

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.

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User Guide

Delta 3

Calibration

Software Ref: NG 302-119

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There are 3 calibration modes,

CAL mode 1 - includes most settings for sprayers including RDS Control valve performance.

CAL mode 2 - includes general settings for the instrument display, regardless of the control system fitted.

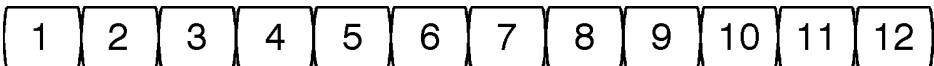
CAL mode 3 - set software option and self-learning mode ON/OFF.

Overlay cards are provided for CAL modes 1 and 2, to denote the alternative functions of the bottom row of switches, when the instrument is set in that CAL mode.

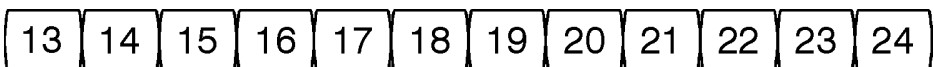
Most calibration need be done only once on installation. An exception is when spraying liquid fertiliser mixtures with a Specific Gravity significantly greater than 1.0. An unmarked switch enables the flow sensor calibration factor to be corrected. This function is accessed from the normal operating mode (refer to the Operating Manual).

Two sets of calibration data can be exchanged between current and backup memory, a useful feature if the *Delta* is to be swapped between two different machines.

In some cases, particularly for telephone support, it is helpful to reference the front panel switches by number as described below.



Numeric/Data entry switches



CAL functions


See PAGE 21 for a quick-reference guide of all CAL functions.

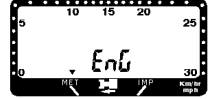
IT IS RECOMMENDED TO COMPLETE AND MAINTAIN THE CALIBRATION RECORD AT THE BACK OF THE BOOK.

Enter/store/print calibration data

Entering CAL mode.

Overlay cards are provided, re-defining the button functions in CAL mode 1 and 2.

- 1 Switch off.
- 2 Position the appropriate overlay card.
- 3 Hold  and switch on.

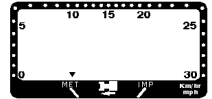


Language

Entering data

Numeric

- 1 Select function button.
LH display shows current value.



(Flow calibration factor)

- 2 Enter new value.
If you make a mistake, continue and repeat the correct number sequence.



- 3 Press to accept.



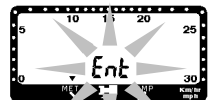
Non-numeric

- 1 Select function button.
LH display shows current option.

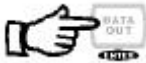


(Operating mode)

- 2 Press button again to select option.
LH display shows new setting.



- 3 Press to accept.

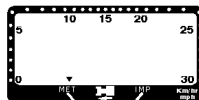


Enter/store/print calibration data

Secondary data

Some functions have secondary data which can be numeric or non-numeric.

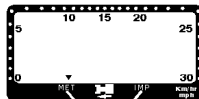
- 1 Select function button.



Nozzle spacing

- 2 Hold button.

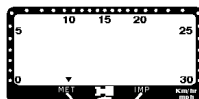
Secondary data selected.



- 3 Release button and press again to select option.
(or enter new numeric value)

Implement width

LH display shows new setting.



Store/recall CAL data

The full set of calibration data is stored in **current** memory but can also be saved in a separate **backup** memory. This can be **restored** at any time and overwrites data in the current memory.

Two sets of data can also be **exchanged** between the current and backup memory, a handy feature if *Delta* is swapped between two machines.

- 1 Enter CAL mode 2



- 2 Press.



(Store)

(Restore)

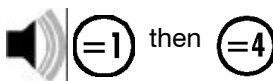
(Exchange)



- 3 Hold to change option.



- 4 Press



Data is now transferred.

Enter/store/print calibration data

Printing data

Keep a permanent record of calibration data in case the instrument memory gets corrupted for any reason.

- 1 **Connect output device - ICP100 In-cab printer, PSION etc.**
- 2 **Enter CAL mode 1**
- 3 **Hold.**




All calibration data is downloaded.

If the LH display shows 'Prnt' but then locks up and the printer does not respond, then check the data lead connection.



