

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

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User Guide

"CHECKRATE 200"

Speed-Area Meter

Calibration and Operation

Software Reference WZ400-000 rev.1

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Overview

The RDS *Checkrate 200* is a versatile, simple-to-use work measurement rate monitor. Based on input from a forward speed sensor, and a programmed application rate and implement width, it calculates a range of work measurement functions. The *Checkrate 200* can be programmed by the operator for implements of any practical width and for any sensing wheel size.

Designed primarily for use on spreaders, it can however, also be fitted on sprayers with the addition of an Area Compensation Interface (ACI) to detect which boom sections are switched on.

The system is normally powered through the vehicle ignition system and will be on whenever the vehicle ignition is on. The display is permanently illuminated.

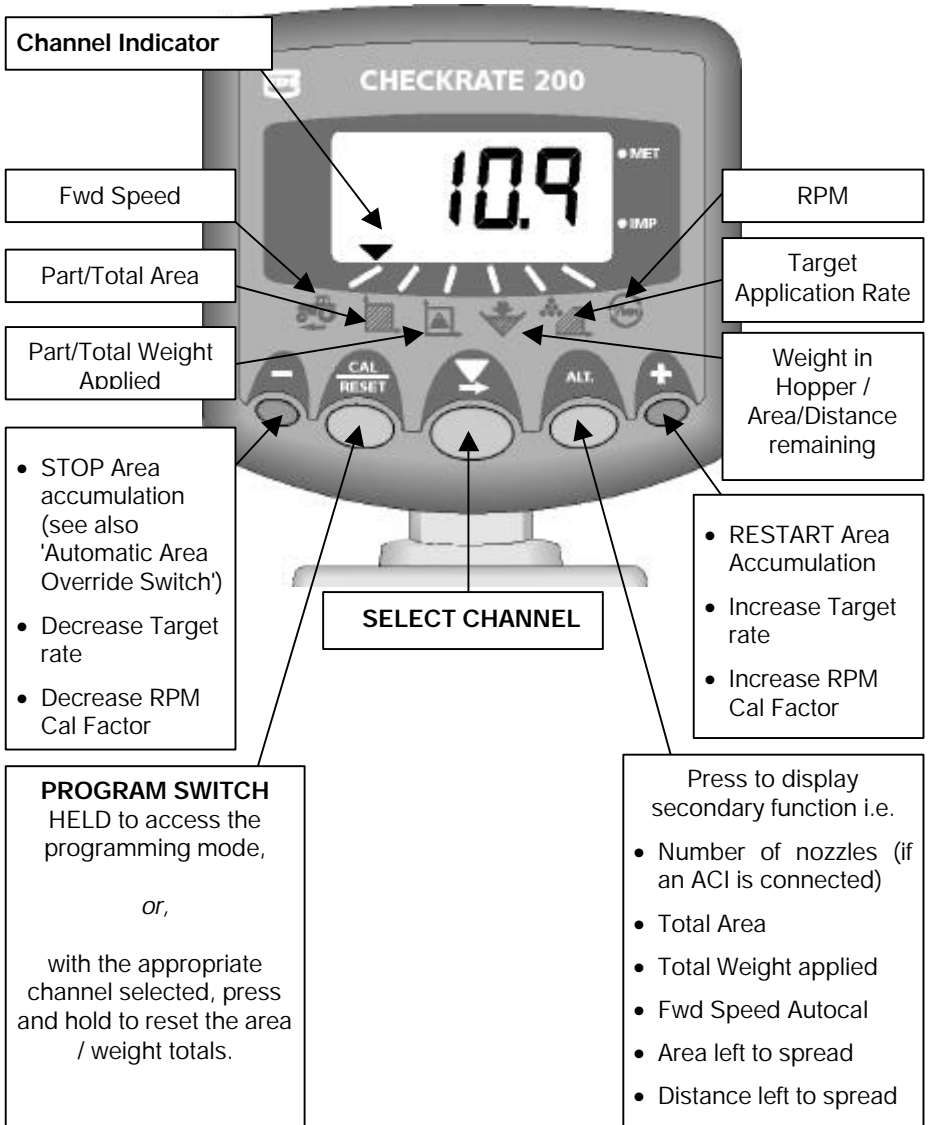
There are a total of 6 channels displaying the following information to the vehicle operator,

