by the number of pulses counted.

eg      Distance Travelled      = 27.65m  
          Pulses counted            = 43  
    27.65m ÷ 43      = 0.643m / Pulse

Record this figure for future reference.

<b>WHEEL FACTOR:</b>
----------------------

## WHEEL CALIBRATION PROCEDURE

1. Switch controller to "CALIBRATE" mode.
2. Press "SPEED" key until "WHEEL CALIBRATION" is displayed

eg 

WHEEL	0.000 m
-------	---------

Use '↑' / '↓' arrow keys to set the wheel factor as calculated

Eg 

WHEEL	0.643
-------	-------

**NOTE:** wheel calibration key allows access to 3 factors. Make sure other calibrations are set to "OFF" using '↓' key, if not used.

eg 

2ND LINE OFF
--------------

SLOW HLD OFF
--------------

## 4.4 SLOW SPEED HOLD CALIBRATION

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 SPEED HOLD POINT", which will make the controller hold pressure when ground speed falls below a set point. eg. Below 8 kph the pressure is held constant.

**WARNING :** Operating below the speed hold point will result in **over** application and activation of the rate "HI" alarm.

This is an owner/operator choice based on the logic that too much chemical is better than incomplete coverage.

### TO DETERMINE SLOW SPEED HOLD POINT

1. Calibrate controller as normal for the required rate.
2. Start spraying at normal speed then slow down until nozzle fan pattern begins to deteriorate.
3. Take note of the ground speed when this happens and use this point for slow speed calibration as explained below.

### TO SET SLOW SPEED HOLD

1. Switch to "CALIBRATE" mode.
2. Press "SPEED" key a couple of times until slow speed hold calibration is displayed.

eg. SLOW HOLD OFF

3. Use '↑' or '↓' arrow keys to set the required slow speed hold point (1 - 99 kph)

eg. SLOW HOLD 8 kph

4. Switch back to "OPERATE" mode.

### TO DISABLE SLOW HOLD FUNCTION

Use '↓' key to set slow hold to "OFF".

## 4.5 SECOND SPRAYLINE CALIBRATION

Utilising a second sprayline, it is possible to travel at twice the speed range that would be possible with only one sprayline using automatic spray control.

When the second sprayline function is enabled, the spray controller will automatically activate a second sprayline at a preset ground speed. In this way an operator can take advantage of faster spraying speeds when conditions permit.

At slower speeds the second sprayline will de-activate below the preset point.

### SECOND SPRAYLINE NOZZLE CHOICE

The choice of nozzle size for the second sprayline would normally be the same as the first sprayline, but you could have finer nozzles for smaller droplets or coarser nozzles for larger droplets on the second sprayline.

As with any spraying setup it is important that the choice of nozzles installed on both the first and second spraylines is suitable to achieve the rate and speeds desired.

Refer to the nozzle manufacturers reference chart example (Page 40) to make sure the nozzles are suitable to deliver the intended rate at workable speeds.

**FOR EXAMPLE :**

Spraying systems Green XR 110015 will deliver 50 L / ha in the approximate speed range 8 km/h to 16 km/h on the first sprayline.

Therefore, a second sprayline fitted with the same green nozzles will allow double the speed range at 50 L / ha, ie. 8 km/h to 32 km/h. The best speed to activate the second sprayline is when the first line nozzles are approaching full pressure (300 - 350 kPa). In the example this would be around 14 km/h (300 kPa).

**TO SET SECOND SPRAYLINE ACTIVATION**

1. Switch controller to "CALIBRATE" mode.
2. Press "SPEED" key a couple of times until 2nd sprayline function is displayed.  
eg. 

2ND LINE	OFF
----------	-----
3. Now use '↑' and '↓' arrow keys to set second sprayline activation speed.  
eg. 

2ND LINE	14 km/h
----------	---------
4. Switch back to "OPERATE" mode.

**Note:** If 2405 boom control used, the second sprayline function may be over ridden by switching the 2nd line switch to "OFF".

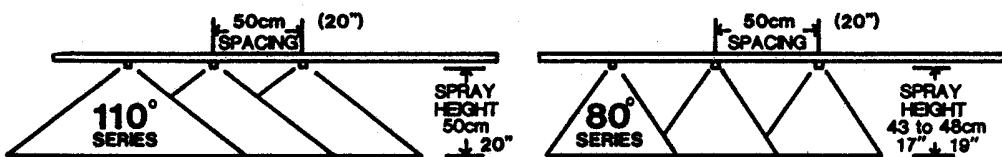
Spray chart courtesy of Spraying Systems

## FLAT SPRAY TIP CHART

CHART ALSO APPLIES TO STANDARD FLAT SPRAY TIPS

TIP COLOR	TIP NO. <sup>1</sup> (Strainer Screen Size)		Liquid Pressure Kpa	Capacity 1 Nozzel lit/min	LITERS PER HECTARE								
	110° SERIES	80° SERIES			8 km/h	10 km/h	12 km/h	14 km/h	16 km/h	18 km/h	20 km/h	24 km/h	30 km/h
ORANGE	XR11001 (100 Mesh)	XR8001 (100 Mesh)	100	0.23	34	27	23	19.5	17	15	14	11.5	9
			150	0.28	42	34	28	24	21	19	17	14	11
			200	0.32	48	39	32	28	24	21	19	16	13
			300	0.39	59	47	39	34	29	26	23	20	16
			400	0.46	68	55	46	39	35	31	28	23	18
GREEN	XR110015 (100 Mesh)	XR80015 (100 Mesh)	100	0.34	51	41	34	29	25.5	23	20	17	14
			150	0.42	63	50	42	36	32	28	25	21	17
			200	0.48	72	58	48	41	36	32	29	24	19
			300	0.59	89	71	59	51	44	39	35	30	24
			400	0.68	102	82	68	59	51	45	41	34	27
YELLOW	XR11002 (50 Mesh)	XR8002 (50 Mesh)	100	0.46	68	55	46	39	34.5	31	28	23	18
			150	0.56	84	67	56	48	42	37	34	28	22
			200	0.65	97	77	64	55	49	43	39	33	26
			300	0.79	118	95	79	68	59	53	47	40	32
			400	0.91	137	109	91	78	68	61	55	46	36
BLUE	XR11003 (50 Mesh)	XR8003 (50 Mesh)	100	0.68	103	82	68	59	51	45	41	34	27
			150	0.84	126	100	84	72	63	56	50	42	34
			200	0.97	145	116	97	83	73	64	58	49	39
			300	1.18	178	142	118	102	89	79	71	59	47
			400	1.37	210	164	137	117	103	91	82	69	56
RED	XR11004 (50 Mesh)	XR8004 (50 Mesh)	100	0.91	137	109	91	78	68	61	55	46	36
			150	1.12	167	134	112	96	84	75	67	56	45
			200	1.29	193	155	129	111	97	86	77	65	52
			300	1.58	240	189	158	135	118	105	95	79	63
			400	1.82	270	220	182	156	137	121	109	91	73

### CHART BASED ON SPRAYING WATER



One Millimeter = 1000 Micrometres

- 500 Micrometres
- 1.200 Micrometres
- 5.500 Micrometres

ACTUAL PARTICLES SIZES

#### USEFUL FORMULAS

$$\frac{\text{lit/min}}{\text{(Per Nozzle)}} = \frac{\text{lit/ha km/h} \times \text{w}^2}{60.000}$$

$$\text{lit/ha} = \frac{60.000 \times \text{lit/min (Per Nozzle)}}{\text{km/h} \times \text{w}^2}$$

\*W - Nozzle spacing (in boom spraying or spray swath (in boom-less spraying) in centimetres.