It may be necessary to switch off and re-enter Cal mode.

Exit CAL mode

Either switch off, or hold the button marked  on the overlay card until the display reverts to operating mode.

Instrument failure

If both displays freeze and the switches do not function, this is indicative of a low supply voltage (<10 V). All CAL settings and stored data should be retained in the memory.

Check the voltage supply at the Harting connector.

If ALL segments on both displays flash on and off, this is indicative that instrument memory has been corrupted for some reason. A POWER-ON RESET is necessary to recover normal operation.

PRESS and HOLD SWITCHES 13 AND 24 together as the instrument is switched back on. It will perform a self-test routine before entering CAL mode 1.

All stored data will be lost and CAL functions default to factory settings.

Speed sensor factor



The distance the vehicle travels forward over two intervals between speed sensor pulses. Default = 2.000 m (78.74 ")

This could be calculated based on nominal tyre diameter or rolling distance and entered manually, however this does not take account of wheel slip, sinkage or tyre deformation under practical operating conditions.

Auto-Calibration

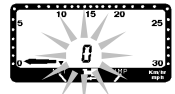
The best method is to do an 'AUTO CAL' over a measured distance* as follows;

- 1 **Place two markers in a field (not on a tarmac or concrete driveway) exactly 100 metres apart.**
- 2 **Position the vehicle with the first marker level with some reference point on the vehicle, e.g. the tractor step.**



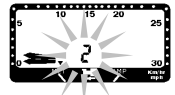
- 3 **Hold.**

LH display flashes.



- 4 **Drive the test distance.**

Displays show no. of sensor pulses...

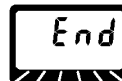


- 5 **Stop when the reference point on the vehicle is exactly opposite the 100 metre marker.**

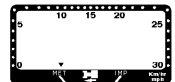
Do not reverse the vehicle if you overrun the 100 metre marker. Repeat from Step 2.



- 6 **Press**



...then the calculated speed factor is displayed.



* Measuring the distance is easier with a trundle wheel. Start the AUTOCAL function and move off along the field while an assistant walks alongside the vehicle for 100 metres.

Cal mode 1

Manual calibration

If a **two-magnet wheel sensor is fitted**, drive in field conditions for exactly **10** turns of the sensed wheel.

If a **propshaft sensor is fitted**, drive in field conditions for exactly **20** turns of the propshaft.

In either case calculate the factor = Distance travelled and enter value.

10

If a **RDS TGSS radar sensor is fitted at the recommended angle**,

1. Set an initial value of **0.016** in metric mode (or for higher resolution, set a value of **0.613** in Imperial mode, and then return to Metric mode).
2. Set the implement full width to 100m.
3. Set the instrument to display AREA in normal operating mode and drive over a 100 metre measured distance.

NOTE: This must be a rolling 100 metres, not a start-stop 100 metres.

If the TGSS CAL factor is correct, the AREA display will show 1.000 hectares.

If not then adjust the CAL factor based on the following calculation,

New factor = existing factor x displayed area (ha)

4. Re-enter CAL mode 1 and adjust the CAL factor. Don't forget to reset the implement width.

Nozzle spacing



Set individual nozzle spacing. when *Delta* is linked to the sprayer control box via the RDS Interface lead. Otherwise (i.e. for spreaders), set the full working width of the implement.

Default = 0.5m

Part/Full width

Secondary data

If a sprayer interface lead is connected, select '**part**' for the individual nozzle spacing.

If a conventional cutout switch is connected to the Grey Harting, set '**full**' for the full implement width (nozzles per section then defaults to 1).

Nozzles per section



Programme each boom section (max. 9) by switching on individually and enter the corresponding number of nozzles.

Default = 8

RH analogue display indicates a boom section 1-9 is on.



Error message



This will occur if,

1. More than ONE section is switched on at a time.
2. The interface cable or power supply is not properly connected to the sprayer control box.
3. '**full**' implement width is selected - set to '**part**'.

Cal mode 1

Sensed width



Programme the total width of the boom section(s) to which liquid is delivered **via the flow sensor**. This is normally the full boom width, but in some installations, for practical reasons it may be a single boom section.