- Ch.1 Forward Speed (km/hr or miles/hr)
Number of nozzles being used (if an Area Compensation Interface (ACI) is connected)
- Ch.2 Partial and Total Area worked (hectares or acres). Also displays the part width setting if a Width Correction Interface (WCI) is connected.
- Ch.3 Part and Total Weight of product applied (kg/ha or lbs/acre)
Work Rate (Ha/hr or acres/hr)
- Ch.4 Quantity left in hopper (kg or lbs)
Area remaining that can be spread.
Distance remaining that can be spread
- Ch.5 The application rate used for calculation.
- Ch.6 RPM

The displayed information can be converted from Metric to Imperial units at any time.


On spreaders, the instrument can also be used in conjunction with the RDS Width Correction Interface (WCI) to ensure accurate area monitoring when using partial implement width.

Instrument Facia and Controls



Channel Selection



Simply press the  button to cycle through the six different channels that can be displayed.

Forward Speed / Distance Display



View Forward Speed

Channel 1 displays the current forward speed. The instrument defaults to this channel when switched on.

Forward speed is measured via a sensor suitably mounted to a wheel hub or a convenient location to the vehicle drivetrain. Speed is displayed either in miles/hr or km/hr according to the units selected in the CAL Mode.

View Distance Remaining

The instrument calculates the distance that can be spread based on the weight remaining in the hopper and the programmed application rate.


With channel 4 selected, press and hold the  key and then press and hold the  key

The display will show 'd rEM' for 3 seconds then the value in either metres or yards according to the units selected in the CAL Mode.

NOTE: *If the value is calculated to be more than 9999 units, the display will show 'HIGH'.*

Speed Sensor Factor

In order to display the correct speed and accumulate distance correctly, the instrument must be programmed with the correct Speed Sensor Factor (SSF). This is the distance travelled between pulses received from the sensor.

To view the speed factor, select channel 1, then press and hold the  key for 5 seconds.

The factory default setting is 2.000 m (78.78").

The S.S.F. can be calculated theoretically and then manually programmed, or the instrument can automatically calculate it via the "Autocal" function. Carry out the calibration whenever soil conditions or wheel sizes change.

NOTE: An 'Autocal' is simpler to perform and is more accurate in field conditions

Manually calculating the Factor

The smaller the speed sensor factor the better the speed update will be. Aim for a factor less than 2.000 m (78.78").

NOTE: Perform the following calculations in inches or metres depending on whether the instrument is set for Imperial or Metric units. If you calculate the factor using any other unit of measurement e.g. feet or centimetres, the forward speed display will be incorrect.

- (i) ***If a single magnet is installed (as with a standard RDS Propshaft Sensor kit)***, the distance travelled for each turn of the prop shaft must be determined. To determine this distance, drive the vehicle forwards for exactly **10** revolutions of the prop shaft. Measure this distance (in inches or metres) and divide by **10**, to find the Speed Sensor Factor.
- (ii) ***If 2 magnets are installed (as with a standard RDS Wheel Sensor kit)***, the distance is 1/2 the effective rolling circumference of the wheel. To determine this circumference, drive the vehicle forward in field conditions (with the implement attached if applicable), for exactly **10** revolutions of the sensed wheel. Measure this distance (in inches or metres) and divide by **20** to find the Speed Sensor Factor.
- (iii) ***If 4 wheel magnets are installed***, the distance is 1/4 the effective rolling circumference of the wheel. To determine this circumference, drive the vehicle forward in field conditions (with the implement attached if applicable), for exactly **10** revolutions of the sensed wheel. Measure this distance (metres) and divide by **40** to find the Speed Sensor Factor.
Carry out this test whenever soil conditions or wheel sizes change.
- (iv) ***If an RDS Radar sensor is installed***, the Speed Sensor Factor is **0.008** m (or **0.312** inches).

If the calibration factor works out at over 2.000 m (78.78 inches), consider fitting additional magnets. Extra magnets are recommended if the vehicle has large diameter wheels or is slow-moving. In extreme circumstances you can find that the speed keeps going to zero as it times out before the next pulse arrives.

