

## Electro-Magnetic Compatibility (EMC)

This product complies with Council Directive 89/336/EEC when installed and used in accordance with the relevant instructions.

### Service and Technical Support

PLEASE CONTACT YOUR LOCAL DISTRIBUTOR  
If unknown then fax: 44 (0) 1453 835521 for details.

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#### Document number

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\\UK209-3.DTP



# User Guide.

## Ratemaster 200

### Installation, Calibration and Operation

Software Ref: UDJ 306-9

# Overview

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The *Ratemaster 200* enables both automatic or manual control of the spray application rate. The flow rate is controlled by a butterfly valve returning excess liquid to the sprayer tank. The Ratemaster system is compatible with both balanced return and non-return sprayer systems.

When selected, automatic rate control maintains the application rate as close as possible to a programmable target rate. With either manual or automatic control, the display flashes a 'HI' or 'LO' warning if the application rate differs by more than  $\pm 20\%$  of the target rate.

The instruments displays the functions Forward Speed, Area Sprayed, Volume Sprayed and the Application Rate on a 4-digit LCD, 4-channel display module.

Initial instrument settings are made in 'Calibration Mode'.

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**Ratemaster 200**

**Programme switch**  
 HOLD and power-on to enter CAL mode  
 In normal operating mode, PRESS to display Speed Sensor Factor or HOLD for 5 sec to start AUTO CAL.

**Manual rate adjustment**  
 Manual rate adjustment

**Calibration functions**  
 /Calibration functions

**Normal function**  
 PRESS to select Normal function  
 Forward speed (km/h)  
 Area sprayed (ha)  
 (CH.3) -----  
 (CH.4) -----  
 Volume sprayed (litres x 10)  
 Application rate (litres/ha)

**Calibration function**  
 /Calibration function  
 Nozzle Spacing  
 Nozzles per boom section  
 Flow sensor Cal Factor  
 Min. Pulse length  
 System response  
 Shutoff valve type

**Display**  
 200

**Buttons**

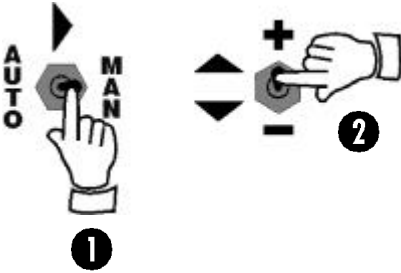
**Switches**  
 AUTO MAN


**Callouts**  
 \* (points to the display)

**Instructions**  
 (a) PRESS to reset Area/Volume totals  
 (b) With the Forward Speed channel selected, then HOLD to set simulated speed for nozzle tests.  
 (c) With the Rate channel selected, HOLD + PRESS/HOLD to set the target application rate  
 (d) PRESS/HOLD to change CAL figure.

# Operation

## Manual rate control

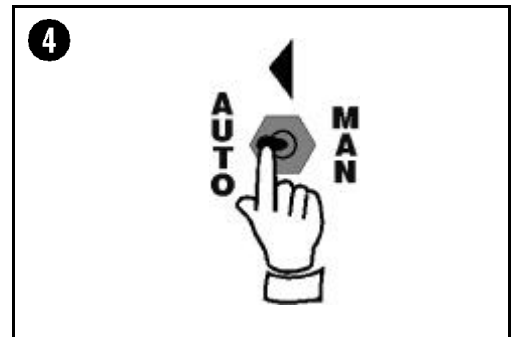
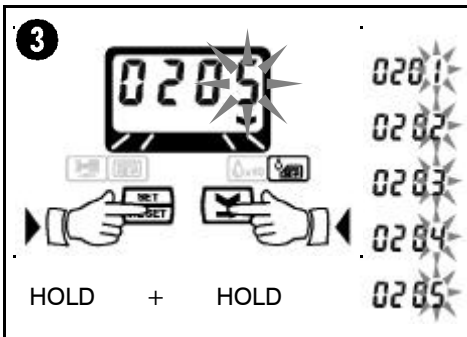
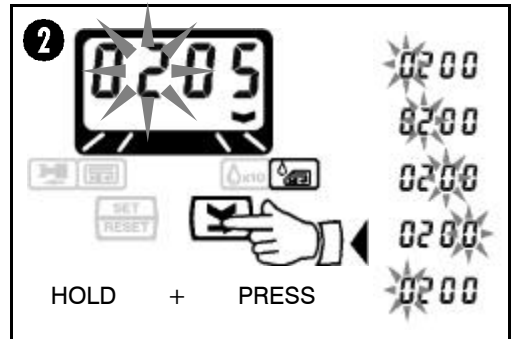
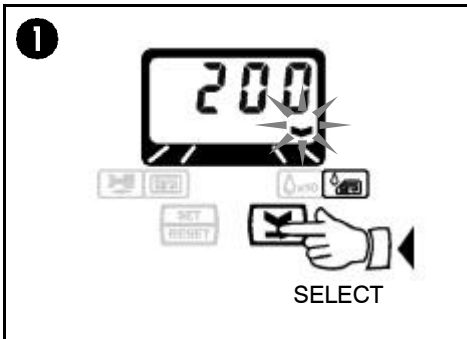



The application rate displayed is dependent on forward speed. If it varies more than  $\pm 20\%$  of the target rate, the display defaults to  and flashes 'HI' or 'LO' accordingly.

Use the -/+ switch to manually adjust the rate.

Switching to AUTO mode reverts the application rate back to the preset target rate.

## Automatic rate control - setting the target rate (litres/Ha) \_\_\_\_\_



The application rate is maintained at the target rate (within limits). If the rate cannot be maintained within  $\pm 20\%$  of the target rate, the display defaults to  and flashes 'HI' or 'LO' accordingly. Whilst spraying, the application rate can be altered to suit localised crop conditions by switching to MANUAL mode.

## Reset area/volume total



Select  or 



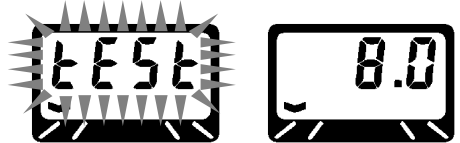
Hold for 5 seconds.

# Calibration

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## Set simulated speed


To do a calibration check of the spray nozzles while stationary in the yard, the instrument can be set to simulate a forward speed (8 km/h). The application rate displayed can then be compared with the results of the nozzle test.





Switch off instrument or move the vehicle to stop speed simulation.


## Enter CAL mode/change settings

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To enter CAL mode, press and hold  and switch on instrument.

Excepting the SPEED SENSOR FACTOR, to change settings, first press  to select channel.

PRESS  to SELECT a digit or decimal point - 0.200, 0.200, 0.200, 0.200

HOLD  to CHANGE value or decimal place - 0.201, 0.202, 0.203, 0.204

The following calibration settings normally need be set only on installation, unless the instrument memory is subsequently corrupted for any reason.

## Nozzle spacing

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Set individual nozzle spacing in metres.

Default = **0.5m**

## Nozzles per boom section

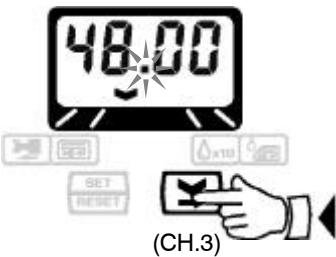


Programme each boom section by switching on individually and enter the corresponding number of nozzles. If none or more than one section is switched on, the display will show '1.SEC'.

Default = 6

**NOTE:** When set to 'r' mode (p.8) the instrument has no 'sensed width' and so all unused boom sections must be set to zero nozzles.

## Flow sensor cal factor



The factor (pulses per litre) differs according to the flow sensor fitted and is based on clean water.

1" Delta Flow	48.00
1/2"	3 700
3/4"	1 786
1"	6 50.0 = Default
1-1/2"	1 65.0
2"	1 00.0

Re-calibration may be required if the S.G. is significantly greater than 1.000 or if there is a consistent discrepancy between the volume total on the instrument and the actual volume discharged. To re-calculate the factor,

$$\text{New factor} = \frac{\text{Old factor} \times \text{Indicated volume}}{\text{Actual volume}^*}$$

\*Measurements from the sprayer sight gauge alone may not be sufficiently accurate.

## Minimum pulse length



This relates to automatic control performance. The pulse driving the flow control valve becomes shorter as the application rate nears the target rate. If the pulse is too short, the flow rate may not change sufficiently.

Range from 1 to 9      Default = 4

(This will normally ensure good performance but may be increased)

# Calibration

## System response



This number relates to incremental movement of the control valve - the smaller the number, the smaller the increment.

Small movements will make the system sluggish - increasing the time taken for the application rate to match the target rate.

Large movements will make the system unstable - the application rate will vary about the target rate.

May be set from 0-999. Default = **200**

## Shut-off valve type




If each boom section valve simply shuts off the flow, set to 'n' for a non-recirculating system.

If each boom section valve when closed, diverts the flow back to the tank, set to 'r' for a recirculating 'balanced return' system.

**NOTE:** All unused boom sections must be set to zero nozzles (p.7).

Default = **n**


## Speed sensor factor


This can be calculated and entered manually although it is recommended to AUTO-CALIBRATE. By either method, first select the  channel in operating mode. Default value = **2.000** (metres)

### Manual calibration

If a **two-magnet wheel sensor is fitted**, drive in field conditions for exactly **10** turns of the sensed wheel. Factor =  $\frac{\text{Distance travelled}}{10}$  = Effective tyre circumference

If a **propshaft sensor is fitted**, drive in field conditions for exactly **20** turns of the propshaft. Factor =  $\frac{\text{Distance travelled}}{10}$

To set factor, first press and hold .

PRESS 

t o SELECT a digit or decimal point - 2.000, 2.000, 2.000,


HOLD 

t o CHANGE value or decimal place - 2.100, 2.200, 2.300, 2.400

## Auto-calibration of speed sensor

It is recommended to do this in field conditions to account for wheel slip. The instrument must be in operating mode.


**1** Place two markers 100 metres apart. Position the vehicle opposite a marker.

**2** Press and hold  for 5 seconds.



**3** Drive the test distance. *The sensor pulses are counted.*

**4** Stop with the same point on the vehicle opposite the second marker. Do not reverse if you overrun - repeat the procedure.

**5** Press and hold  for 5 seconds. *The display shows the calculated Speed Factor.*

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# Installation

The Ratemaster system comprises the following components;

- Head Unit (with Mounting bracket kit)
- Forward speed sensor (Wheel sensor kit and Wheel magnet kits)
- Flow sensor (Flow sensor pickup kit)
- Control valve (1" valve kit supplied as standard)
- Power supply kit (instrument kit)

You can refer to the individual instruction leaflets enclosed with each kit, however this section of the manual also includes a schematic diagram, parts list and additional instructions which pertain to the majority of sprayers models and types.

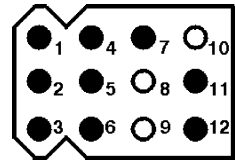
## Sprayer control interface lead

A Sprayer Control Interface lead Pt No: S/CB/159-1-012 links the head unit to an existing boom section switch box. The instrument can then recognise when the sprayer is switched on or off and which of up to 7 boom sections are switched on. This ensures that area accumulation and application rates are monitored and regulated correctly for the width of implement actually used.

NOTE: When using the interface lead, the 'AREA CUTOUT' terminals 6 and 3 of the GREY Harting are redundant.

The lead has 12 cores with the following functions;

Cable colour	BICC terminal	Function
Red	1	Boom section 1 recognition
Pink	2	Boom section 2 recognition
White	3	Boom section 3 recognition
Grey	4	Boom section 4 recognition
Violet	5	Boom section 5 recognition
Turquoise	6	Boom section 6 recognition
Green	7	Boom section 7 recognition
Yellow	-	n/a
Orange	-	n/a
Blue	-	n/a
Black	11	Area Override
Brown	12	+ 12v



BICC socket

Route the interface cable into the sprayer switchbox and cut to length. Any unused boom recognition wires can be cut or tied back. The end of the brown wire (+12v) if not used should be insulated. The other wires are at 0V and do not need to be insulated.

One of the outside sections is normally section 1. Connect the boom recognition wires in sequence across the other boom sections following the table above. Each boom recognition wire must be connected to a point in the switchbox which has +12V when that boom section is switched on. On electrically controlled sprayers a suitable pickup point is normally available on the boom section switch either by soldering, using a 'piggyback' connector onto the back of the switch, or using a 'snaplock' connector to tap into the appropriate wire.

On pneumatically controlled sprayers an electro-pneumatic switch is required on each boom section air line. A suitable switch is RDS Pt. No. CUT/OUT/KIT/004. In this case a +12V supply (e.g. the brown wire on the interface lead) must be fed to the common terminal of each switch. Assuming the air line is pressurised to spray, the appropriate boom recognition wire is connected to the N.O. (normally open) terminal of the each switch.

## Master On-Off switch

**If the master switch when switched OFF, removes the 12V signal from all the boom section switches:-**

No further wiring is necessary. When all the boom recognition wires are at 0V the instrument recognises that the sprayer is switched off and stops accumulating area.

**If the master switch when switched OFF, opens a solenoid valve to divert the flow back to the tank and the boom section valves stay open:-**

Connect the black wire to a point on the master on-off switch which is at +12V when the sprayer is switched ON. When the sprayer is switched OFF the black wire is grounded to 0V through the solenoid coil.

## Installation without an interface lead

1. Make a wiring link across terminals 1 and 11 of the BICC connector on the rear of the head unit.
2. Connect a suitable on-off switch across terminals 6 and 3 of the GREY Harting connector. to act as the area cutout switch.
3. Set the 'Nozzles per boom section' setting (p. 7) to the total number of nozzles for the full boom width.
4. Set the appropriate 'Nozzle Spacing' setting (p. 6).

So long as the sprayer is applying at full width and the area cutout switch is operated in tandem with the sprayer master on-off switch, then the instrument will monitor and control accurately.

# Installation

## Electrical interference suppression

The RDS control system supplied for your machine has been rigorously tested and complies with the EMC Directive 89/336/EEC. Where the RDS control system interfaces with or is installed together with other electrical components or accessories, it is essential that they also conform to the Directive. Any device legitimately CE marked should already incorporate such suppression devices.

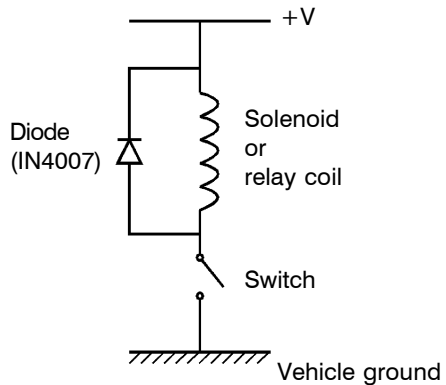
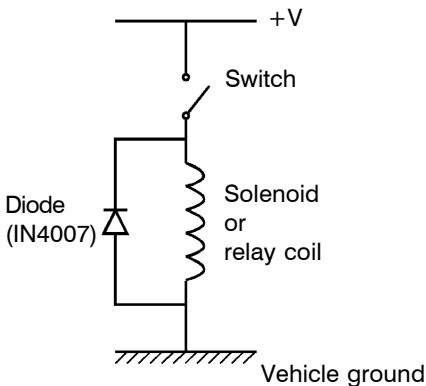
Switching of non-suppressed control valves can generate voltage spikes which can damage the instrument. If the RDS instrument is being fitted to a sprayer with electric control valves, it is essential that the sprayer control valves have been suppressed.

### Suppressing a solenoid valve

The simplest method of suppressing a solenoid is the fitting of an IN4007 diode across the solenoid. The bar of the diode (the side with the white stripe) faces the positive terminal of the solenoid.

A varistor can be fitted instead of a diode, and is not polarity sensitive. If possible, a diode should be used.

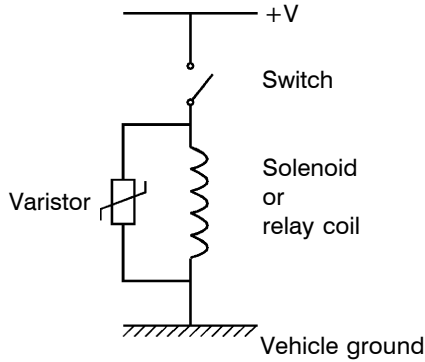
### Diode suppression for solenoids or relays



#### NOTE:

1. Ensure correct diode polarity when fitting.
2. In certain applications where fast switching of solenoids is required, diode suppression may cause an unacceptable delay in operation. This would be cured by using a varistor instead of a diode. A diode however, is the preferred option since it is most effective.

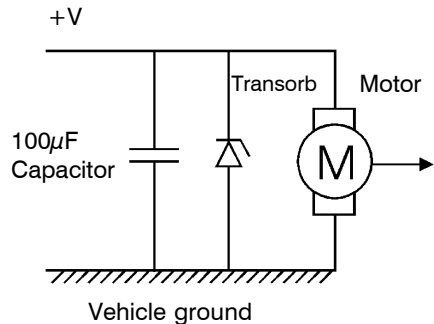
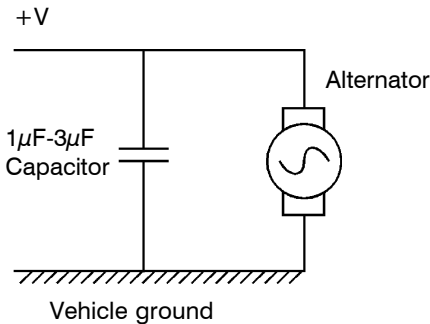
## Varistor suppression for solenoids or relays



## Suppressing a motor driven valve

Motor valves are less likely to generate voltage spikes but they cause interference to audio equipment and other electrical hardware. All electric motors on the vehicle must be protected by a  $100\ \mu\text{F}$  capacitor and a bi-directional Transorb (e.g. BZW04P19B) across the motor terminals. Alternators require a smaller  $1\ \mu\text{F}$  -  $3\ \mu\text{F}$  capacitor.

## Capacitor suppression for alternators and motors



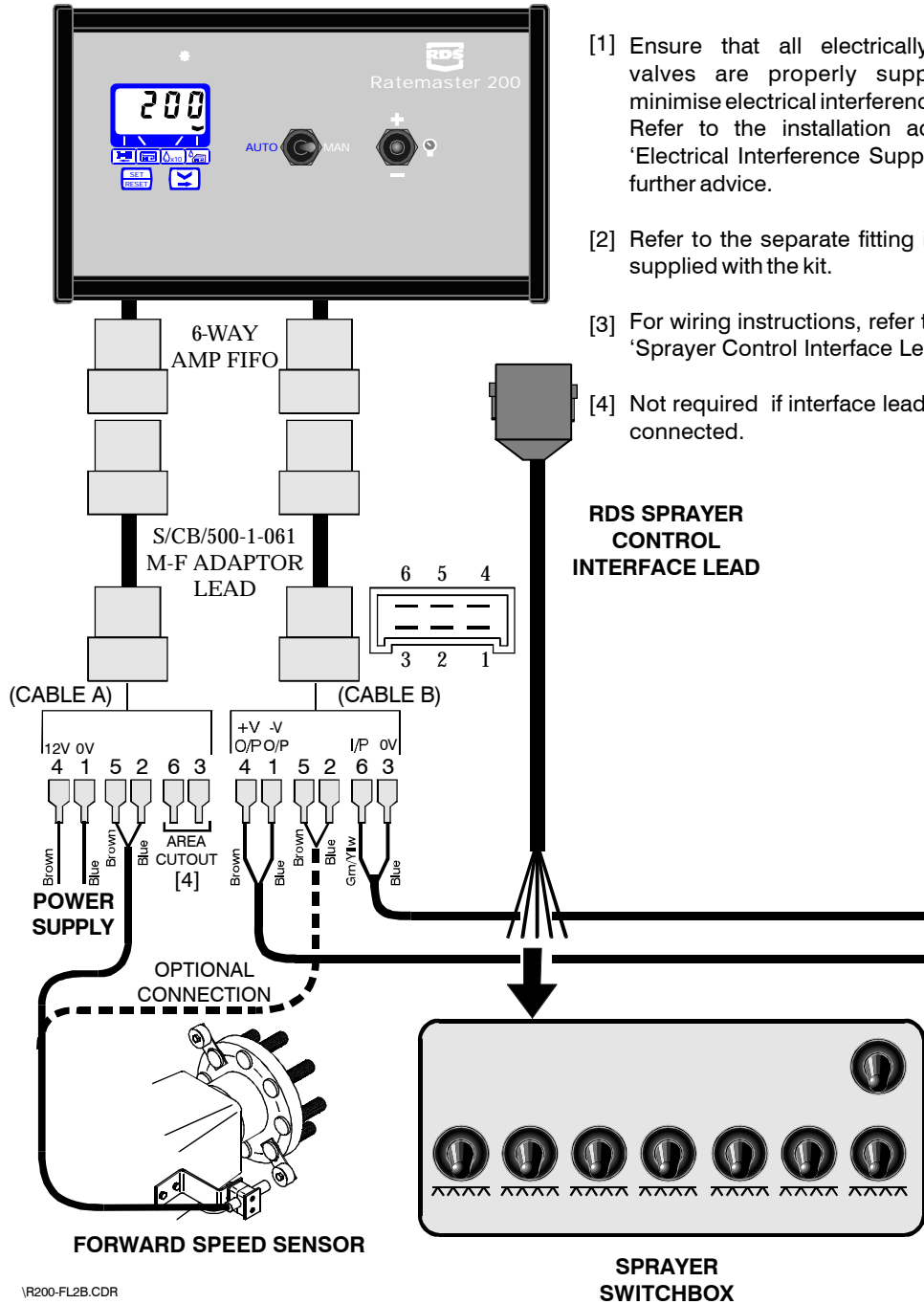
# Installation

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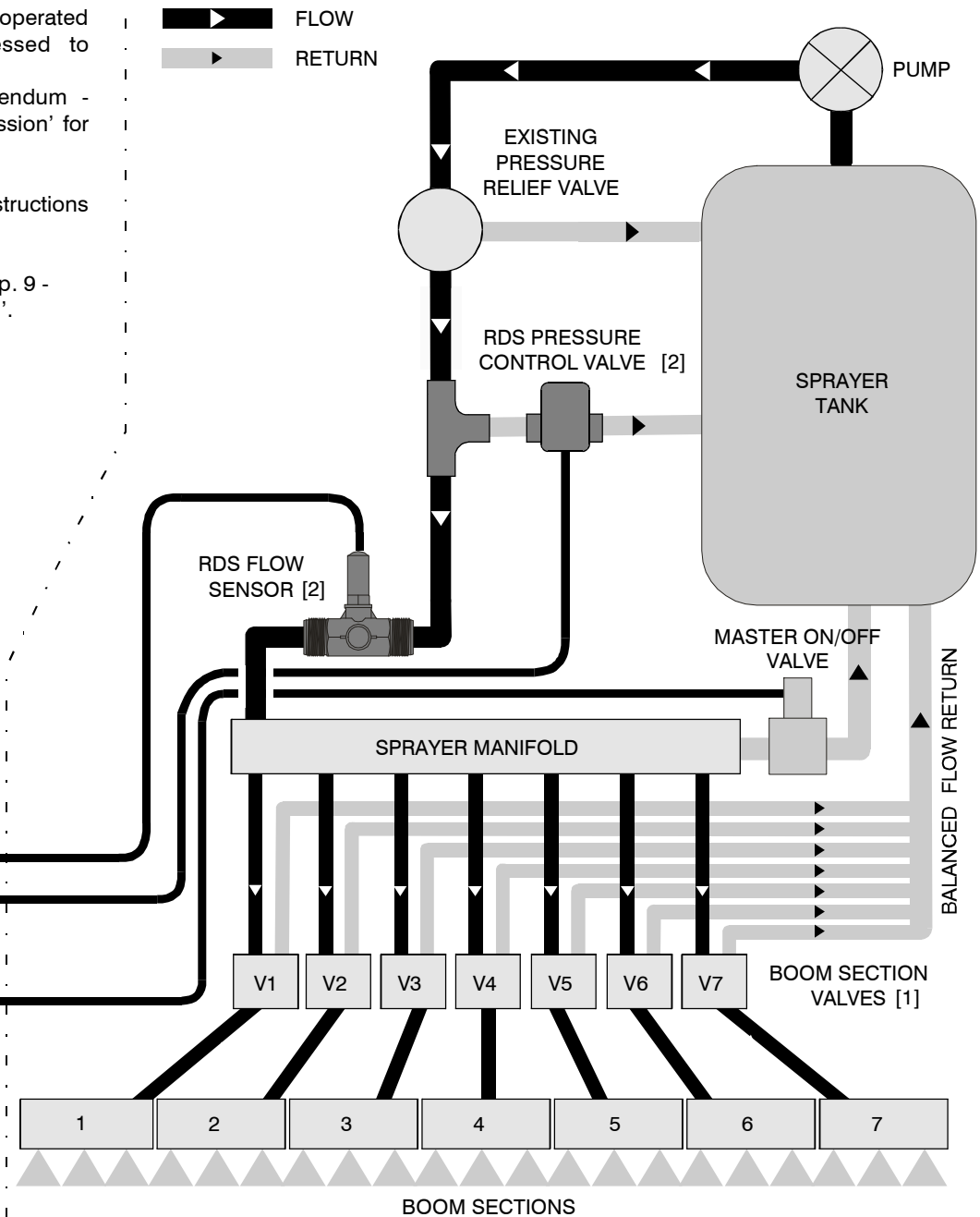
## General recommendations

- ❑ Suppress all solenoids
- ❑ All components used for suppression should be connected as near to the source of interference as possible.
- ❑ Separate C.B. wiring from other wiring looms.
- ❑ Suppressed solenoid caps are available from *Richard Hirstmann Electronics UK Ltd* or *mPm Systems Ltd*.
- ❑ Individual components, e.g. diodes, varistors, etc. are available from RDS Technology Ltd.