Default = 24.00m

Flow sensor CAL factor



Initially set the the factor (pulses/unit volume) as given below, according to the size of RDS flow sensor fitted.

Sensor type	pulses/litre	pulses/UK gal	pulses/US gal
1" Delta Flow	48.00 = <i>default</i>	218.2	181.7
1/2"	3700	-----	-----
3/4"	1786	8119.0	6760.0
1"	650.0	2955.0	2460.0
1-1/2"	165.0	749.1	624.5
2"	100.0	454.6	378.5

Using clean water only, spray out a known volume* and note the displayed volume.

If the reading differs, calculate the required CAL factor as;

New factor = existing factor x $\frac{\text{displayed volume}}{\text{known volume}^*}$ e.g. $650 \times \frac{2000}{1950} = \mathbf{666.7}$

Use the Calibration Correction Factor in the Operating mode to compensate for spraying liquids with Specific Gravity significantly greater than 1.0. *Measurements from the sprayer sight gauge alone may not be sufficiently accurate.

Boom section valve type



If each boom section valve simply shuts off the flow (i.e solenoid valves), set to 'n' for a non-recirculating system.

If each boom section valve when closed, diverts the flow back to the tank (e.g. ARAG, Spray Systems valves), set to ' r ' for a recirculating 'balanced return' system.

Default = n

System response



This function relates to the performance of the RDS control valve as fitted to sprayers. For details refer to the section 'AUTOMATIC CONTROL PERFORMANCE' on PAGE 17.

Target speed limits



These are the limits either side of the Target speed (set in Operating mode), at which an audible alarm will sound.

For example, if the Target speed is 8 kph and the limits are set to **1.0**, then the low speed alarm sounds if the speed drops below 7 kph and the high speed alarm sounds if the speed goes above 9 kph.

Default = 0 (ALARM DISABLED)

Minimum Pulse Length



This function relates to the performance of the RDS control valve as fitted to sprayers. For details refer to the section 'AUTOMATIC CONTROL PERFORMANCE' on PAGE 17.

Clock/Calendar




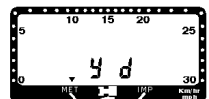
PRESS ONCE
then enter hours/minutes.



PRESS 
then enter date/month.



PRESS 
then enter year/day
(Day 1 = Monday)



PRESS 

Cal mode 1

Units



To select the *default* units displayed in operating mode, PRESS and RELEASE to toggle between the options.



Metric (default)



UK Imperial



USA

Units vary according to the material mode selected - 'SPRAY', 'SLURRY', 'SALT' or 'BITUMEN' (SEE PAGE 16)

	Function	Metric	UK Imperial	US
SPRAYING	Trip Volume	litres	gallons	US gallons
	Total Volume	litres x 10	gallons x 10	US gallons x 10
	Area	hectares	acres	acres
	App. Rate	litres/hectare	gallons/acre	US gallons/acre
	Flow Rate	litres/min	gallons/min	US gallons/min
SLURRY	Trip Volume	metre ³	gallons x 10 ³	US gallons x 10 ³
	Total Volume	metre ³ x 10	gallons x 10 ⁴	US gallons x 10 ⁴
	Area	hectares	acres	acres
	App. Rate	metres ³ /hectare	gallons x 10 ³ /acre	US gallons x 10 ³ /acre
	Flow Rate	metres ³ /min	gallons x 10 ³ /min	US gallons x 10 ³ /min
SALT	Trip Volume	litres	-	-
	Total Volume	litres x 10	-	-
	Area	metres ²	-	-
	App. Rate	millilitres/metre ²	-	-
	Flow Rate	litres/min		
BIT	Trip Volume	litres	-	-
	Total Volume	litres x 10	-	-
	Area	metres ²	-	-
	App. Rate	litres/metre ²	-	-
	Flow Rate	litres/min	-	-

Print CAL data



Refer to PAGE 6 - 'Printing data'.

Data ON/OFF



ENABLES/DISABLES data logging and downloading.


Engine RPM CAL factor



The CAL factor is the number of pulses received by the engine speed sensor per revolution of the crankshaft. The RDS sensor operates off the 'W' terminal of the alternator.