Number of Sensor magnets

The table gives the number of magnets required to enable a speed update of approximately once per second or faster on the display.

Tire diameter	Typical speed in normal operation:		
	up to 5mph (8km/hr)	6 to 9 mph (9 to 15 km/hr)	10mph (16 km/hr) or over
12" (0.3m)	1	1	1
24" (0.6m)	1	1	1
36" (0.9m)	2	2	1
48" (1.2m)	4	2	2
60" (1.5m)	4	4	2
72" (1.8m)	4	4	2

Example Calculation 1

A truck is fitted with a single magnet mounted in the tire sidewall. The measured distance for 10 rotations of the sensed wheel is 47'-6".


1. Convert the distance to inches :- $(47' \times 12") + 6" = 570"$
2. Divide by 10 (magnet pulses) to give the calibration factor:- $570" / 10 = \underline{57.0}"$
3. Programme the factor '057.0' as described overleaf.



Example Calculation 2

A vehicle with row crop wheels is fitted with 4 magnets. It is found to move 144 feet for 10 rotations of the sensed wheel.

Converting the distance to inches and dividing by 40 gives a calibration factor of $(144' \times 12") / 40 = \underline{43.2}"$.

Manually setting the Factor


With channel 1 selected, press and hold the  key for 5 seconds.

Continue holding this key and adjust the factor up or down using the  and  keys.

Simply release the keys to return to the normal display mode.

'AutoCal'


For maximum accuracy, perform an auto-calibration in field conditions.

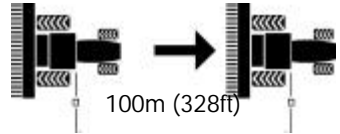
1. Set two markers at 100 metres apart (328 feet). Choose a convenient reference point on the tractor/implement and position this point opposite the first marker.
2. With channel 1 selected, press and hold the  for 5 seconds,

and then press the  key to start the 'Autocal' routine. The display should show 'Auto'.

3. Drive the vehicle until the chosen reference point on the tractor/implement is opposite the second marker.

The instrument counts and displays the sensor pulses received over the distance travelled.

4. Press the  key again to end the autocal. The factor is briefly displayed before returning to the normal forward speed display.



Autocal' distance

Area Measurement


View/Reset Area Totals

Channel 2 displays accumulated area. It is calculated from distance travelled and the programmed spreading width, and is displayed either in acres or hectares according to the units selected in the CAL Mode.


NOTE: The accuracy of these totals is dependent on correct speed sensor calibration, and programmed spreading width.


There are two memory registers - a 'Part' total and a 'Full' Total, which can be independently reset. For example the part total register may be utilised for individual jobs, fields etc, whereas the 'full' total register may be the daily total.

View/ Reset Part Area Total

Selecting channel 2 displays the Part total Area. Press and hold the  key for 5 seconds to zero the Part total. The instrument will beep and the display alternates between 0.000 and the part total before zeroing.


View / Reset Full Area Total

To view the 'Full' Total register, press and hold the  key. The display will show '**toAr**' for 3 seconds before displaying the Full total.

To zero the Full total, while the total is displayed press and hold the  key as for the part total above.

View Area Remaining

The instrument calculates the area that can be spread based on the weight remaining in the hopper and the programmed application rate.

With channel 4 selected, press and hold the  key. The display will show '**A rEM**' for 3 seconds then the value.

Area Override and Part Width

(i) On-Off Switch

As standard the system will have an on-off override switch installed. Depending on the particular application, this may be a simple manually operated switch, or it could operate automatically. The area will stop accumulating when the implement is put out of work. The channel indicator will flash when area accumulation is overridden and will be on permanently when area is being recorded.

Area accumulation can also be overridden at any time by pressing the button.



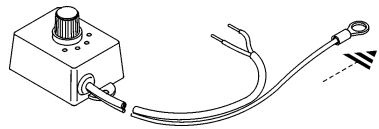
Whichever channel is selected, the display will then alternate between the channel readout and the message 'HoLd'.

Press  to resume area accumulation.

(ii) Optional Width Correction Interface

A Width Correction Interface (WCI) enables the operator to select a part width - 1/4, 1/2, 3/4, or full width as required.

