

## **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 NEAREST DISTRIBUTOR

If unknown then fax: 44 (0) 1453 733311

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Our policy is one of continuous improvement and the information in this document is subject to change without notice. Check that the software reference matches that displayed by the instrument.

### **Document number**

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# **User Guide**

## **Delta 3**

## **Operation**

Software Ref: NG 302-119

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*Delta 3* provides a fully comprehensive flow-based sprayer control system. With either a liquid or granular installation kit, it is compatible with sprayers, slurry applicators, moving belt fertiliser spreaders and pneumatic fertiliser spreaders.

The *Delta 3* enables two control modes,

- **MANUAL** - simple, manual control of flow rate. Field data can be continuously logged and stored in memory.
- **AUTO** - fully automatic rate control. The flow rate is automatically adjusted as forward speed varies, to ensure that the application rate constantly matches a target rate. There is a programmable alarm to warn of high and low flow rates. Field data can be continuously logged and stored in memory.

*Delta 3* is fitted with quick-release connectors so it can be easily transferred between different machines. All system calibration data and field data is automatically stored in memory when the instrument is switched off or disconnected from the vehicle.

The instrument is normally powered on via the vehicle ignition circuit or a separate toggle switch, and recalls the function last set. The instrument has an internal audible alarm.

## Features

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The front panel has two 4-digit LCD screens. The RH screen has both analogue and digital displays for forward speed. (Metric or Imperial units, can be set in the normal operating mode). The instrument is controlled via two rows of switches, grouped and colour-coded for easy operation;

- **Blue switches** are for selecting the work function to be displayed.

Instantaneous application rate

Part and Total volume applied

Part and Total area applied

Tank contents

Engine/PTO rpm (with optional sensors), Engine hours, Time of day

Reset totals

# Overview

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- **Red switches** are for setting and adjusting the system in normal operating mode including,

Control mode - AUTO or MANUAL

Target rate and speed (AUTO)

Increase/decrease application rate

Tank contents (tank-filling sensor optional)

Simulated speed for static testing

Flow sensor - correction factor

- **Yellow switches** are for controlling data logging and transfer.

Field data including extended data functions, can be logged into memory during AUTO or MANUAL operation, and later downloaded to a printer or PC based software.

## Calibration

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An unmarked switch enables the flow sensor calibration figure to be corrected for mixtures with a high specific gravity, and to check the number of nozzles recognized (via the sprayer control interface lead) as being switched on.

Most calibration is done only once on installation. There are two calibration modes accessed by holding a particular switch while powering the instrument.

Overlay cards are provided to denote the alternative functions of the bottom row of switches, when in the calibration mode.

Refer to the Calibration Manual.

## Front panel Guide

## Front panel Guide

### DISPLAY FUNCTIONS (BLUE SWITCHES)

#### FUNCTION

#### UNITS (LIQUID/GRANULAR FERTILISER)

(Units are selected in CAL mode 1)

- |     |  |   |   |    |              |
|-----|--|---|---|----|--------------|
| (1) |  | Current Application Rate                          | litres/ha   | OR | gallons/acre |
| (2) |  | Partial quantity applied                          | litres  | OR | gallons      |
| (3) |  | Total quantity applied                            | litres x 10   | OR | gallons x 10 |
| (4) |  | Total Area  | hectares  | OR | acres        |
| (5) |  | Partial Area                                      | hectares  | OR | acres        |
| (6) |  | Quantity remaining in tank                        | litres  | OR | gallons      |
| (7) |  | PTO RPM*, Engine RPM*,<br>Engine Hours, Time      | Press again to select next function<br>TIME displays for 4 seconds only)<br>(* With optional sensors) |    |              |
|     |  | RESETS selected functions (2), (3), (4), (5), (6) |   |    |              |

### DATA LOGGING CONTROLS

- START data logging in AUTO or MAN mode  
(LED ON while logging is in progress)
- STOP logging a job
- Download field data to a printer or PC
- + HOLD to clear field data memory