Default = 16 pulses per rev

To calibrate the engine RPM display

- Using the default factor, return to the normal operating mode and PRESS  TWICE to select the engine RPM display.
- Run the engine at a steady speed. Measure the engine RPM using either a hand-held tachometer or note the reading from the vehicle's own tachometer. At the same time note the engine RPM figure on the *Delta* display.
- If the readings differ, calculate the required CAL factor as;

$$\text{Initial factor} \times \frac{\text{Instrument reading}}{\text{measured RPM}}$$

e.g. the *Delta* reads '1550' as the tachometer reads 1700 RPM

$$\text{New factor} = 16 \times \frac{1550}{1700} = 14.58$$

- Re-enter CAL mode and adjust the CAL factor.

CAL mode 2

Select PTO/Tank-fill sensor




Both a PTO and a tank-fill sensor can be fitted to the system but *Delta* cannot receive input from both. It must be set to recognize one or the other.

Default = 'PtO' - CAL factor of 1 pulse per rev.

The LH display will show 'PTO' for 3 seconds, then show the CAL factor.

Secondary data

1. PRESS and HOLD  until the LH display shows 'FIL' then release.
The RH display will flash 'Ent'.


2. PRESS  to accept.

The LH display will show 'FIL' for 3 seconds, then show the CAL factor.

NOTE: When 'FIL' is selected, then PTO RPM can still be displayed based on a PTO calibration factor, but derived from the *engine* RPM sensor input.

In this case, calculate a suitable PTO factor as below. Note however, that the display is accurate *only* for the engine/PTO gear ratio engaged during calibration. (For example, the transmission ratios are different for 'Std' and 'Economy' PTO ranges).

To calibrate the PTO RPM display

1. Using the default factor, return to the normal operating mode and PRESS  ONCE to select the PTO RPM display.
2. Run the engine at a steady speed. Measure the PTO RPM using a hand-held tachometer. At the same time note the PTO RPM figure on the *Delta* display.
3. If the readings differ, calculate the required CAL factor as;
Initial factor x $\frac{\text{Instrument reading}}{\text{measured RPM}}$
e.g. with a CAL factor of 1 programmed, the *Delta* reads '480' at 540 PTO RPM

$$\text{New factor} = 1 \times \frac{480}{540} = 0.888$$

4. Re-enter CAL mode and adjust the CAL factor.

To calibrate the Tank-filling sensor

(Default CAL factor = 95.00 pulses per litre for a 2" turbine)

If an alternative size of turbine is installed then initially programme the appropriate factor (see PAGE 9).

1. Fill the sprayer tank with a known volume of liquid via the in-flow sensor. Note the volume indicated on the LH screen.
2. If the readings differ, calculate the required CAL factor as;
$$\text{Initial factor} \times \frac{\text{Displayed volume}}{\text{Actual volume filled}}$$

e.g. the *Delta* reads '1750' after filling 1900 litres
New factor = $95 \times \frac{1750}{1900} = 87.50$
3. Re-enter CAL mode and adjust the CAL factor.

Engine speed alarm



The primary data is the engine speed at which the audible alarm will operate.

Default = 0 (Alarm function DISABLED)

The secondary data is the option of an 'overspeed' alarm (**HIGH**), or an underspeed alarm (**LO**).

Default = 'HIGH'

If necessary refer to PAGES 4-5 to change settings.

PTO speed alarm



Set as as above.

Default = 0 (Alarm function DISABLED)

Engine hours accumulation



Default setting = 'IGN'

If no engine speed sensor is fitted, then accept default setting.

Delta logs time while the ignition is on.

If an engine speed sensor is fitted, select '**EnG**', to log time while the engine is running.

CAL mode 2

Language



Delta can display messages and printout data in English or French.

Select '**EnG**' for English or '**Fra**' for French.

Material mode



Delta can be set to display appropriate units for the type of material being applied.

The options are,

'SPrY' for normal spraying

'SLur' for slurry spreading

'SALT' for salt spreading

'bit' for tar spraying

The appropriate units for each instrument function are given on PAGE 12.

Delay time



This function relates to the performance of the RDS control valve as fitted to sprayers. For details refer to the section 'AUTOMATIC CONTROL PERFORMANCE' on PAGE 18.