When the WCI is switched to a part width, the display will alternate between the currently selected channel and '1/4', '1/2' or '3/4' corresponding to the switch position, and area accumulation is reduced accordingly.



Width Correction Interface

The WCI works in addition to the standard area override switch.

(iii) Optional Area Compensation Interface

An Area Compensation Interface (ACI) connects between the instrument and a sprayer switchbox. It senses the number of nozzles in use in order for the instrument to calculate the working width.



E.g. An ACI is fitted on a 24-metre sprayer with 5 boom sections. The nozzle spacing is 0.5 metres and there are 10, 10, 8, 10, and 10 nozzles respectively on each section, giving 48 nozzles in total.

The instrument should be programmed with an implement full width = nozzle spacing. When all boom sections are on, the ACI will signal the instrument that there are 48 nozzles in use.

Working Width Setup / Select Units




Press and hold the  and  keys while switching the instrument on to select the WCI / ACI / Width setup mode.

CH. 1 Select WCI /ACI Mode

Using the  or  keys,
Select 'WCI' if either a WCI or a standard override switch is fitted.
Select 'ACI' if an Area Compensation Interface is fitted.

CH. 2 Set Implement Width/Nozzle Spacing

In order for area to be accurately measured, the implement effective width must be correctly set. If 'WCI' mode is set on channel 1, this channel represents the full working width of the spreader. If 'ACI' mode is set (installation on a sprayer), this channel represents the nozzle spacing.

To set the width/nozzle spacing, press and hold the  key and adjust the value using the  and  keys.



CH.3 Set No of Nozzles per Section

This channel only appears when ACI mode is selected.

Switch on one section at a time, then programme the number of nozzles for each section using the  and  keys.


If more than one section is switched on the display will show '1SEc' and you won't be able to enter the number of nozzles.

CH.4 Metric/Imperial Selection

The 4-bar indicator can be switched between "MET" for metric units and "IMP" for Imperial units, using the  and  keys.

Imperial	Metric
miles/hr	km/hr
acres	hectares
inches	metres
lbs/acre	kg/ha

View Total No. of Nozzles

Select channel 1 (Forward Speed), then press and hold the  key for 5 seconds.

If a standard on-off override switch is fitted, the display will show '**n 1**' (1 x implement full width) when the machine is in work and '**n 0**' when it is out of work.

If an ACI is fitted, the display will show the total number of nozzles currently switched on, e.g. '**n 48**' (48 x 0.5m = 24m working width) for the above example).

Weight Display

'Weight Applied' Totals

Channel 3 displays the weight of product applied. It is calculated from the area accumulation and the target application rate, and is displayed either by UK ton (2240 lbs) or metric tonne (2205 lbs) according to the units selected in the CAL Mode.


NOTE: *The accuracy of these totals is dependent on the actual application rate being as close as possible to the programmed rate, and correct area accumulation.*


There are two memory registers - a 'Part' total and a 'Full' Total, which can be independently reset. For example the part total register may be utilised for individual jobs, fields etc, whereas the 'full' total register may be the daily total.

View / Reset Part Total

Selecting channel 3 displays the Part total Weight applied. Press and hold the CAL/RESET key for 5 seconds to zero the Part total. The instrument will beep and the display alternates between 0.000 and the part total before zeroing.

View / Reset Full Total

To view the 'Full' Total register, press and hold the  key. The display will show 'toWE' for 3 seconds before displaying the Full total.

To zero the Full total, while the total is displayed press and hold the  key as for the part total above.




Weight in Hopper

Channel 4 displays the weight of product remaining in the hopper. The value displayed counts down based on area accumulation and the programmed target rate. The area and distance that can be spread from the remaining hopper contents are also displayed on this channel.


NOTE: *The accuracy of these totals is dependent on the actual application rate being as close as possible to the programmed rate, and correct area accumulation.*

Hopper weight is displayed either in lbs or kgs according to the units selected in the CAL Mode.

Set Default Maximum Hopper Weight

With channel 4 selected, press and hold the  key and within 5 seconds, press the  /  keys to adjust the value to equal the amount of material that the hopper will be refilled with. The value will change slowly at first, but will accelerate as the key is held.