Where Tables Are Based on 50cm. Nozzle Spacing									
Other Spacing cm.	20	25	30	35	40	45	55	60	75
Conversion Factor	2.5	2	1.67	1.43	1.25	1.11	.91	.83	.66

CONVERSION FACTORS	
Lit./Ha. to Imp. G.P.A. × 0.089	
kPa to P.S.I. × 0.145	
Litres to Imp. Gallons × 0.219	
km./hr. to m.p.h. × 0.621	

## 4.6 WIDTH CALIBRATION

The effective working “WIDTH” is best calculated by multiplying the number of nozzles on a single sprayline by the nozzle spacing when spacings are equal.

### EXAMPLE

Number of Nozzles	=	24
Nozzle Spacing	=	0.5 metres
24 x 0.5	=	12 metres

This formula can be applied to the whole boom or to individual boom sections. For row crop booms, measure the total width regardless of nozzle spacings.

Before setting boom width calibration, you must set the number of sections in operation.

### SETTING NUMBER OF SECTIONS

1. Switch to “CALIBRATE” mode.
2. Press “TOTAL AREA” key a couple of times until “SECTIONS” is displayed.

eg 

SECTIONS	1
----------	---

3. Use ‘↑’ / ‘↓’ arrow keys to set correct number of sections under **solenoid control**.  
**Note:** If sections are manually controlled you must set 1 section only.

You must not shutdown manually controlled sections, unless the width factor is changed accordingly.

If 5 section boom control installed, but you only use 3 sections then set 3 sections only etc.

### SINGLE WIDTH CALIBRATION

1. Switch to “CALIBRATE” mode and press “TOTAL AREA” key a couple of times until “WIDTH” calibration factor is displayed.

Eg 

WIDTH	0.00 M
-------	--------

Or 

WIDTH	OFF
-------	-----

If 3 Section boom control used, switch “CENTRE” width “ON”, or if 5 section boom control, switch “WIDTH 1 ‘ON’”.

2. Use ‘↑’ / ‘↓’ arrow keys to set full width of boom to be controlled.

eg 

WIDTH	12.00 m
-------	---------

## MULTIPLE WIDTH CALIBRATION PROCEDURE

1. Switch to "CALIBRATE" mode.
2. Press "TOTAL AREA" key a couple of times to display "WIDTH" calibration factor.

eg 

WIDTH	0.00 m
WIDTH	OFF

  
or

3. Switch boom control "MASTER" Switch "ON" and switch **ALL** section switches "OFF". Display will read,

WIDTH	OFF
-------	-----

4. Switch "LEFT" boom switch or boom 1 "ON" and enter boom width (for that section) using '↑' and '↓' keys.

Eg 

WIDTH L	5.50 m
---------	--------

Or 

WIDTH 1	5.50 m
---------	--------

5. Switch "LEFT" boom switch "OFF" and switch "CENTRE" boom switch or boom 2 "ON" and enter width for that section.

eg 

WIDTH C	10.50 m
---------	---------

6. Switch "CENTRE" boom "OFF" and "RIGHT" boom "ON" then enter "RIGHT" width etc.

eg 

WIDTH R	5.50 m
---------	--------

If using 2405 boom control, repeat above procedure for all sections.

7. Switch **ALL** boom section switches "ON" to display overall width.

eg 

WIDTH	21.50 m
-------	---------

- NOTE:**
- Any sections connected but not used must be set to zero.
  - If installing fence line jets together with second sprayline, set the width to zero for the fenceline section.
  - Second spray line will not operate unless all non-zero sections are switched "ON".



## 4.7 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 is unique to every flow sensor and will vary slightly depending on liquid viscosity.

Attached to every flow sensor is a tag which gives the PPL factor for that sensor. It may be used for initial flow calibration.

**Important:** After installing the system, the PPL factor should be checked before operating the controller by measuring into a known container.

To check the flow calibration factor, at least 20 Litres of Liquid must be pumped through the flow sensor.

If bucket marks are doubtful, use a calibrated jug to check the pumped quantity or weigh the measured quantity, eg. 1 litre water = 1 kg.

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 to easily stop and start the test.

### TEST PROCEDURE:

1. Fully prime the flow sensor and hose before starting.
2. Switch controller to "OPERATE" mode and press "TEST" key until "TEST FLOW" is displayed then press "RESET" to zero pulse counter.

eg 

TEST FLOW	0
-----------	---

3. Start liquid flow into container and shutoff flow exactly at the desired point. The test flow counter should immediately stop counting.

eg 

TEST FLOW	568
-----------	-----

Divide the pulses counted by the volume measured.

eg  $568 \text{ Pulses} \div 20 \text{ Litres} = 28.4 \text{ PPL}$

5. Repeat the test to make sure there are no errors, then set the correct flow calibration factor as explained below.

### TO SET FLOW CAL FACTOR

1. Switch controller to "CALIBRATE" mode.
2. Press "FLOW RATE" key a couple of times to display flow cal factor.

eg 

FLOW CAL	45.6
----------	------

3. Use '↑' / '↓' keys to set correct flow cal factor.

eg 

FLOW CAL	28.4
----------	------

4. Switch back to "OPERATE" mode.

### IMPORTANT:

Metal body flow sensors type AA-120/P use a factor of 45.6 PPL when factory adjusted.

Check calibration into a bucket before use.

## 4.8 GPS CALIBRATION

The GPS calibration must be set to “DISABLED” if not operating under GPS control or “ENABLED” if GPS serial communication is connected. If not correctly set, “COMMS ERROR” will be displayed.

### GPS CALIBRATION PROCEDURE

1. Switch controller to “CALIBRATE” mode.
2. Press “FLOW RATE” key a couple of times to display “GPS CALIBRATION”.

eg 

GPS	ENABLED
-----	---------

3. Use ‘↑’ / ‘↓’ keys to select desired mode.

eg 

GPS	DISABLED
-----	----------

## 4.9 TANK CALIBRATION

By entering the tank capacity, the spray controller will calculate volume used, and volume left after each tank refill.

The alarm point at 100 litres left is based on this tank calibration factor which would need to be altered for a partial tank fill if you wanted the low tank alarm to activate.

### TANK CALIBRATION PROCEDURE

1. Switch to “CALIBRATE” mode.
2. Press “TANK” key until tank volume calibration factor is displayed.

Eg 

TANK VOL	0 L
----------	-----

3. Use ‘↑’ and ‘↓’ keys to set tank volume.

## 4.10 MISTING CALIBRATION

Misting calibration must remain **OFF** if not used.