**In/Out of work indicator**  
(flashes when sprayer/spreader switched off)

**Display function indicator**

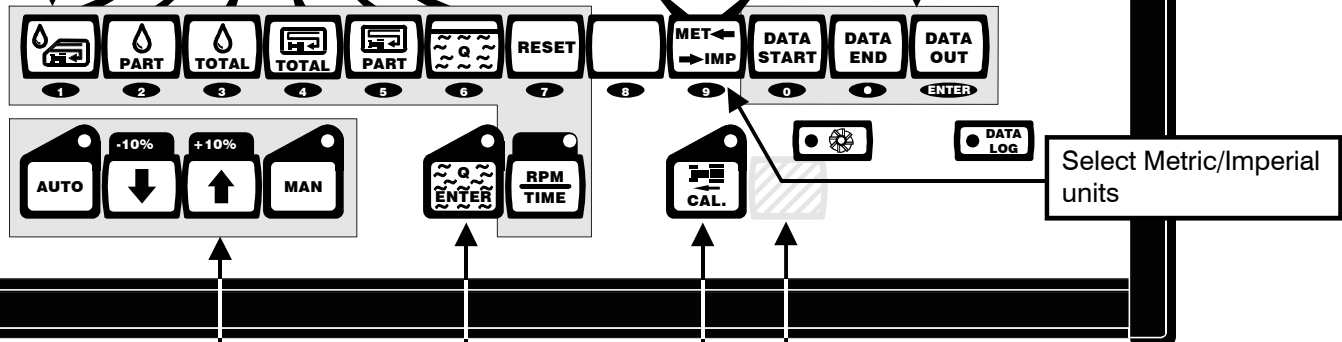
Function display

Forward speed display



### RATE CONTROLS

- AUTOMATIC control mode**  
HOLD to display Target rate (or set the Target rate with the numeric switches)
- PRESS to alter the application rate in AUTO or MAN**  
 **PRESS AUTO switch to resume preset automatic rate**
- MANUAL control mode**



Select Metric/Imperial units

5

6

Set tank contents/alarm volume

Set Target/Simulated speed LED Speed indicator

Flow correction factor/ LED Flow indicator

## Automatic rate control



*LED indicates mode is selected*

The operator sets a 'target' rate (l/ha or galls/acre) and 'target' speed. The flow rate is then automatically adjusted as forward speed varies, to ensure that the application rate constantly matches a target rate. You can also log and store field data as you go, and transfer to a printer or PC when convenient (see PAGE 15-16)

## Adjustment

The preset target rate can be overridden in  $\pm 10\%$  steps while spraying, e.g. over localised weed infestation or other crop conditions.



*An LED above the appropriate switch indicates that the application rate differs from the preset rate. The LED on the AUTO switch flashes.*

PRESS  to restore preset target rate.

## Spray rate alarm

If the application rate cannot be maintained within  $\pm 20\%$  of the target rate, the display will flash '**High**' or '**Lo**' and the audible alarm will beep every two seconds. A '**high**' display may be caused by the control valve being unable to dump sufficient flow back to the sprayer tank as a result of:- speed too slow or stationary, too small or too few nozzles in use - sections off or blocked nozzles, pump capacity too large or control valve too small.

A '**lo**' display may be caused by:- forward speed too high, insufficient pump capacity, low pump speed, low or empty tank, blocked filters or incorrect jets fitted.

## Forward speed alarm

*Default = 0.0 (no alarm)*

When forward speed exceeds target speed limits (set in Cal mode 1), the audible alarm beeps 5 times and the speed display flashes continuously.

# Normal operation

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## Manual rate control



*LED indicates mode is selected*

### Adjustment

INCREASE



DECREASE




*The application rate is shown on the LH display.*

To maintain the desired application rate (l/ha or gals/acre) the operator must keep to the target speed. There is no alarm function in manual mode.

You can also log and store field data as you go, and transfer to a printer or PC when convenient (see PAGE 15-16).

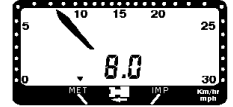
## Target rate and target speed

HOLD  to see or change either of the 'target' conditions.

*When released the display reverts to the previous function.*





Target rate











Target speed

### Set target rate


HOLD  and key-in the new value e.g. 1, 5, 0, then PRESS 

### Set target speed

This is the speed for optimum spraying/spreading performance. Set as recommended for the nozzle type(s) fitted. There are three ways to set the target speed.