Reset Hopper Weight to Maximum




With channel 4 selected, press and hold the  key for 5 seconds. The instrument will beep and the display alternates between the current weight and the maximum weight before resetting to the last programmed maximum weight.

Application Rate Display

Channel 5 displays a target application rate as manually programmed by the operator

Because the instrument uses the programmed rate in calculating the 'Weight Applied' totals, and 'Area Remaining' / 'Distance Remaining' totals, to ensure reliable totals, it is important that the operator adjusts the target rate as required to equal the actual application rate.

Setting a Target Rate


With channel 5 selected, press and hold the  and  keys.  key, then adjust the rate

RPM Display

Channel 6 typically displays the spinner speed, PTO speed or Engine speed, but it can be for any other rotating shaft depending on your particular application.

Calibrating the RPM Sensor

In order to display the correct speed and accumulate distance correctly, the instrument must be programmed with the correct Speed Sensor Factor (SSF).

To view the speed factor, select channel 6 then, press and hold the  key for 5 seconds.




The RPM Sensor Factor is equal to the number of pulses received by the instrument per revolution of the sensed shaft, e.g. for measuring Engine RPM, PTO Speed, Shaft Speed, Fan Speed etc depending on the particular installation.

The default setting is 1 pulse per rev (p.p.r), which is OK in the case of a magnetic sensor with a single magnet on the sensed shaft.

In other cases, perform the following calibration procedure.












1. Run the sensed component at a known speed. If necessary measure this speed using a hand-held tachometer.
2. At the same time have someone note the RPM displayed on the instrument.
3. Calculate the new calibration factor

$$\text{New Factor} = \text{Initial Factor} \times \frac{\text{Displayed Speed}}{\text{Actual Speed}}$$

4. To programme a new factor, with channel 6 selected, press and hold the key for 5 seconds to display the factor. Adjust the value up or down using the  and  keys. 

NOTE: It is always worth checking the calibration again to ensure the RPM display is reading correctly.