Store/Recall CAL data



Refer to PAGE 5


Self-learning mode

Delta has a 'self-learning' mode which automatically sets the optimum response time to allow fast and stable regulation for a particular application rate and target speed. It is guided by the programmable factors - 'response time' and 'minimum pulse length'.

Self-learning mode may not be as effective at higher forward speeds, and if necessary, can be switched OFF in CAL mode 3 as follows,

1. PRESS and HOLD SWITCH 18 () FOR 5 SECONDS.

The LH display will show 'dEL.3'

2. PRESS SWITCH 13 (bottom left) to toggle ON/OFF, then PRESS  .
3. Switch off to exit CAL mode.

System response



This sets the frequency at which the system adjusts the control valve, when reacting to a change in forward speed.

A lower setting results in a slower response, and increases the time taken for the application rate to match the target rate. A higher setting results in a faster response. If the application rate is unstable and varies about the target rate, then the response setting may be too high.

Enter CAL mode 1 Set from 0-9999. Default = 200

Minimum pulse length



This sets the length of pulses driving the flow control valve. The pulses becomes shorter as the application rate nears the target rate. A lower setting gives shorter pulses - too short and the flow rate may not change sufficiently. If the pulse is too long, the system may be unstable about the target rate.

Enter CAL mode 1 Set from 1 to 128 Default = 20

Automatic control performance

Delay time



If a spray boom is empty of liquid, the flow into it is rapid until it pressurises. The flow rate then reduces to the correct flow rate.

Consequently the system takes some time to stabilise at the target rate.

The instrument must be stopped from reacting to the initial flow surge. A delay time can be programmed from 0 - 10 seconds.

When the whole boom or individual section is switched on or off, the control valve will not operate for this time period.

Set from Cal mode 2 Default = 0 seconds

NOTE: On some CAL overlay cards, this switch is not marked 'AUTO DELAY', but left blank.

CAL MODE 1

Speed sensor factor - (m):

Tyre size: | | | |

Factor: | | | |

Nozzle spacing - (m):

Part/Full width:

Section No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Nozzles per section: | | | | | | | | | |

Sensed width - (m):

Flow sensor - (pulses/litre):

Boom section valve type: (n/r)

System response time:

Target speed limits - (\pm kph):

Valve minimum pulse length:

CAL MODE 2

Data ON/OFF:

Engine speed sensor factor - (pulses/rev)

PTO speed sensor factor - (pulses/rev):

In-flow sensor factor - (pulses/litre):

Engine speed alarm limit - (RPM):

High/Low speed alarm:

PTO speed alarm limit - (RPM):

High/Low speed alarm:

Engine hours accumulation - IGN/ENG:

Material mode - SPRY/SLUR/SALT/BIT:

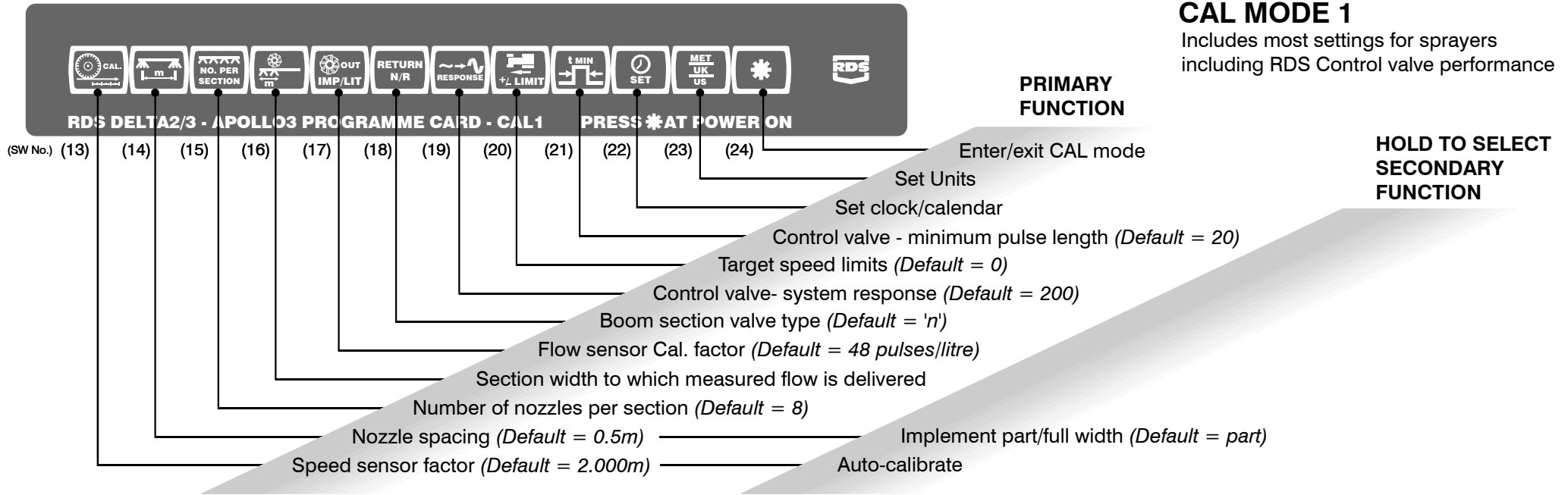
Delay time - (s):

Self-learning - ON/OFF:

Updates

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

Your local distributor is:

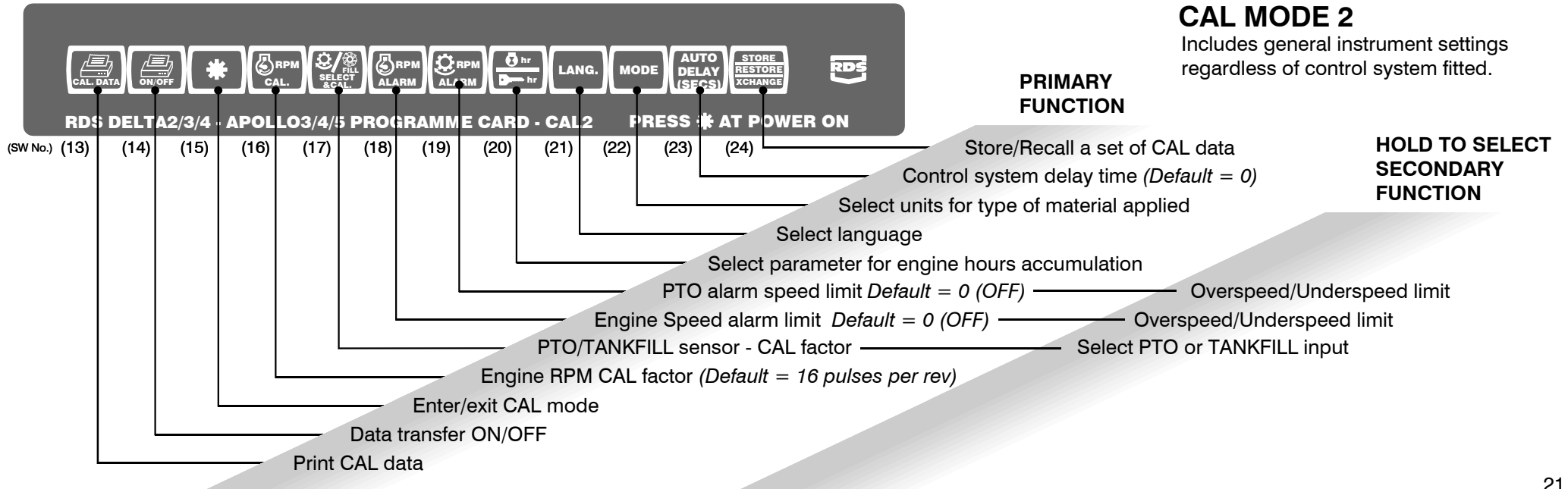


CAL MODE 1

Includes most settings for sprayers including RDS Control valve performance

PRIMARY FUNCTION

HOLD TO SELECT SECONDARY FUNCTION



CAL MODE 2

Includes general instrument settings regardless of control system fitted.

PRIMARY FUNCTION

HOLD TO SELECT SECONDARY FUNCTION

COPY SEPARATELY AND TRIM BACK TO LINE. INSERT AND FOLD AT BACK OF BOOK