- (i) HOLD  +  OR 
- (ii) HOLD  +  OR 
- (iii) HOLD  + Key-in the value and PRESS 

### NOTE:

The  switch is also used to set and initiate a simulated speed input for nozzle calibration purposes (see PAGE 17).


# Normal operation


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## Sprayer tank contents

The volume remaining in the tank can be displayed at any time, The correct display is dependent on the correct volume being programmed when the tank is filled. The instrument sounds an alarm for 5 beeps and the switch LED flashes continuously when the tank contents go below a preset volume.

If an optional flow sensor and shutoff valve is installed in the filling hose, the instrument will automatically monitor and control refilling.

PRESS  to display the volume remaining.

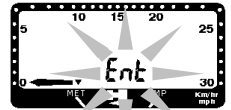
HOLD  FOR 5 SECONDS to reset to the preset 'full tank volume'.

## Tank-filling - manual entry

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Fill the tank to the desired level.

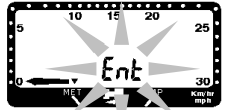
1. PRESS 



*The display scrolls 'full tank volume' then the preset volume (litres or gallons).*

Confirm 'full tank volume' corresponds to the quantity in the tank, otherwise enter new value.

2. PRESS 



*The display scrolls 'Alarm volume' then the preset volume.*

Confirm the alarm volume is OK. This is typically the volume needed to spray a single bout. If necessary key-in the new value.

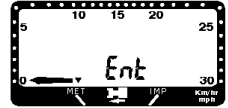
3. PRESS 

## Automatic tank refilling

Where a tank in-flow sensor and shutoff valve are fitted in the filling hose and the option selected in Cal mode 2.

Filling occurs only when the sprayer is stationary and switched off i.e. the chevron flashing.

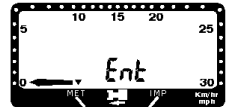
1. PRESS 



*Display scrolls 'full tank volume' then quantity.*

Confirm this is the quantity you want in the tank after filling, otherwise enter new value.

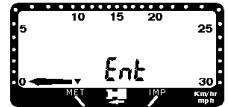
2. PRESS 



*Display scrolls 'volume left in tank' then quantity.*

Confirm this is the quantity presently left in the tank, otherwise enter new value.

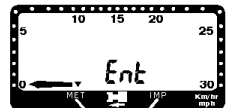
3. PRESS 



*Display scrolls 'volume to fill' then quantity.*

Confirm this is the volume required to fill the tank to the desired level, otherwise enter new value.

4. PRESS 



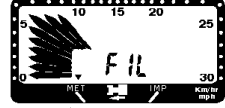
*Display scrolls 'alarm volume' then quantity.*

Confirm alarm volume is OK, otherwise enter new value.

# Normal operation

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5. PRESS



*Display counting (litres/gallons) as tank fills.*

*Display acts as a contents gauge (30 = required volume)*

When the required volume is reached, the audible alarm sounds 10 beeps, and if fitted the shutoff valve closes to stop filling.

## NOTE:

The automatic tank-filling function is enabled/disabled in CAL mode 2.

The yellow switches control data logging.



The DATA LOG LED indicates when logging is in progress.

Data downloading is enabled/disabled in CAL mode 2

## Field data

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Field data can be logged and stored in memory during AUTO or MANUAL operation, and later output to a printer or PC based farm management software. Up to 275 individual jobs can be stored in memory.

**To start, end or reset field data logging, refer to the flow diagram on PAGE 15**



**It is recommended to download field data on a regular basis, to minimise the risk of data loss for whatever reason.**

The following data is logged for each job;

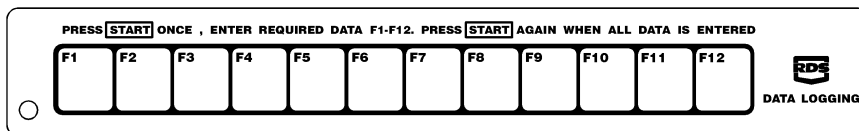
- Job number (sequentially assigned by *Delta*),
- Job date, Start time,
- Job time duration,
- Area, Quantity applied,
- Average application rate.

## Extended data

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Field data can include up to 12 supplementary items of data selected by the bottom row of switches. Each can have any value between 0 and 9999 set with the top row of switches.