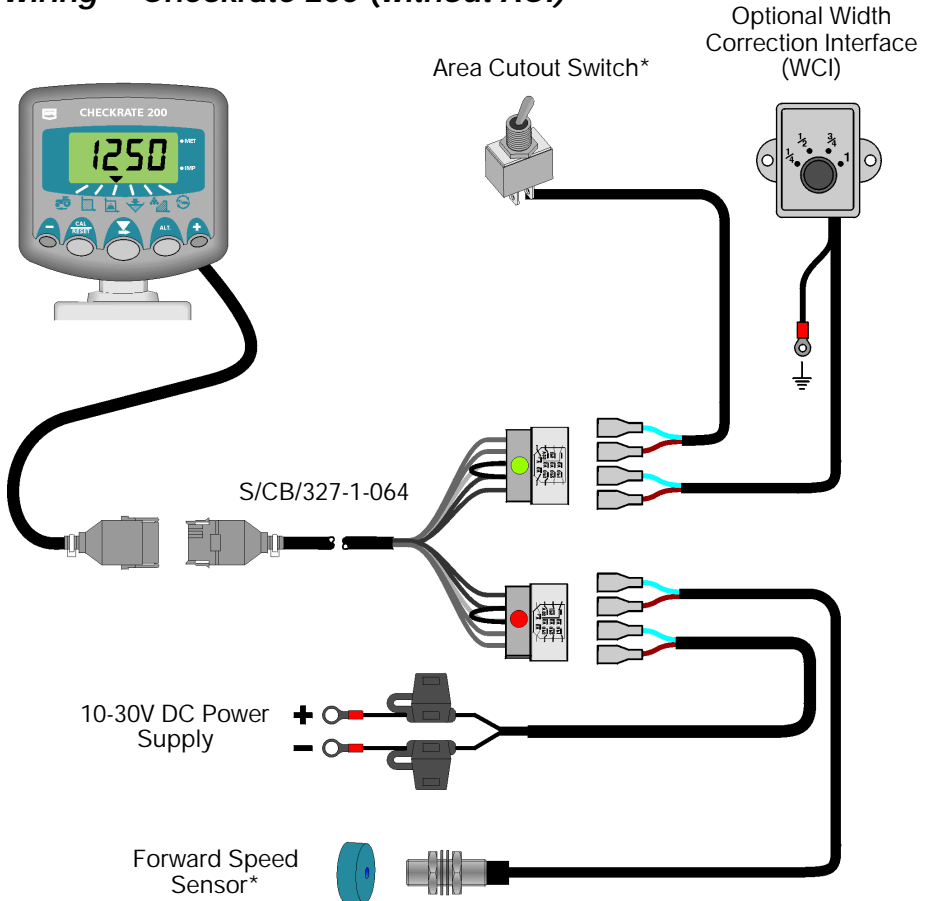
Functions summary

Mode	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6
Normal Display	Forward Speed	Part Total Area	Part Total Weight applied	Weight left in hopper	Application Rate	RPM
Hold 	View Speed Cal. Factor	Zero Part Total Area	Zero Part Total Weight	Reset to Max. Weight	-	View RPM Cal. Factor
Hold plus  	Set Speed Cal. Factor	-	-	Set Maximum Hopper Weight	Set Application Rate	Set RPM Cal. Factor
Hold for 5 sec then   	Start Fwd Speed 'AutoCal'	-	-	-	-	-
Hold 	View No. of Nozzles	Total Area	Total Weight	Area remaining	-	-
Hold plus  	-	Zero Total Area	Zero Total Weight	Distance remaining	-	-
Hold plus and power on  	Select ACI / WCI mode	Set Implement Full width / Nozzle spacing	No. of nozzles per section (ACI mode)	Select Metric/Imperial Units	-	-

System Components

The installation depends whether you have a Cutout Serial Interface (otherwise known as an Area Compensation Interface or 'ACI') fitted or not.

Wiring - Checkrate 200 (without ACI)



For a TGSS Radar Sensor, power supply (24V max.), piggyback a connection from terminal 11.

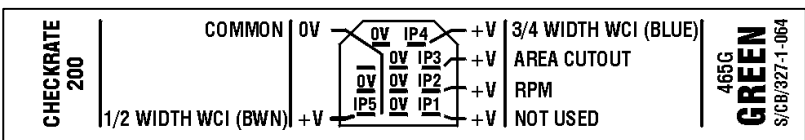
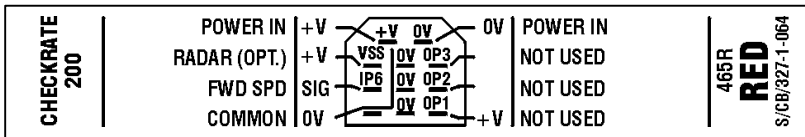
*Refer to the "Work measurement Installation" manual S/DC/500-10-261 for details on power supply, fitting sensors / cutout switches etc.

Connections for Cable S/CB/327-1-064 (system without ACI)

CONNECTOR - RED			
TERMINAL	KEY	COLOUR	FUNCTION
11	+V	RED	+V IN
10 2,5,8	0V	BLACK	0V IN (+0V FOR SENSORS)
9	Vss	RED	+V SUPPLY (RADAR SENSOR)
6	IP6	WHITE	FWD SPEED +V
7	OP3	GREY	-
4	OP2	ORANGE	-
1	OP1	TURQUOISE	-

CONNECTOR - GREEN			
TERMINAL	KEY	COLOUR	FUNCTION
2,5,6,8,11	0V	PINK/BLACK	0V FOR SENSORS
3	IP5	BLUE	½ WIDTH WCI* (BROWN)*
10	IP4	BROWN	¾ WIDTH WCI* (BLUE)*
7	IP3	PURPLE	AREA CUTOUT SWITCH
4	IP2	YELLOW	RPM +V
1	IP1	GREEN	-

*IP4 + IP5 at 0V signals ¼ width. IP4 + IP5 at +V signals full width.
The AMP connector wiring labels are Pt No. S/DC/500-10-465



Wiring – Checkrate 200 (with ACI)

Further information is available on request. Please contact RDS Technology Ltd
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CHECKRATE 200 SPEED-AREA METER

Issue 1 8/9/04

First issue (excludes ACI wiring instructions)