### TO ACTIVATE MISTING FUNCTION

1. Switch to “CALIBRATE” mode.
2. Press “WIDTH” key until “SECTIONS” is displayed.

eg. 

SECTIONS	3
----------	---

3. Use ‘↓’ arrow key to scroll down through the sections until you reach “MISTING”.

eg. 

SECTIONS MISTING
------------------

- Press "TOTAL AREA" key to display width calibration.

eg. 

WIDTH OFF
-----------

- Switch misting solenoid "ON" to activate swath width calibration.

**NOTE:** Misting solenoid controlled by solenoid 1 on a 2405 and the center solenoid on a 2403.

eg. 

WIDTH S	0.0 m
---------	-------

- Use '↑' / '↓' arrow keys to set swath width.

eg. 

WIDTH S	60.0 m
---------	--------

- Switch solenoid OFF and ON again to check width is firmly in memory.
- Set rate and wheel calibrations and check that slow hold and 2nd sprayline functions are deactivated. Set "HI" & "LO" pressure alarm points to zero.
- Recalibrate modified flow sensor as explained under flow sensor calibration in this manual.
- Switch back to "OPERATE" mode.

## 4.11 PRESSURE CALIBRATION

As the servo control valve responds to variations in speed or changes in rate (High, Low, Normal), the pressure indication will increase or decrease accordingly.

Excessively high pressure will result in fine droplets and the risk of increased spray drift (Usually 350 - 400 kPa). Excessively low pressure will result in the loss of full fan pattern and consequently weeping nozzles that over-apply chemical in a narrow band. (Usually less than 150 kPa)

The option is available to set upper and lower pressure alarm points, so whenever the pressure is outside these points an alarm will sound and the display will prompt the operator to take corrective action.

It is normally recommended to leave pressure alarm points at zero until spray controller is fully operational, then introduce alarms on pressure if desired.

### PRESSURE ALARM POINT CALIBRATION PROCEDURE

- Switch to "CALIBRATE" mode.
- Select "PRESSURE" to display pressure high alarm point.

Eg 

PR HIGH	400 kPa
---------	---------

- Use '↑' and '↓' keys to set "PR HIGH" point.

- Select "PRESSURE" calibration key again to display "PR LOW" point - enter low pressure alarm point.

Eg 

PR LOW	100 kPa
--------	---------

**NOTE:** Set zero for no alarm on either "HI" or "LO" option.



eg 

PADDOCK	No 12
---------	-------

2. PRICE \$/ha Set charge rate per hectare or leave set to zero if not contract spraying.

eg 

PRICE	\$4.00 / ha
-------	-------------

3. TEMPERATURE C° Use your own thermometer to measure temp, then enter the figure.

eg 

TEMPERATURE	25 C
-------------	------

4. HUMIDITY % Use your own hydrometer to measure humidity, then enter the figure.

eg 

HUMIDITY	38%
----------	-----

5. WIND SPEED km/h Use your own anemometer to measure windspeed, then enter the figure.

eg 

WINDSPEED	8 kph
-----------	-------

6. CHEMICAL 1 CODE Set your own 2 digit code number to indicate Chemical No 1 type.  
(eg 08 = SPRAYSEED)

eg 

CHEM 1 CODE	08
-------------	----

7. CHEMICAL 1 L/ha Enter the neat rate of chemical code 1 used (eg 1.5 L/ha).

eg 

CHEM 1	1.5 Lha
--------	---------

8. CHEMICAL 2 CODE Set a second 2 digit code to indicate a second chemical mixed with the first  
(eg 04 = HOEGRASS)

eg 

CHEM 2	CODE 04
--------	---------

9. CHEMICAL 2 L/ha Set the neat rate of Chemical No 2. used

eg 

CHEM 2	0.5 Lha
--------	---------

10. CHEMICAL 3 CODE As above

11. CHEMICAL 3 L/ha As above

If you wish to skip a data line in the printout, set the value to zero for that line and it won't print out. Once the data variables are set they will duplicate for each of the ten trip memories if you don't change them.

Alternatively, you can vary any line as required **after** incrementing to a new trip memory, See Section 3.10, ie trip 1 to trip 2 may have different data.

Date stamping of each trip area is initiated when the first accumulation of **litres** and **area** is recorded after each new trip memory is selected.

## 5.0 SPRAYER ADJUSTMENT AND TEST

Once the spray controller is installed and calibrated you need to make sure the components are working properly and to adjust the sprayer pump to ensure sufficient pressure is available so that both spraying and agitation of the tank can be maintained at the same time.

### 5.1 SPRAYER PRESSURE ADJUSTMENT PROCEDURE

This procedure is performed whilst stationary for all types of stationary pumps. For ground driven pump systems, fit a drive sprocket that delivers a higher rate, eg. If target is 30 L/ha fit 50 L/ha sprocket and make the adjustment by trial and error driving at your maximum working speed.

A pressure relief valve must be installed **before** the servo control valve.

1. Part fill tank with water only. If a positive displacement pump is used, make sure pressure relief valve is fully open to start (wound out fully anticlockwise).
2. Establish brand and model of nozzles fitted to your sprayer.
3. Refer to the nozzle manufacturer's spray chart and find out the maximum pressure required to establish the desired rate at the desired maximum speed. eg. Spraying Systems XR110015 Green spray tips for a target rate of 40L/ha at 18 kph = 300 kPa
4. Switch controller to "OPERATE" mode, switch "POWER" on and switch servo valve to "OPEN" position.
5. If boom control used, place master switch "ON" and **ALL** boom section solenoid switches "ON".
6. Run pump at normal revs and verify that all nozzles are spraying properly.
7. Select "PRESSURE" readout on digital display.
8. Adjust pressure relief valve to attain 50 kPa - 100 kPa (7psi - 14 psi) higher pressure than the maximum required eg. 350 - 400 kPa. This gives the servo valve a small headroom of extra available pressure at your maximum speed.

**NOTE:** Actual pressure at nozzles may be lower than digital readout due to line losses. It is recommended to fit a glycerine filled mechanical pressure gauge on the sprayline to measure true working pressure for the adjustment procedure.

### 5.2 SYSTEM COMPONENTS TEST

#### SERVO CONTROL VALVE TEST

1. Switch to "OPERATE" mode and switch servo valve to "CLOSE" position.
2. Switch servo valve to "OPEN" position and watch brass coupling between stepper motor and ball valve turn through 90 degrees in approximately 6 seconds.
3. Switch back to "CLOSE" position and watch the reverse.

**NOTE:**

A vibrating sound is normal when the valve has turned a full 90 degrees or when the controller power is first switched "ON" and the valve position is reset automatically.

#### SOLENOID VALVE TEST (Optional if Boom Control Used)

1. Turn boom control master switch "ON" and switch servo to open.
2. Turn each of the boom solenoids "ON" in turn listening for a soft click as each one is activated.

- **2403:** LEFT, CENTRE and RIGHT boom solenoids.
- **2405:** 1 to 5 & 2nd sprayline, left & right foam solenoids (if used).