These functions are identified as F1 to F12 on a special overlay card provided.



The meaning of each function is determined by the farmer, and can be noted on the overlay card or the chart on PAGE 14. They may refer to such information as,

Customer reference, Windspeed, Crop variety, Product being applied, etc.

**Refer to the charts on PAGE 15-16 for full instructions on data logging and transfer.**

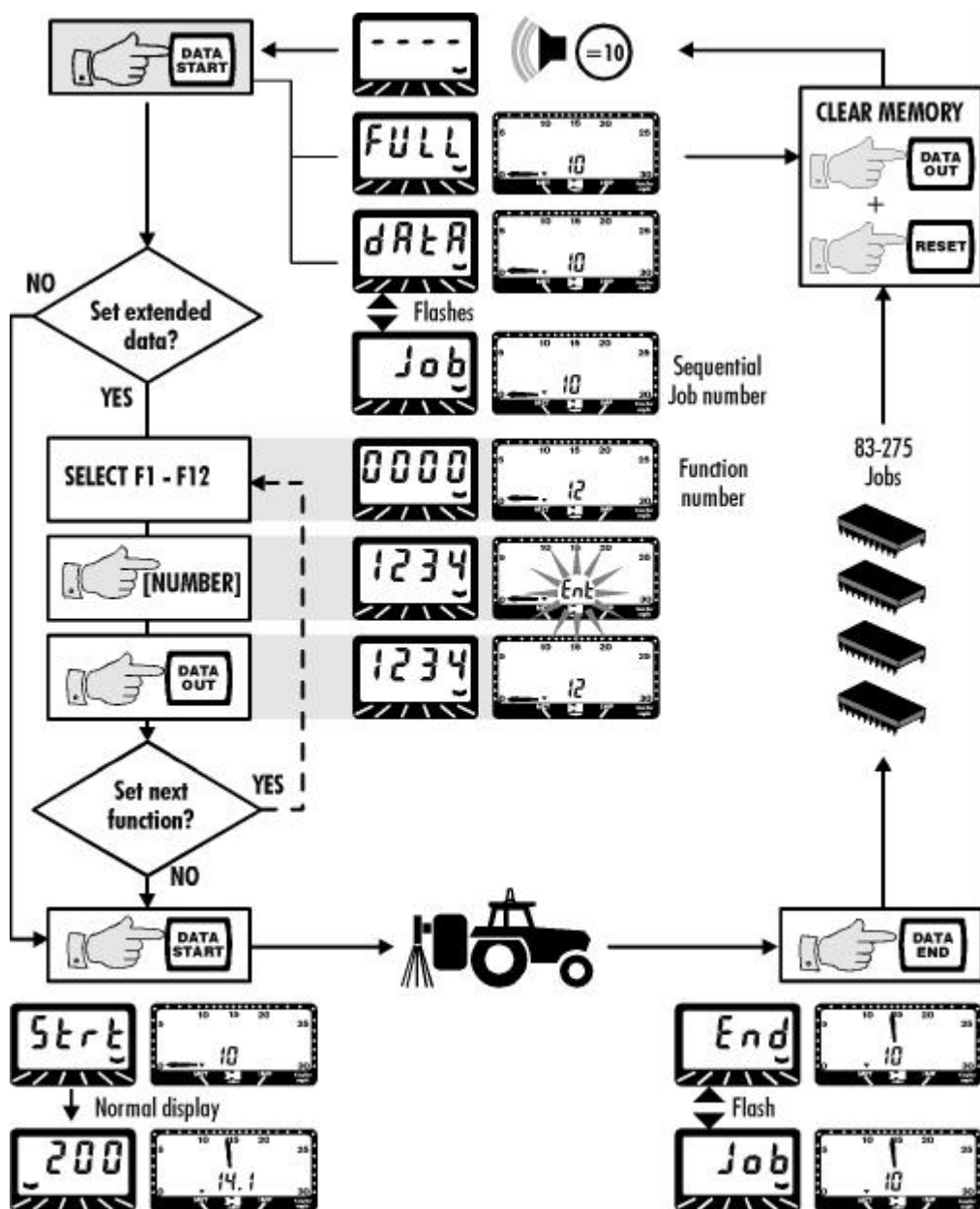
# Data logging

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## Extended Data Functions

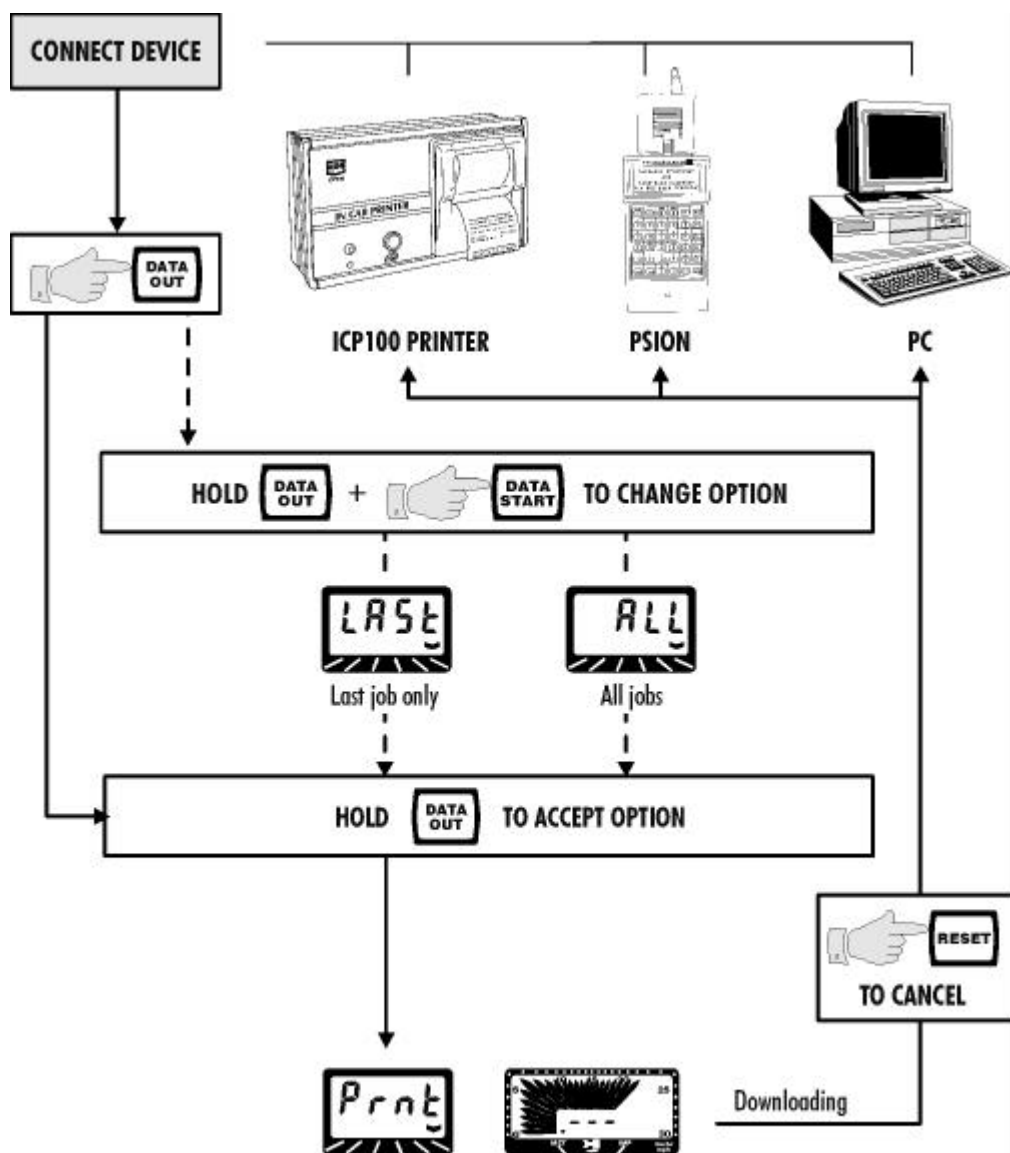
Function No.	Meaning
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