If you have concerns regarding the suppression of your sprayer, contact your RDS distributor.



- [1] Ensure that all electrically operated valves are properly suppressed to minimise electrical interference. Refer to the installation addendum - 'Electrical Interference Suppression' for further advice.
- [2] Refer to the separate fitting instructions supplied with the kit.
- [3] For wiring instructions, refer to p. 9 - 'Sprayer Control Interface Lead'.
- [4] Not required if interface lead is connected.



## Appendix 2 - Parts list

KIT REF.	RDS PART NO.	QTY	DESCRIPTION
<b>P/RM200</b>	<b>RATEMASTER 200 - 1"</b>		<b>COMPRISING:</b>
	S/HU/267-3-001	1	HEAD UNIT
	K/SPRAY/CONT/LD	1	SPRAYER INTERFACE CABLE KIT
	S/CB/133-1-013	1	VALVE DRIVE LEAD
	S/DC/500-10-209	1	INSTRUCTION BOOK
	S/DC/500-10-014	1	WARRANTY CARD (AG)
	S/DC/500-10-015	1	WARRANTY CARD (IND)
	S/DC/500-10-021	1	WINDSCREEN STICKER
	S/AC/199-2-134	1	TOGGLE SWITCH
	S/CB/500-1-061	2	AMP FIFO M-F ADAPTOR CABLE

<b>K/NEW/GEN/MTG</b>		<b>1</b>	<b>HEAD UNIT MOUNTING KIT</b>
	S/FSNR/940205	2	M6 PLAIN WASHER
	S/FSNR/940117	2	M6 X 16 HEX SETSCREW
	S/FSNR/406	2	M6 NYLOC™ NUT

<b>K/WL/SNR</b>		<b>1</b>	<b>WHEEL SENSOR KIT</b>
	S/FSNR/203	2	M6 FIBRE WASHER
	S/FSNR/406	2	M6 NYLOC™ NUT
	S/FSNR/601	2	M6 X 30 S/S HEX SETSCREW
	S/BK/500-3-001	2	MAGNET BRACKET
	S/MAGNET/002	2	MAGNET
	S/SR/500-2-001	1	WHEEL SENSOR
	S/FSNR/401	4	M6 FULL NUT
	S/FSNR/301	4	M6 SPRING WASHER
	S/FSNR/103	4	M6 X 25 HEX SETSCREW
	S/FIXING/079	2	1/4" FEMALE TERMINAL
	S/CBL/TIE/005	10	CABLE TIE
	S/BK/500-3-002	1	SENSOR BRACKET

KIT REF.	RDS PART NUMBER	QTY	DESCRIPTION
<b>K/FLOW/SNR</b>		<b>1</b>	<b>FLOW SENSOR PICKUP KIT</b>
	S/SR/500-10-131	1	SENSOR PICKUP
<b>K/CNTRL/VLV-1</b>		<b>1</b>	<b>1" CONTROL VALVE KIT</b>
	S/CV/200-1-001	1	CONTROL VALVE
	S/FSNR/301	2	M6 SPRING WASHER

<b>K/INSTRUMENT</b>		<b>1</b>	<b>INSTRUMENT KIT</b>
	S/AC/500-4-003	2	5A FUSE
	S/FX/199-2-129	6	CABLE TIE BASE
	S/FSNR/940506	2	NO 8 X 5/8" CSK SCREW
	S/FIXING/079	2	1/4" FEMALE TERMINAL
	S/FIXING/071	1	FUSEHOLDER
	S/CBL/TIE/001	50	CABLE TIE

<b>K/WL/MGNT/COM</b>		<b>2</b>	<b>WHEEL MAGNET KIT</b>
	S/FSNR/401	4	M6 FULL NUT
	S/FSNR/301	4	M6 SPRING WASHER
	S/FSNR/103	4	M6 X 25 HEX SETSCREW
	S/MAGNET/002	2	MAGNET
	S/FSNR/601	2	M6 X 30 S/S HEX SETSCREW
	S/FSNR/406	2	M6 NYLOC™ NUT
	S/FSNR/203	2	M6 FIBRE WASHER