## FLOW SENSOR TEST

1. Switch to "OPERATE" mode, "CLOSE" servo valve, and turn power on.
2. Check red light on flow sensor is active.
3. Select flow rate (Lpm) display on controller.
4. With water in tank, start pump and turn on at least one boom solenoid (if used).
5. Switch servo valve to "OPEN" position.
6. Green light on flow sensor should flash at a regular beat. Lpm readout should be stable.

## WHEEL SENSOR / SPEEDO SENSOR TEST

1. Switch to "OPERATE" mode, "CLOSE" servo valve and turn power "ON".
2. Select "SPEED" (kph) display and drive down road at a steady normal spraying speed. Readout should be stable within +/- 0.2 km/h.

## 5.3 CONTROL SYSTEM FIELD TEST

1. Switch spray controller "ON" and check that all calibrations are set correctly. ie: "RATE" (High, Normal, Low), "WIDTH", "FLOW CAL", "WHEEL"
2. Switch to "OPERATE" mode and set servo valve switch to "AUTO" position.
3. Select "NORMAL" Spray rate and press "FLOWRATE" key to display Lha.
4. Start pump and run at normal RPM as established in 5.1.
5. Switch on boom control master switch together with **ALL** boom solenoid switches (LEFT, CENTRE, RIGHT or 1-5 depending on boom control model).
6. Drive forward and accelerate to your target speed. Rate Lha readout should stabilise to the selected rate within 5 seconds to an accuracy of +/- 0.5 Lha. If response sloppy, then recheck pressure setup 5.1.
7. Now try varying your speed within the minimum and maximum limits defined by the manufacturers spray chart.

## 5.4 SECOND SPRAY LINE TEST

### BOOM CONTROL CENTRE NOT USED

Switch servo to open and second sprayline solenoid should immediately activate.

### MULTISECTION BOOM CONTROL USED

Switch all boom sections ON and switch servo to "OPEN", then second sprayline should immediately activate.

**NOTE:** If controller set for 3 Sections only on a 5 section controller, then 3 sections must be switched on.

If the master solenoid control is switched "OFF", then both spray lines should switch "OFF".

## PUMP ADJUSTMENT



Now to set the pump spray pressure to cope with both spray lines, switch the servo valve to "OPEN" and all solenoid valves "ON".

Start the pump and adjust the pressure to read 400 - 450 kPa on the spray controller pressure readout with both spray lines operating.

**NOTE:** To achieve desired maximum speeds, the available pressure at the nozzles must be at least 400 kPa when in the "OPEN" condition. Because of line loss, the actual boom pressure may be lower than indicated on the spray controller. Check actual pressure at the spray boom with a separate gauge if speeds cannot be attained.

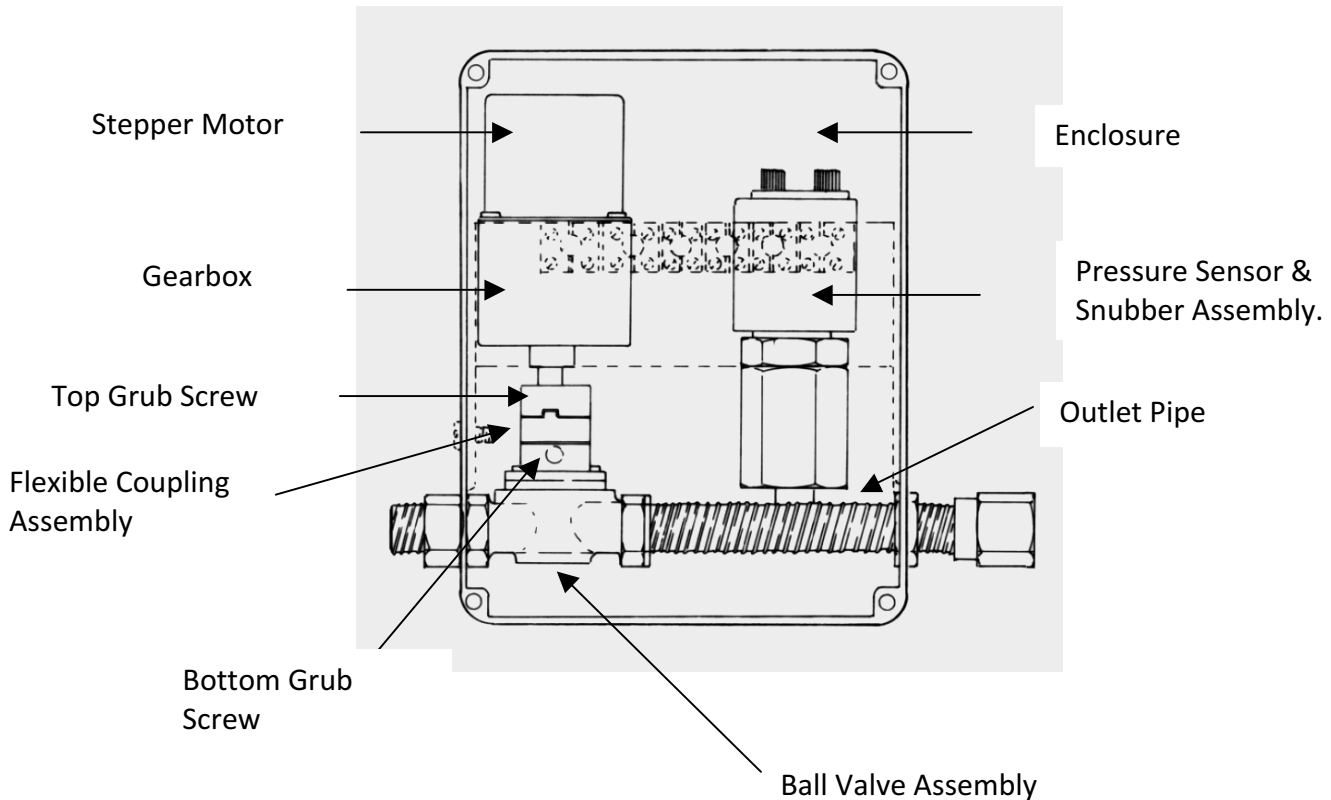
## 5.5 PREVENTATIVE MAINTENANCE

SPRAY CONTROLLER	*	Store in a cool dry place when not in use for long periods.
SERVO CONTROL VALVE	*	Flush out daily with fresh water.
	*	Check internal fittings for leaks.
	*	Check top and bottom grub screws in flexible coupling are firmly tightened onto flat of shafts
	*	Check wiring into terminal strip is secure and clean.
	*	Do not oil motor.
FLOWSENSOR	*	Flush out daily with fresh water.
	*	Check inlet filter for trapped debris.
	*	Keep electrical connections clean.
	*	Check calibration every 3 months.
PRESSURE SENSOR	*	Prior to storage remove sensor from servo valve and follow Servicing Procedure 5.7
		<b>NOTE:</b> To avoid risk of crop damage remove and clean snubber housing when changing chemicals.
BREAKAWAY CONNECTIONS	*	Wash pins of multiconnector plug with kero or petrol before each season or when dirty.
	*	Do not use conductive spray.
	*	Carefully expand split pins on breakaway connector plug to ensure a good contact.

STORAGE

- \* Flush and drain sprayer before storing. Freezing temperatures may damage flow meter or servo valve if not drained properly.

## 5.6 3/4" SERVO CONTROL VALVE - PARTS BREAKDOWN'



## 5.7 PRESSURE SENSOR SERVICE PROCEDURE

The 2015 Pressure sensor will operate over the range of 0 to 500 kPa. The pressure sensor is supplied complete with brass "Snubber" which acts to protect the sensor from chemical damage.

The pressure sensor adaptor may be unscrewed for cleaning of powder build up on the **INLET** side of the snubber housing.

The pressure sensor itself should not be removed from the pressure sensor adaptor which contains a measured quantity of a special oil inside the viton sack.

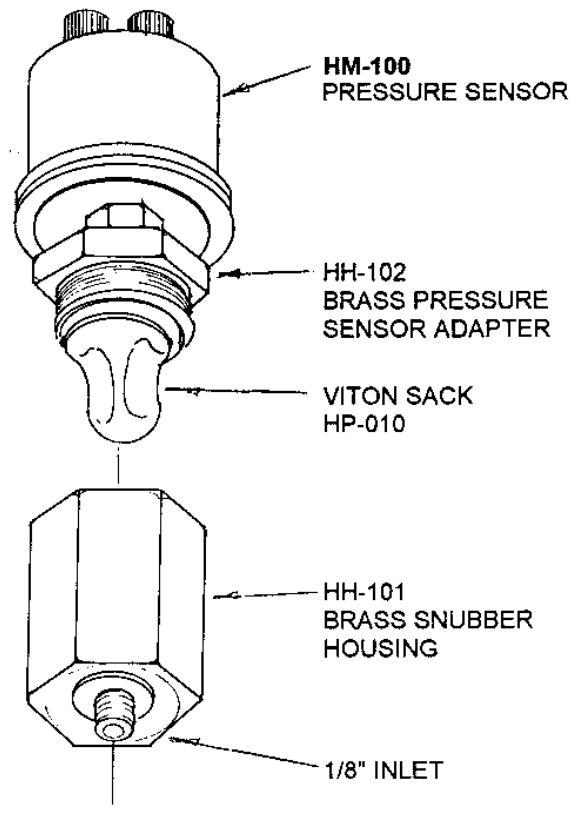
## INSTALLATION

Screw pressure sensor and snubber unit into 1/8" NPTF threaded hole on the pressure line, using thread sealant (thread tape) to ensure a liquid tight seal.

Connect the sensor cable (the end with the eyes) to the screw terminals on the pressure sensor, positioning the spring washer between the eye and the nut. Polarity of these wires is not important.

## SERVICING

If the snubber **INLET** becomes blocked with suspension chemicals remove sensor snubber assembly and hold snubber housing in a vice and gently unscrew sensor adaptor containing oil in one piece. Clean bottom section and reassemble without disturbing viton sack containing oil



**RESISTANCE TESTING:** Using a multimeter the pressure sensor should measure,

0 $\Omega$	at	0 kPa
180 $\Omega$	at	500 kPa

## 5.8 FLOW SENSOR SERVICING 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 propellor 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 propellor spins freely.
5. Reassemble the flow sensor making sure the yellow sensor and turbine assembly are tightly fastened.

## 6.0 TROUBLESHOOTING GUIDE - 2400 SPRAY CONTROLLER V3.0

PROBLEM	POSSIBLE CAUSE / REMEDY
1. NO POWER TO SPRAY CONTROLLER	<ol style="list-style-type: none"> <li>a) Remove fuse from rear of spray controller and check using a Multimeter or test light – Replace with 3amp fuse only.</li> <li>b) Disconnect power cable at controller and test voltage is 12-13.8V DC from battery.</li> <li>c) Check connections at Battery are <b>clean</b> and tight at terminals, try with engine running.</li> <li>d) Check that <b>red</b> wire is to positive and <b>black</b> wire is to negative.</li> <li>e) Check that no other electrical device is connected to the same power cable - the power cable must be completely independent.</li> <li>f) Connect controller direct to another 12 Volt battery known to be in good condition.</li> <li>g) Unable to locate fault – contact nearest Dealer.</li> </ol>
2. LCD DISPLAY DROPS OUT OR GREY SQUARES APPEAR ON HALF THE READOUT	<ol style="list-style-type: none"> <li>a) If display rectifies when engine running this indicates battery is in poor condition or connections to battery are poor. If problem persists when engine running, then voltage supply is low or low current is problem due to poor connections at battery or corroded inline fuse holder.</li> <li>b)</li> <li>c) Clean battery terminals and power cable connections.</li> <li>d) Connect spray controller directly to an independent battery to prove if controller is OK.</li> <li>e) Disconnect servo control valve - if problem goes away then this confirms insufficient current available from power cable.</li> </ol>
3. CHECK.....CAL ON DISPLAY - INDICATES CALIBRATION FACTORS LOST FROM MEMORY OR NOT CHECKED.	<ol style="list-style-type: none"> <li>a) See calibration warning instructions Section 3.6 in this manual. If problem occurs regularly, then it is probably caused by outside interference. See "Interference Causes and Remedies" Troubleshooting Section 27.</li> <li>b)</li> <li>c) CHECK CAL may be caused by memory chip beginning to fail, usually after 3-5 years when in-built battery in memory chip runs out - see dealer for replacement.</li> </ol>
4. SPEED READOUT TOO FAST OR TOO SLOW	<ol style="list-style-type: none"> <li>a) Recheck "WHEEL" calibration is measured correctly and entered in metres. eg. 2.445 metres.</li> </ol>

5. LCD DISPLAY LOCKS ON TO ONE PARTICULAR READING AND NONE OF THE KEYS RESPOND.	<p>a) Spray Controllers must be connected directly to a 12 V battery without going through any fuse blocks, ignition switch or cigarette lighter socket.</p> <p>b) Temporarily bypass any inline fuses in power cable to isolate if fuseholder is causing fault.</p> <p>c) If problem occurs regularly then it is probably caused by outside interference. See "Interference Causes and Remedies" Troubleshooting Section 27.</p>
---	---

PROBLEM	POSSIBLE CAUSE / REMEDY
6. SPEED READOUT JUMPY	<p>a) Make sure magnet is facing sensor correctly as shown in Section 2.6 "Wheel Sensor Installation". (Use of an alternative magnet may cause problems due to wrong orientation of magnet).</p> <p>b) Check that wheel 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 impulses from the wheel sensor / speedo sensor are inconsistent. Check for poor or intermittent connections to Sensor. Check sensor cable for physical damage or rubbed through to chassis on sharp edges.  If speedo sensor, check that drive cable is not binding or full of oil due to leaky seal.</p> <p>d) If fault can not be found, press "TEST" key on monitor 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 27 "Interference Causes and Remedies".</p>
7. SPEED READOUT INTERMITTENT OR STAYS AT ZERO	<p>a) Fault is probably a broken or intermittent connection to wheel sensor / speedo sensor or perhaps a faulty sensor. Check all connections first. Particularly check male breakaway plug at drawbar of sprayer and spread split pins - <b>carefully</b>.</p> <p>b) Make sure clearance between wheel magnet and wheel sensor is 15-20 mm.</p> <p>c) Press "TEST" key until "TEST WHEEL" is displayed  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).  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>

- |    |  |
|----|--|
| d) | If wiring and controller can not be faulted, replace sensor.   |
| e) | If no audible response from shorting out wiring at wheel sensor connection, short out progressively between wires 8 & 9 at all points back to spray controller to isolate broken section of cable. |

PROBLEM		POSSIBLE CAUSE / REMEDY
7. SPEED READOUT INTERMITTENT OR STAYS AT ZERO continued...	f)	<p>Remove green 12 way plug at rear of spray controller and short circuit directly across pins 8 &amp; 9. If still no result return controller to dealer for repair.</p> <p>If wheel sensor connected direct into "WHEEL" input at rear of controller short out directly across ground (Black) and signal (White) connections instead.</p> <p>If no audible response direct into controller then return controller for repair to your nearest Farmscan Dealer.</p>
8. WHEEL SENSOR TEST PROCEDURE		<p><b>DO NOT TEST WHEEL SENSOR WITH A TEST LIGHT, USE A MULTIMETER ONLY.</b></p> <p>a) Disconnect wheel sensor from cable.</p> <p>b) Switch Multimeter "ON: and select "OHMS" scale.</p> <p>c) Touch test probes together and meter needle should swing to right of scale indicating "0" OHMS resistance. (If digital meter display – should read zero)</p> <p>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)</p>
9. TOTAL AND TRIP AREA INCORRECT	a)	<p>Check "SPEED" readout is correct and steady - if not, this will affect the area totals. See Troubleshooting Section 4.</p> <p>b) Recheck "WIDTH" calibration is set correctly in <u>metres</u>.</p> <p>c) If boom section controls used, must be connected to boom control input at rear of controller see section 2.7.</p>
10. TOTAL AND TRIP AREA WON'T RECORD	a)	<p>Check that "SPEED" readout is working. If not see Troubleshooting Section 11.</p> <p>b) Servo valve switch must be in "AUTO" or "OPEN" position. area meter does not work in "CLOSED" position.</p> <p>c) At least one boom solenoid must be switched on. (if used)</p> <p>d) If servo valve switch in "AUTO" position, then liquid must be flowing before AREA will record. Flow sensor must be working OK.</p> <p>e) With liquid flowing, press "FLOW RATE" key and check if Lpm readout is working. If not see flow sensor test procedure.</p>



PROBLEM	POSSIBLE CAUSE / REMEDY
11. RATE READOUT FLUCTUATES MORE THAN +/- 0.5 LHA IN AUTO MODE.	<p>a) Big fluctuations may be normal for 2-5 seconds only when changing speed or rates.</p> <p>b) Close servo valve and check "SPEED" readout is stable at a constant driving speed. If not, follow Troubleshooting Section 6.</p> <p>c) Check <b>all</b> calibrations are set correctly.</p> <p>d) Checkout if flow sensor is giving a stable pulse rate as follows:            * Switch servo valve to "OPEN"            * Activate boom section solenoids (if used)            * Slow down pump and press flow key until display shows L/MIN. If flow (in L/Min) readout still fluctuates then Flowsensor is either faulty, requires cleaning or is subject to outside interference.            Eliminate external causes as a possibility before servicing.</p> <p>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.</p> <p>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 servo valve will hunt for the right setting. Increase rates or get the right nozzles for the job.            See RATE CALIBRATION 4.2</p> <p>g) If Boom is over 24 metres wide, then rate may fluctuate at slower speeds. Prise out black plug below servo valve switch and adjust 10 position switch to position 1. (This changes the step size for the servo motor.)</p> <p>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.</p> <p>i) Water hammer could be the reason - See 2.3 "Servo Valve Installation - Notes".</p> <p>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 27.</p> <p>k) Check both grub screws on servo valve flexible coupling are firmly tightened onto flat section of shafts.</p> <p>l) Switch servo to "OPEN" and get nozzles operating then use down key to adjust pressure back to working range. Observe if pressure is fluctuating due to pump fault.</p> <p>m) Check if air is entering the system.</p>

PROBLEM	POSSIBLE CAUSE / REMEDY												
12. RATE READOUT STAYS AT ZERO	<p>a) Check "SPEED" readout. If no speed follow Troubleshooting Section 7.</p> <p>b) Switch controller to "OPERATE" and press "TEST" key until "TEST FLOW" is displayed. Pump liquid through flow sensor, if sensor OK controller will beep and display will increase an in pulse counts. If not see step c.</p> <p>c) Check connections back to spray controller in cab. Make sure split pins of breakaway plug are making contact. Use a</p> <p>d) Use a multimeter or test light to check for + 12 volts between red and black wires (on loom) to flow sensor. Check for +12 volts between pins 11 and 9 at rear of spray controller and through Pins 11 &amp; 9 of breakaway plug at rear of towing vehicle.</p> <table border="0" data-bbox="630 750 1236 884"> <thead> <tr> <th data-bbox="630 750 861 779">Flow sensor wiring</th> <th data-bbox="938 750 1093 779">Loom wiring</th> <th data-bbox="1133 786 1204 815">+12 V</th> </tr> </thead> <tbody> <tr> <td data-bbox="662 786 742 815">Brown</td> <td data-bbox="965 786 1013 815">Red</td> <td data-bbox="1133 819 1236 848">Ground</td> </tr> <tr> <td data-bbox="662 819 742 848">White</td> <td data-bbox="965 819 1029 848">Black</td> <td data-bbox="1133 853 1220 882">Signal</td> </tr> <tr> <td data-bbox="662 853 742 882">Green</td> <td data-bbox="965 853 1045 882">White</td> <td></td> </tr> </tbody> </table> <p>e) If voltage OK to flow sensor then follow "Flow Sensor Service Procedure 5.8".</p> <p>f) If after servicing the controller does not register pulses then disconnect flow sensor plug at servo control valve 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 servo valve grey box.</p> <p>g) A continuous beep should be heard from the spray controller. Now wriggle all wiring and connections from flowsensor plug to rear of spray controller and listen if the beep can be made to drop out.</p> <p>h) If No beep heard, then repeat test by shorting out progressively across pins 9 &amp; 10 at all points back to controller until faulty cable section is isolated.</p> <p>i) Remove green 12 way plug at rear of controller and repeat Test directly across pins 9 &amp; 10 of controller.</p> <p>j) If no audible response directly into controller then return controller to your nearest dealer for service.</p>	Flow sensor wiring	Loom wiring	+12 V	Brown	Red	Ground	White	Black	Signal	Green	White	
Flow sensor wiring	Loom wiring	+12 V											
Brown	Red	Ground											
White	Black	Signal											
Green	White												

PROBLEM	POSSIBLE CAUSE / REMEDY
13. RATE LOW "SLOWER" ALARM OR CAN'T REACH MAXIMUM SPEED.	<ul style="list-style-type: none"> <li>a) Indicates target rate selected "HIGH", "NORM", or "LOW" is not achievable.</li> <li>b) Flick "SERVO" to "OPEN" whilst travelling if rate does not increase then servo is already at maximum available pressure or not opening fully.</li> <li>c) Check manufacturers spray chart to see what rates should be achievable at maximum pressure.</li> <li>d) Check inline filters and nozzle filters which may be blocked causing restriction to available flowrate.</li> <li>e) Check top and bottom grub screws of servo valve flexible coupling are firmly seated on flats of top and bottom shafts.</li> <li>f) Check flow sensor <b>inlet</b> for debris causing restriction</li> <li>g) Check difference between actual pressure at boom using a mechanical gauge, and pressure at servo accordingly to spray controller. Then refer to manufacturers spray chart to see rate and speed possible given pressure at boom - line losses are normal.</li> </ul>
14. FLOW SENSOR INACCURATE	<ul style="list-style-type: none"> <li>a) Make sure flow direction arrow points in direction of flow.</li> <li>b) If diaphragm or piston pump, make sure pump is not hammering. See 2.3 "Servo Control Valve Installation - Notes"</li> <li>c) Remove flow sensor and check INLET strainer on Flowsensor is clear.</li> <li>d) Follow flow sensor calibration test procedure 4.7 and <b>make sure correct flow cal factor is set.</b></li> <li>e) Follow "FLOW SENSOR SERVICING PROCEDURE 5.8".</li> </ul>
15. SPLIT WIDTH CALIBRATION FACTOR NOT WORKING	<ul style="list-style-type: none"> <li>a) If using 2403 Boom Control make sure power is connected to boom control panel with polarity correct.</li> <li>b) For 2403 make sure green six way plug into socket marked "BOOM CONTROL" is correctly inserted - screws face upwards.</li> <li>c) If using 2405 Boom Control check 9 way ribbon cable is attached securely.</li> <li>c) Switch to "CALIBRATE" mode &amp; press "TANK" key until "MISTING" function is displayed and make sure <b>MISTING</b> is <b>OFF</b>.</li> <li>d) For non Farmscan switch panel if message "SOL ON AND NO LINK" appears, then make sure wire loop between pins D &amp; F of boom control plug is installed.</li> <li>e) If message persists whenever a Boom section is switched ON, then controller width input is damaged internally – return for service.</li> <li>f) To keep working if width input damaged, remove 6 pin plug from controller, set for 1 section and program for whole width. Don't shutdown sections on-the-go.</li> </ul>

PROBLEM	POSSIBLE CAUSE / REMEDY
16. SERVO CONTROL VALVE WON'T OPEN AUTOMATICALLY	<p>a) Make sure controller is switched to "OPERATE" and servo valve is switched to "AUTO".</p> <p>b) Make sure a red light is on above "HIGH", "NORM" or "LOW" rate selection keys.</p> <p>c) If no red light on, then flick to "CALIBRATE" and check the following.</p> <ol style="list-style-type: none"> <li>1. Check "WIDTH" calibration factor is correctly entered and make sure boom control switches are activating "WIDTH" memories (if used). If section controls <b>not</b> used, make sure nothing is inserted into socket marked "<b>BOOM CONTROL</b>".</li> <li>2. Check "FLOW" cal factor is set.</li> <li>3. Check "WHEEL" cal factor is set.</li> <li>4. Check rates are set.</li> </ol> <p>d) 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.</p> <p>e) Check ground speed readout is working correctly.</p> <p>f) Flick servo valve switch to "OPEN" position and check pressure readout rises to at least 300 - 400KPA.</p> <p>g) If no pressure, make sure pump is working correctly.</p> <p>h) If pump OK, press "TEST" key and make sure all servo motor windings are OK - Not open or short. See Troubleshooting 19.</p> <p>i) Remove cover from servo control valve box and check top and bottom grub screws of brass flexible coupling are firmly seated onto flat section of shafts.</p> <p>j) Switch servo valve from "CLOSE" to "OPEN" or "OPEN" to "CLOSE", and valve should shift through 90 degrees and stop within 6 seconds.</p>
17. SERVO KEEPS CLOSING IN AUTO	<p>a) Check speed readout is working accurately . Refer Troubleshooting 4 - 6</p> <p>b) Follow Troubleshooting 11 (c) to isolate flow sensor as cause.</p> <p>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.</p>

PROBLEM	POSSIBLE CAUSE / REMEDY
18. SERVO RESPONSE TOO SLOW TO START SPRAYING	<p>a) If switching OFF regularly at headlands you must use solenoid valves to instantly Start / Stop spray. See Section "3.3 Instant ON/OFF".</p> <p>b) If using solenoid shutdown at headlands you must switch OFF master solenoid whilst <b>still travelling at working speeds</b>. If you shut OFF too late the servo will have closed.</p> <p>c) When shutdown, pump must be able to cycle some material back to tank, otherwise cavitation may cause loss of pressure.</p> <p>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.</p>
19. MOTOR WINDINGS OPEN OR SHORT CHECK	<p>a) If one of the servo motor windings read "OPEN" or "SHORT" then there is a break in the continuity or short circuit connection to that particular motor winding or the problem could be inside the motor itself.</p> <p>b) If the winding test shows "SHORT", disconnect the green 12 way plug at rear of controller then switch controller power OFF and ON, test windings again.</p> <p>c) If winding still shows "SHORT" with <b>12 way plug disconnected</b> then fault is with controller – Return to dealer for repair.</p> <p>d) If fault goes away then short circuit must be in wiring or motor itself.</p> <p>e) Reconnect 12 way plug at controller and disconnect wire No 1 from terminal strip inside servo control valve grey box.</p> <p>f) Switch controller power OFF and ON then repeat winding "TEST". If same winding shows "SHORT" then fault is in wiring between controller and terminal block of servo valve.</p> <p>g) If fault goes away, then replace motor.</p> <p>h) If one winding shows "OPEN" then connect a wire link from wire No.1 to the wire number that corresponds to the faulty winding number.</p> <p style="padding-left: 40px;">If Winding 1 OPEN = Wire 2  If Winding 2 OPEN = Wire 3  If Winding 3 OPEN = Wire 4  If Winding 4 OPEN = Wire 5</p> <p>i) Switch controller power OFF and ON again then repeat winding "TEST".</p> <p>j) If faulty winding number now shows "SHORT" then replace motor.</p> <p>k) If faulty winding number remains "OPEN" then fault is in wiring between controller and terminal block at servo valve.</p>

PROBLEM	POSSIBLE CAUSE / REMEDY
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20. SERVO MOTOR TEST PROCEDURE	<p>a) If you disconnect the servo motor wiring directly from the terminal block, each motor winding should measure approximately 20 <math>\Omega</math> (ohms) resistance using a multimeter between <b>black and white as common</b> and each of the four motor windings.</p> <p style="margin-left: 40px;">WINDING 1 = PINK WINDING 2 = GREEN WINDING 3 = WHITE / RED WINDING 4 = WHITE / GREEN</p> <p><b>NOTE:</b> Do Not measure motor wires whilst still connected to main loom or results will be wrong.</p>
21. SPRAY CONTROLLER MOTOR DRIVE TEST	<p>a) Make sure winding 1 - 4 are measuring 20 <math>\Omega</math> as above.</p> <p>b) Use a multimeter switched to DC volts range 0 - 20 Volts and check constant voltage of 12 volts DC between wire 1 positive and wire 9 negative, when controller power switched ON.</p> <p>c) If (b) OK, then measure between wire No. 1 positive and wires 2, 3, 4 and 5 should each read approx 6 VDC for approx 6 seconds after switching servo to "OPEN" or "CLOSE". Each should then drop to 0 Volts after 6 secs.</p>
22. HOW TO GO SPRAYING MANUALLY (WITHOUT AUTOCONTROL)	<p>a) Open servo valve either using the servo valve switch or manually by turning the brass coupling inside the servo valve box using an allen key as a lever.</p> <p>b) Look up nozzle spray charts and work out what pressure is required to achieve the desired rate at the normal working speed. You should remember what pressure and speed was being achieved when the system worked automatically.</p> <p>NOTE: A manual pressure gauge should be installed out on the boom sprayline to establish the true pressure if you can't remember.</p> <p>c) Switch boom solenoids on (if used).</p> <p>d) Use '↑' / '↓' keys to adjust Spray pressure or adjust pump revs or pressure relief valve to achieve required spraying pressure to boom.</p> <p>e) Drive the sprayer at a constant speed according to the chart.</p> <p>f) If possible, select "RATE LHA" readout to check sprayrate is correct.</p>
23 RATE HI ALARM ACTIVATES FOR MORE THAN 2-3 SECONDS	<p>a) Make sure servo is switched to auto.</p> <p>b) Switch servo to "CLOSE" to make sure valve is closing correctly or see Troubleshooting 19.</p> <p>c) Switch to "CALIBRATE" mode and press "SPEED" key until slow hold function is displayed and check setting - See CALIBRATION 4.4.</p>

PROBLEM		POSSIBLE CAUSE / REMEDY
24. PRESSURE READING INCORRECT	<p>a)</p> <p>b)</p> <p>c)</p> <p>d)</p>	<p>It is normal to read up to 10 kPa residual reading when there is no pressure. This does not affect the working range.</p> <p>If there are restrictions downline from the servo control valve ie. from hoses, solenoids or blocked filters, it will be normal to read a higher pressure in the cab than the true pressure being achieved at the nozzles.</p> <ul style="list-style-type: none"> <li>• If the pressure reading is locked at zero kPa, then there is a dead short circuit between wires 6 and 7 of Main Loom or inside Pressure sensor itself or in the monitor. Disconnect wires directly at pressure sensor if reading goes to 621 kPa then replace pressure sensor. If reading stays at zero when pressure sensor disconnected then problem is in wiring.</li> <li>• To check monitor short pins 6 &amp; 7 directly at the rear of the monitor. If the reading goes to zero, the problem is definitely in the wiring. If not, the monitor is faulty. Please return to your dealer.</li> </ul> <p>If the pressure reading is locked at 621 kPa, then there is an open circuit between wires 6 and 7 or inside the pressure sensor itself. Disconnect wires at pressure sensor and touch ends together. If reading goes to zero then replace pressure sensor. If reading stays at 621 kPa then problem is in wiring.</p> <p>NOTE: The pressure sensor reading has no effect on the correct functioning of the controller. The pressure reading is only an <b>indication</b> for your information.</p>
25. AUTO VALVE LEAKS	<p>a)</p> <p>b)</p> <p>c)</p>	<p>If auto valve is closed and liquid leaks to boom - Check screws on top of ball valve assembly are not loose.</p> <p>If ball valve screws are tight make sure grub screws in flexible coupling are firm to flat side of ball valve / motor shafts.</p> <p>Ball valve seals may require tightening, remove inlet fitting and tighten seals with flat bladed object.</p>
26 PRESSURE TOO LOW UNDER AUTO CONTROL OR 2ND LINE CONTROL	<p>a)</p> <p>b)</p> <p>c)</p> <p>d)</p> <p>e)</p> <p>f)</p>	<p>Check all calibration factors are correctly entered.</p> <p>Flick servo to "OPEN" with boom spraying make sure sufficient pressure is available.</p> <p>Run boom and check hoses for split after servo control valve.</p> <p>Refer to Rate calibration notes 4.2 and make certain nozzles are correct for the job.</p> <p>If using 2nd sprayline and pressure too low when on 1st Line, then nozzles too large or speed too slow.</p> <p>If using 2nd sprayline and pressure too low when on 2nd line, then increase 2nd line activation speed or increase ground speed.</p>

## 27. 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 DIRECT to 12 V battery for spray controller.
Calibrations get corrupted when solenoids switched off.	Run separate power cable to boom control centre. Fit diode across solenoid coil to clamp spike. Run cable for boom control away from spray controller cable.  Separate spare cables from spray controller and boom controller if coiled together.
2 Way Radio interferes with Spray Controller	Disconnect servo valve cable and see if problem goes away. If problem goes away, run cable away from 2 way radio cables.  If interference persists, move controller away from radio or shield monitor from radio with aluminium foil connected to chassis or install controller in metal box.  Connect controller to different battery - if problem goes away fit power cable suppressor.
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.

28 NEED MORE HELP?

a) Contact nearest Farmscan Dealer.

b) Contact Computronics Corporation Ltd.  
Bentley Business Centre  
Bentley 6983 WESTERN AUSTRALIA  
Ph: (08) 9470 1177 Fax: (08) 9470 2855  
Email: [service@farmscan.com](mailto:service@farmscan.com)



## 7.0 WARNING MESSAGES

CHECK CAL	Calibrations for that particular function need to be checked and/or reprogrammed. See section 3.6 in this manual.
TURN 1 SOL ON	When calibrating section widths turn the appropriate boom section ON.
TURN ? SOLS OFF	Only one solenoid should be on at a time when calibrating the corresponding boom width.
UNUSED SOL X ON	Indicates an unused section has been switched on, eg. if unit set for 4 sections but section 5 is on.
SOL ON & NO LINK	Wire link at rear of terminals D & F of boom control input at rear of 2400 missing.
PR HIGH	Pressure exceeded high pressure alarm point.
PR LOW	Pressure has fallen below low pressure alarm point.
WIDTH OFFLINE	Indicates boom control not connected to rear of spray controller properly or fault in boom control panel when in calibration mode.
TANK LO	Volume left in tank has reached 100 litres or below.
RATE HI/LO	Monitor can no longer adjust servo control valve to maintain required spraying rate. Message is followed by "FASTER/SLOWER" respectively, instructing the operator to speed up or slow down to maintain required spraying rate.

After pressing "TEST" the display shows:

WINDING 1/2/3/4	OK	All OK.
	SHORT	Short in wiring or motor.
	OPEN	Open circuit in wiring or motor.
COMMS ERROR	Activates 30 seconds after either boom control panel not connected properly to 2400 or fault in 2405 Boom Control communication to junction box on sprayer.	
	Alternatively, if GPS function enabled, then indicates faulty connection or technical fault where communication to 2400 spray controller has ceased.	