## Log field data

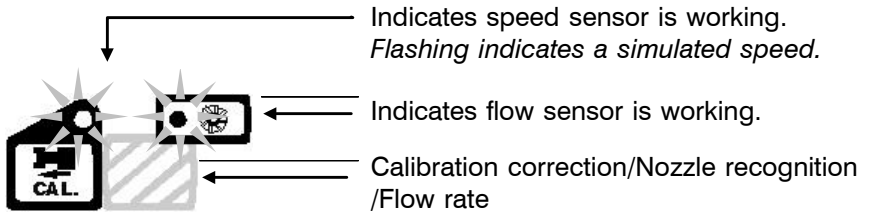


# Data logging

## Downloading field data



**NOTE:** Downloading does not delete logged data from the memory.

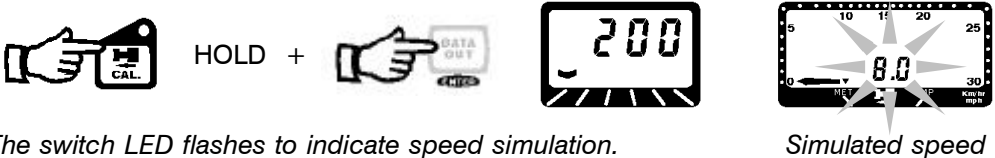


## Speed simulation for nozzle calibration test

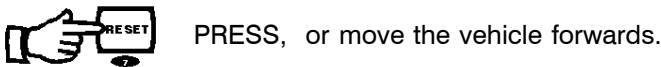
During a calibration check of the spray nozzles while stationary in the yard, the instrument can be set to simulate any desired forward speed. The application rate displayed can then be compared with the results of the nozzle test. To correct a discrepancy, adjust the flow sensor calibration correction factor (PAGE 18).

NOTE: Area does not accumulate. Other functions operate as normal.

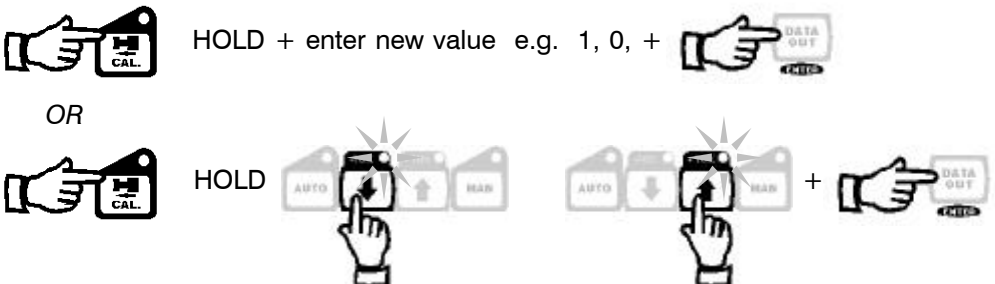
### Start speed simulation



### Stop speed simulation



### Change simulated speed



NOTE: Simulated speed = Target speed

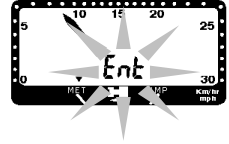
# Checking the system

## Flow sensor Calibration Correction Factor

Compensates for liquids with high Specific Gravity,



PRESS ONCE



Correction factor  
default = 1 (no correction)

Initial calibration of the flow sensor during installation is based on tests using clean water (SG = 1.0). Minor adjustments may be needed on a daily basis. to compensate for liquid fertiliser with a high Specific Gravity.

To determine any correction, spray the first load and note the displayed volume.

Correction factor =  $\frac{\text{existing factor} \times \text{displayed volume}}{\text{actual volume}}$  e.g.  $1.000 \times \frac{1950}{2000} = 0.975$

Key-in new value e.g 0.975 +



## Nozzle recognition

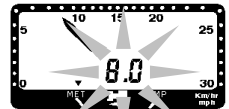
To display the number of nozzles recognized as being switched on via the sprayer control interface lead,



PRESS TWICE  
AND HOLD



No. of nozzles



(Current speed)

## Sensor flow rate

To display the flow rate (litres or gal/min) calculated for the *whole* machine.



PRESS THREE TIMES  
AND HOLD



flow rate



(Current speed)

e.g. If the flow sensor monitors only part of the boom e.g. the centre section, the rate displayed is multiplied accordingly for the full boom width.



# Updates

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**Iss.4** 1/12/97 Update to NG302-119  
Reformatted

Your local distributor is: