NT 8000i Spreader Control
Operation
June 2015

DIGI★STAR
PRECISELY

C E

Electromagnetic Compatibility (EMC)

This product complies with Council Directive 2004/108/EEC when installed and used in accordance with the relevant instructions.

IMPORTANT, READ THIS BEFORE USING THE NT 8000i

The *NT 8000i* installation is a part of the Precision Farming System ("the System"). It is very important that you follow the described calibration procedures before operating the *NT 8000i* instrument. Calibration and operation of the *NT 8000i*must be in accordance with these instructions. Use of the System is subject to the following disclaimer;

1. So far as is legally permissible DIGI-STAR ("DIGI-STAR"), or its distributors, shall not be liable, whatever the cause, for any increased costs, loss of profits, business, contracts, income, or anticipate savings or for any special, indirect or inconsequential damage whatsoever (death or personal injury excluded).

2. The capabilities and functions of the Precision Farming System ("the System") are limited as set out in the specification of the System, details of which are contained in the Help files and product literature and which must be read before using the System.

3. Without prejudice to the generality of the above it is hereby acknowledged that the System is not designed nor intended to a) originate variable treatment plans or b) achieve or avoid any application rate outside application parameters, which in both cases shall be the responsibility of the operator.

4. The standard terms and conditions of DIGI-STAR (except clause 7), a copy of which is available on request, apply to the supply and operation of this System.

1.1 Overview

1.2 Installation and Inter-operability with other systems

A DIGI-STAR control system comprises several component kits. This modular approach means that a suitable control system can be specified for a very wide range of implements. When re-configured with the appropriate control software, the head unit can be simply transferred between different implements.

The *NT 8000i* can also output variable-rate instructions to other control systems including Vicon, Bogballe and Amatron systems, as well as acting on variable-rate instructions received from Fieldstar, Soyl Opti, Agrocom ACT, JD Greenstar, Raven and Hydro-N Sensor systems.

1.3 Control Software

Your *NT 8000i* instrument is pre-loaded with spreader control software only.

With the purchase of a "secondary software module" - an electronic chip loaded into the back of the instrument, the Pro-Series can be instantly switched to perform another function e.g. from a Spreader Controller to a Data Logger for route navigation and soil mapping tasks. This is done from "Instrument Select" in the "USER OPTIONS" menu.

There are software modules for yield monitoring/mapping, route/soil mapping, variable-rate spreader control, variable-rate belt spreader control, variable-rate disc spreader control, and variable-rate seed drilling.

For information on connecting and configuring DIGI-STAR PF *hardware* e.g. the Secondary Software Module, GPS Receiver, cables etc, and data transfer to your PC, please refer to the "Data Logging and Transfer" manual.

1.4 Control System

Closed loop control

The NT 8000i is a single channel controller, operating a control system comprising of a sensor to monitor the floor speed and a control valve to regulate the motor speed to the floor to enable closed loop control.

Proportional control

Also, forward speed measurement and cut out (in work or out of work) sensing enables full *proportional* control, i.e. to maintain a set application rate irrespective of forward speed (within limits).

The forward speed sensor may be fitted either to the tractor/self-propelled spreader or a trailed spreader. It may be either a simple magnetic sensor measuring wheel or prop shaft rotation, or a radar sensor. Speed measurement via a GPS VTG message is also an option.

The cut out status is detected via a switch in the cab or by a hydraulic switch on the spreader.

Figure 2   *The NT 8000i' control system*
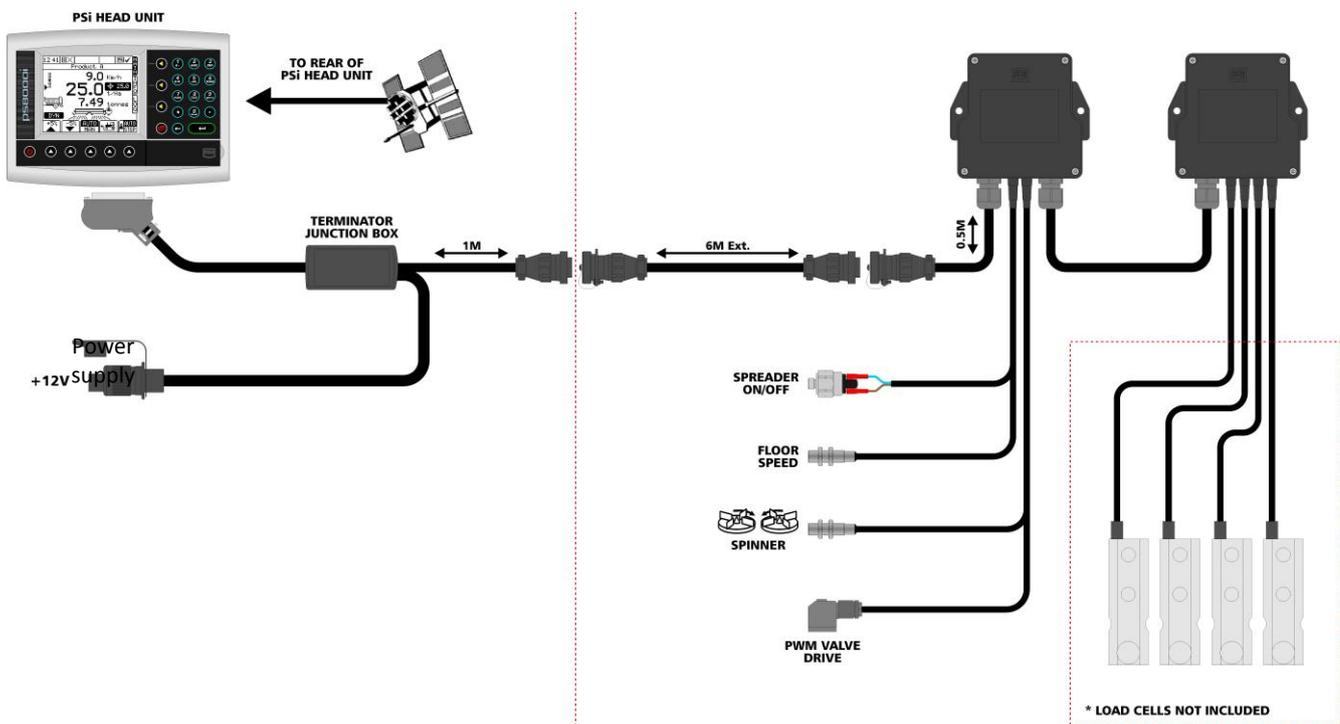
System configuration

The *NT 8000i* can be configured to accurately control any spreader, via a range of settings made in the calibration menu on initial installation. These settings are normally made by a technician, and should not need to be adjusted during normal operation. They are described in the separate Calibration manual supplied.

During normal operation, the operator needs only to set/calibrate the system for the product being applied.   The operator can also 'fine-tune' the product calibration to account for variations in field conditions. These calibration procedures are described in this manual.

1.5   Spreader Control Modes

1.5.1   Automatic Control Mode

This gives fully automatic rate control. Floor Speed is automatically regulated as forward speed varies, to ensure that the actual application rate constantly matches a preset target rate. The application rate can be manually nudged up and down from the target rate as required for spot application in specific areas. Programmable alarms warn of high and low flow rates.

Field data ("job summaries") can be logged and are stored in the instrument memory. Up to 75 summaries can be stored. If you have a GPS receiver connected, as well as creating a job summary, you can also log the vehicle route and application data to a "dynamic log" file on the SD memory card. The job summary data is also appended to this file, which can be viewed using PC-based Precision Farming software programs.

1.5.2   Manual Control Mode

This gives simple manual control of application rate, the floor speed can be manually controlled using an up or down arrow button. Field data ("job summaries") can be logged and are stored in the instrument memory. Up to 75 summaries can be stored.

1.5.3   VRT (Variable-rate treatment) Control Mode

This enables the system to be controlled via treatment instructions prepared using PC-based Precision Farming software programs, in conjunction with GPS position data. To enable fully automatic variable-rate treatment for Precision Farming applications, the *NT 8000i* requires a suitable GPS receiver and suitably formatted SD memory, card to implement treatment plans generated using PC-based Precision Farming software programs.

A work record file is automatically created on the SD card to log data confirming the actual treatment. The job summary data is also appended to this file, which can be viewed using PC-based Precision Farming software programs. Please refer to the "Data Logging and Transfer" manual Pt No. S/DC/500-10-573 for details of GPS installation, setup and data transfer with the PC.

1.6   The Head Unit Keypad

1.6.1   Menu keys

All instrument functions are accessed via the menu keys adjacent to the LCD display.

The four menu keys to the right of the screen (figure 3) access the primary screen pages (those viewed during normal operation). There are two primary screens, MAIN and INFO for normal operating functions, and a SETUP screen for calibration functions.

The five sub-menu keys below the screen control the various display functions and settings for each of the primary screen pages. Text or icons are displayed adjacent to the sub-menu keys to denote their function.

Figure 3

- Select "INFO" screen
- Select "MAIN" screen
- Alpha-numeric keypad
- Select "LOG" screen
- "ENTER" key
- "Power On/Off" key
- SD card slot behind flap
- "Setup" key
  Access the SETUP menu
- 'Backspace' key
- 'Sub-menu' keys
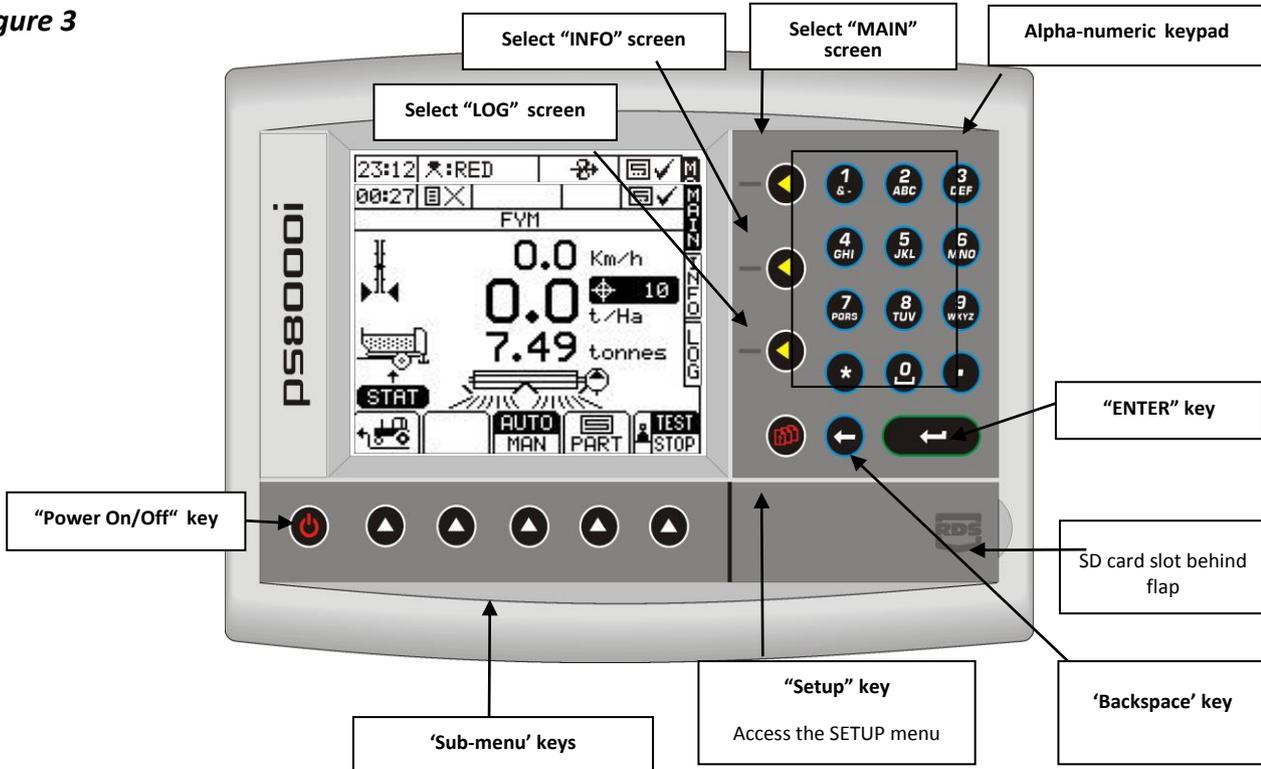
1.6.2 Startup

Press the ⓪ key. The startup screen, which shows the software version, will display for about 8 seconds then the MAIN screen is displayed.

1.6.3 Data Entry

Alpha-numeric values are entered via the right-hand keypad. You must press the key from 2 to 5 times to select the required letter. (Some keys have additional special characters not shown on the key legend).

The ✳ key will either toggle between lower and upper case characters, or when preceding a numerical entry, sets a MINUS value.
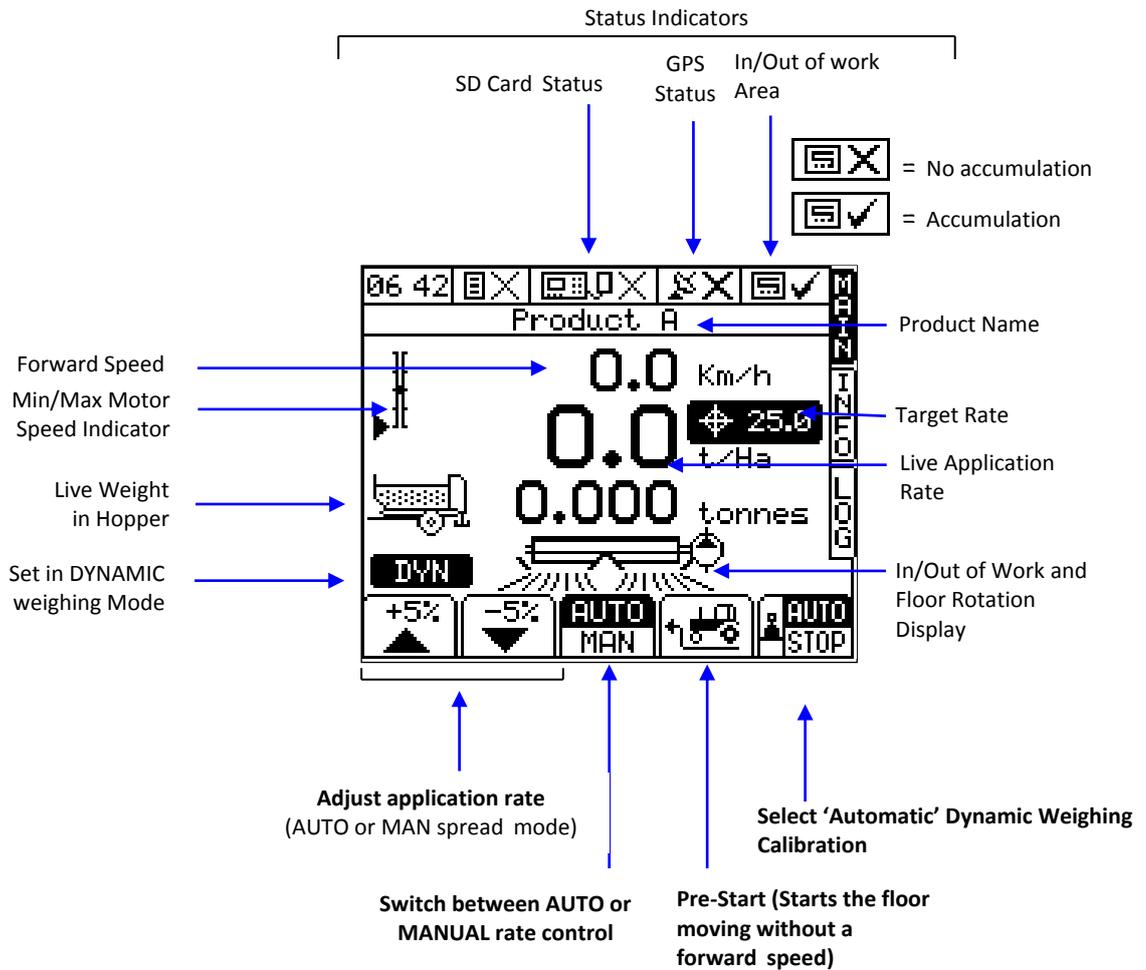
The ⓪ key will toggle between 0 and a SPACE.

The ⬅ key will BACKSPACE the screen cursor if you need to re-enter a character.

The ⏎ key is the ENTER key and is normally pressed to confirm the data entry into memory.

1.7   The MAIN screen page

The instrument will always default to the MAIN screen on startup. The MAIN screen displays the following information.

Figure 4

Status Indicators

SD Card Status   GPS Status   In/Out of work Area

= No accumulation

= Accumulation

Product Name

Forward Speed

Min/Max Motor Speed Indicator

Live Weight in Hopper

Set in DYNAMIC weighing Mode

Target Rate

Live Application Rate

In/Out of Work and Floor Rotation Display

Adjust application rate (AUTO or MAN spread mode)

Select 'Automatic' Dynamic Weighing Calibration

Switch between AUTO or MANUAL rate control

Pre-Start (Starts the floor moving without a forward speed)

1.7.1   Target Rate Indicator

The target rate is displayed by the   graphic in 'AUTO' spread mode. If the application rate has been adjusted above or below the target rate, then the target rate will be flashing.

There is no target rate icon in 'MAN' spread mode.

1.7.2   Min/Max Motor Speed Indicator

The Spread performance Indicator shows the motor speed within the minimum and maximum parameters set for the motor speed range. The "Target Speed" is at the middle of the speed range.
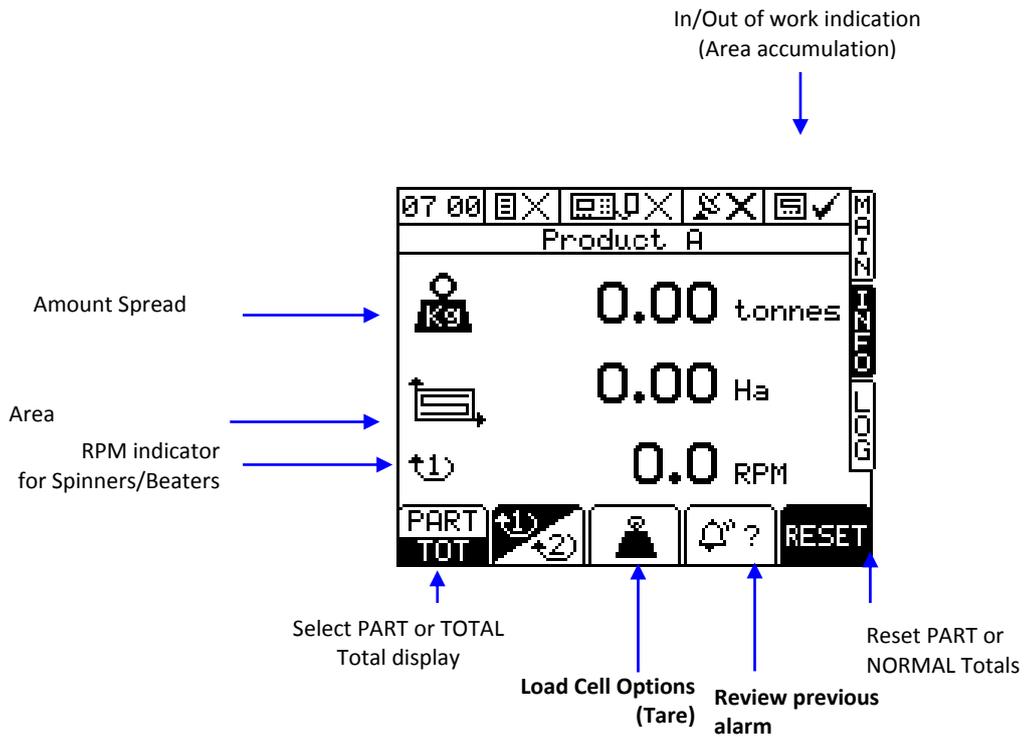

Too slow

At "Target" speed (for optimum spread performance)

Too fast
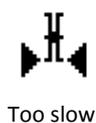
If the target motor speed is output of this range then the system will alarm that the forward speed is either too high or too low.

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1.8 The INFO screen page

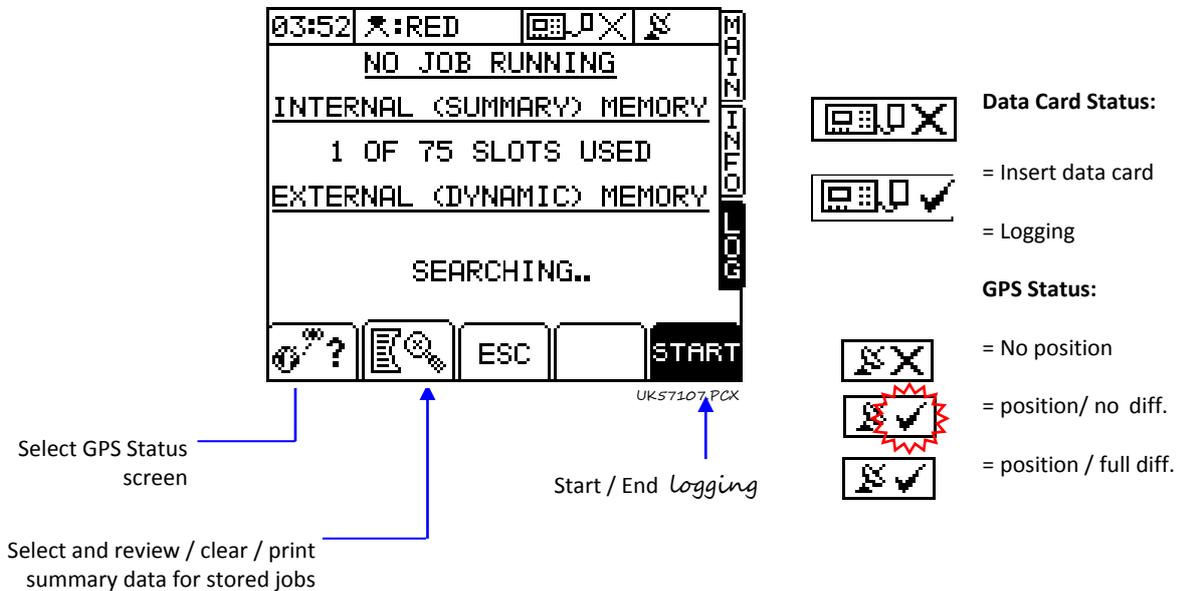Additional work measurement functions are displayed on this page.

Figure 6 *The INFO screen*

In/Out of work indication
(Area accumulation)

Amount Spread

Area

RPM indicator
for Spinners/Beaters

Select PART or TOTAL
Total display

**Load Cell Options
(Tare)**

**Review previous
alarm**

Reset PART or
NORMAL Totals

1.9 The LOG screen page

This page controls data logging (Field Summary data), and P.F. functions, and data transfer (e.g. printing a job summary).
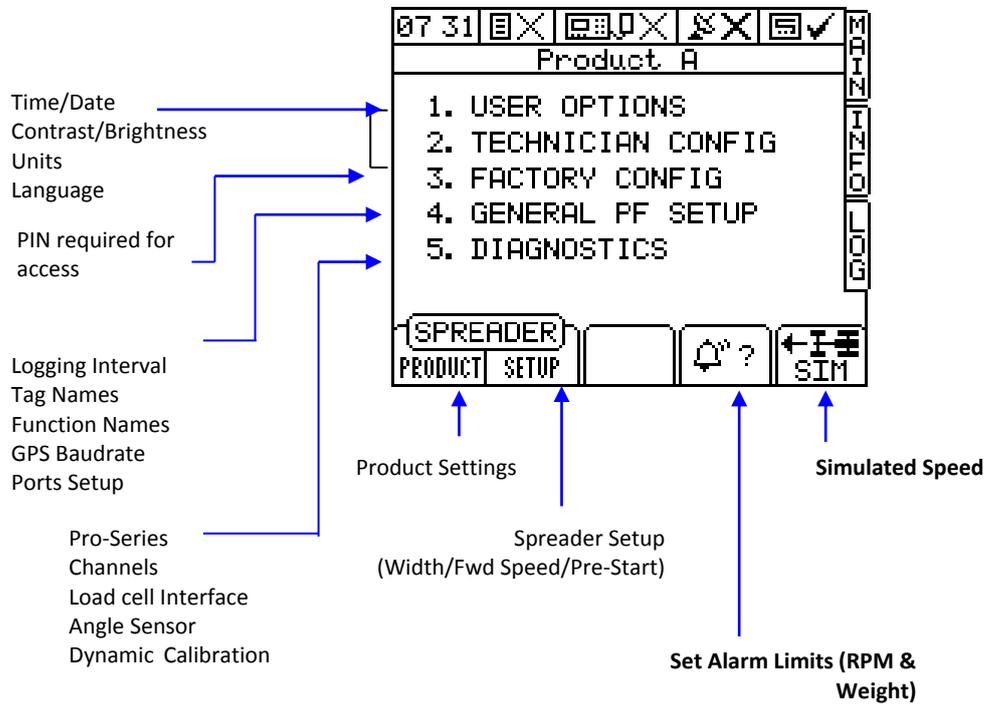
Figure 7 *The LOG screen*

UK57107.PCX

Data Card Status:

= Insert data card

= Logging

GPS Status:

= No position

= position/ no diff.

= position / full diff.

Select GPS Status
screen

Select and review / clear / print
summary data for stored jobs

Start / End *logging*

Please refer to the "Data Logging and Transfer" manual for further information.

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1.10 The SETUP screen page

The ⬡ key selects the SETUP menu for calibration factors and calibration settings specific to particular products being spread and nozzle types fitted.

Figure 8 The SETUP screen

Time/Date
Contrast/Brightness
Units
Language

PIN required for access

Logging Interval
Tag Names
Function Names
GPS Baudrate
Ports Setup

Pro-Series
Channels
Load cell Interface
Angle Sensor
Dynamic Calibration

Product Settings

Spreader Setup
(Width/Fwd Speed/Pre-Start)

Set Alarm Limits (RPM & Weight)

Simulated Speed

You should not need to enter menus 1, 2 and 3 in normal use. These settings are generally made only on initial installation. Menus 2 and 3 can be protected with a personalized PIN number to prevent unauthorized access. Calibration settings that need to be changed during normal use are shown on figure 8.

1.11 Units

Information can be displayed in Metric or Imperial units by selecting the desired option via the SETUP menu.

Function	Units	
	Metric	UK Imperial
Forward Speed	km/hr	miles/h
Application rate	kg/ha	lbs/acre
	tons/ha	tons/acre
	m^3/ha	kgals/acre
Part/Total Area	hectares	Acres
Tank volume/ Part/Total volume applied	Tons	lbs

2. Operation

2.1 Product presets

You can select any one of up to eight different product presets via the 'PRODUCT SELECTION' screen. For each preset, you can program the product name and individual settings, or perform/adjust the volume calibration as follows,
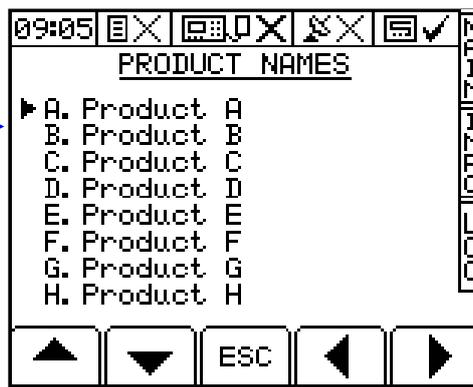
2.1.1 Selecting a product

1. Press the ⟳ key and then press the ⌷SPREADER PRODUCT⌷ key (fig. 8).

2. Select the product using the arrow keys (default names are 'Product A' to 'Product H') and press ⟵ to confirm.

Figure 14a   **Figure 14b**

3. Press the MAIN key to return to the "MAIN" screen page.

2.1.2 Editing a product name

The 8 default product descriptions are 'Product A' to 'Product H'.

From the 'PRODUCT SELECTION' screen, press the ⟵ key while on the product name to select the 'PRODUCT NAMES' screen (fig. 14b).

Select the product name using the arrow keys, and edit the name using the alpha-numeric keypad. Pressing the * key will switch between upper and lower case characters.

2.1.3 Programming a product 'T' factor

The T factor is the calibration factor that is altered while the spreader is dispensing product. It stands for the amount of product that is dispensed for one revolution of the rear floor roller. While spreading, this number will be automatically updated to suit the current product, the system will then automatically compensate in order to maintain the correct application rate and spread performance.

NOTE: In normal circumstances the T factor should be anywhere between 0.1 t/rev and 3.0 t/rev. As the system will automatically calculate this number based on the load cell readings it is usually not necessary to modify it.

2.1.4   Programming a 'T Store Point'

The T Store Point is a setting that stores a T factor when the spreader is at a sensible spreading floor speed. As the spreaders empties and less product comes out per roller revolution (smaller T factor), the floor will speed up and eventually reach maximum. Once the spreader is then refilled, it would still have remembered this small T factor and as such a high belt speed.

This setting therefore resets the T factor, once the spreader has been filled up to the same T factor that the system was at when at the 'T Store Point'. Therefore, once spreading is resumed with the new load then the floor speed will continue at a sensible spreading speed as opposed to a very fast speed. Normal Dynamic Calibration control would then take over and calculated the new correct figure.

This T Store Point therefore should be programmed to be anywhere between 30-70% of the maximum weight of a single load of the current product.

2.1.5   Programming a 'Fast Empty Point'

The 'Fast Empty Point' is the weight at which below this, there are very few limits on how quickly the floor is allowed to increase in speed. Under normal operating conditions, there is a 'Correction Span Limit' which prevents the floor from increasing or decreasing in calibration/floor speed too quickly in case of an erroneous calibration calculation.

When the spreader is close to being empty however, the floor is required to speed up much more rapidly to ensure that all product is dispensed, as such, under this point the floor can increase in speed by a larger number.

This Fast Empty Point therefore should be programmed to be anywhere between 10-30% of the maximum weight of a single load of the current product.

NOTE: These settings are stored individually for each product, as such, Product A can have a different profile to Product B. A dense or heavy product may have the T Store Point at 8t and the Fast Empty Point at 3t where as a light product may have the T Store Point at 4t and the Fast Empty Point at 1t

2.2   Automatic Rate Control

 Select 'AUTO' from the 'MAIN' screen. The flow rate will be automatically adjusted as forward speed and/or applied width varies, to ensure that the application rate constantly matches the preset target rate.

2.2.1   Setting the Target Rate

From the "MAIN" screen simply key-in the desired target rate and press   .

2.2.2   Overriding the Target Rate

1.   Press to override the target rate.

The preset target rate can be overridden in ±5% steps while spreading, e.g. boundaries or other crop conditions.

While overridden, the target rate indicator will flash.

2.   Press to return to the target rate.

The instrument will automatically alarm if the application rate cannot be maintained within a specified % of the target rate (the % band is programmed via the 'Alarm Setup' screen in the Setup MENU).

When the alarm threshold is reached, the instrument beeps, and an alarm screen displays the message "**UNDER APPLICATION**" (e.g if the forward speed is too high), or "**OVER APPLICATION**" (e.g. if the forward speed is too low).

Pressing any of the lower 'OK' keys will cancel the alarm screen and return to the 'MAIN' operating screen.

NOTE: *If you continue spreading at the same speed, the instrument will not automatically re-alarm. It will however, re-alarm if the spreader is switched off and back on again.*

2.3   Manual Rate Control

You do not normally need to select this mode, however in the event you experience a problem with automatic control (if for example the forward speed sensor had stopped working), you can still control the application rate manually.

Select 'MAN' from the 'MAIN' screen. To maintain the required application rate, you must maintain a constant forward speed. You can also log and store field data ("job summaries") as you go, and print them out or download them to a PC or printer when convenient.

Press [▲] [▼]   to adjust the application rate.

NOTE: *The speed range indicator functions as normal, however there is no forward speed or rate alarm in manual mode.*
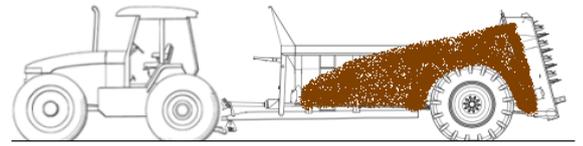
2.4   Pre-Start

The Pre-Start function is used to start the floor moving when there is no forward speed. The benefits of this are to ensure that there is good coverage at the start of each bout and to ensure that irrespective of how the product has been loaded, the spreader does not have to start moving until a suitable amount of product has reached the beaters.
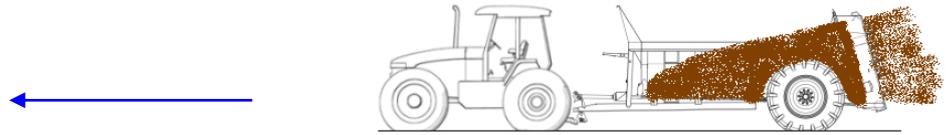
1. From the MAIN screen, press the inner-right selection key and the floor will start to move. If set to AUTO then the system can simply be placed in to work an Automatic Pre-Start will begin.
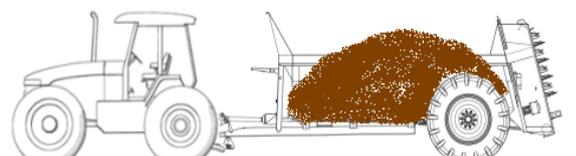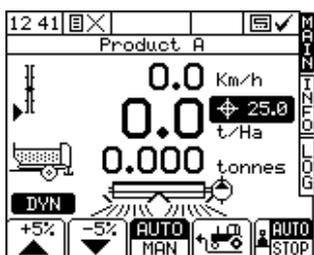
Engage Hydraulics and/or press Pre-Start key

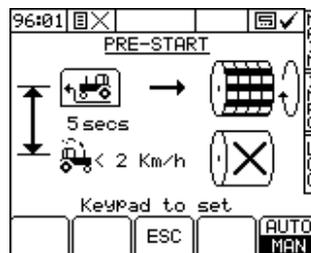**Product automatically moves toward beaters**

Once spread pattern is observed, start to drive forward

2. To set the system to automatically run the Pre-Start when the system is switched in to work from a stationary start -

    Press the ⊚ key and then press the (SPREADER SETUP) key.

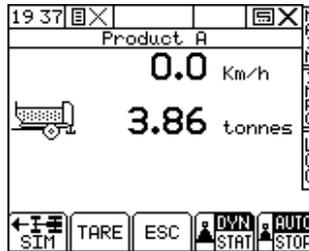   Select 3. Pre-Start from the menu and confirm using the ⟵ key.

Using the number keypad, the Pre-Start time can be set. This is the duration that the Pre-Start will run for before stopping the floor if there is no forward speed movement. This should be long enough to ensure that product is being spread but also so that there is a smooth transition between pre-start and starting to move forward. An average pre-start time would be around 8-10 seconds.

By using the AUTO/MAN button at the bottom of the screen, this can be set to automatically trigger based on the cut out status. This prevents having to push the button at the start of each load.

2.5   Tare Load Cells

As product and debris builds up on the spreader, it is important to tare or remove this debris to ensure that what is loaded in the spreader hopper each time is an accurate reading. This can be achieved by entering the

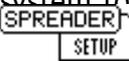INFO page and selecting the Weighing icon [⚖] in the center of the page.

```
19 37 ▣✕          ▣✕ M
      Product A       A
         0.0 Km/h     I
    ╚═╝  3.86 tonnes  N
                      T
                      I
                      N
                      F
                      O

                      L
                      O
                      G
 ←I≢  TARE  ESC  DYN  AUTO
 SIM             STAT STOP
```

Using the [TARE] key, this will set the live hopper weight back to 0kg. It is important however not to do this while there is still product in the main body of the spreader, only for discounting product that is stuck to the chassis or the mud flaps.

2.6   DYN or STAT Calibration Mode

There are two methods of calibrating the system, dynamically (always calibrating) and statically (calibrates once at the start of each load). Due to the variation in Product Density on the spreading system, it is advisable to always leave the system in DYN mode.
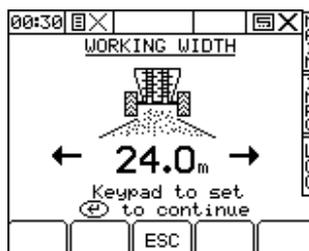
Ensure that on the Load Cell Tare page as shown in 2.5 that both DYN and AUTO [DYN STAT][AUTO STOP] are selected.
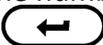
2.7   Working Width

To set the working width of the system to ensure that the application rate and the accumulated area is correct -

Press the (⊞) key and then press the [SPREADER SETUP] key.

Select 1. Working Width from the menu and confirm using the (↵) key.

```
00:30 ▣✕          ▣✕ M
      WORKING WIDTH   A
                      I
       ╫╫╫            N
                      T
                      I
     ← 24.0m →        N
                      F
     Keypad to set    O
     ↵ to continue    L
                      O
              ESC     G
```

Using the number keypad, the width can be programmed and then confirmed using the (↵) key.

2.8   Part / Total Accumulation and RPM display

You can record the area and volume spread for a particular job using the "PART" Total function. In addition the area and volume will be recorded to the "TOTAL" memory register.

Select the "**INFO**" screen to display the accumulated totals and the RPM display.

PART TOT   Select '**PART**' to display the Part Area and Part Volume accumulation,

PART TOT   Select "**TOTAL**" to display the Total Area and Total Volume accumulation.

2.8.1   Reset Totals

Select the "**PART**" or "**TOTAL**" display.

Press the **RESET** key.

Press ⏎ to zero the totals or press **ESC** to return to the "INFO" screen.

2.9   Alarms

There are a number of alarms, most being programmable by the operator.   Note that setting alarm limits to zero will disable that alarm function.

Press any of the lower 'OK' keys to cancel an alarm and return to the MAIN screen.

Application Rate	'UNDER APPLICATION' 'OVER APPLICATION'	This alarm is based on % variance from the target rate. It therefore alerts the operator to speed up or slow down until the alarm condition is cancelled. The limits can be set by the operator on the '**Alarms Setup**' screen in the SETUP menu. The default limits are ±20% of the target rate.
The following alarms can also be configured if so desired, but would normally be overridden by the application rate alarm if set (except for RPM alarm). The limits must be set in respect of flow sensor capacity / spread performance.		
Forward Speed	'FORWARD SPEED LOW' 'FORWARD SPEED HIGH'	The limits can be set by the operator on the '**Alarms Setup**' screen in the SETUP menu.
RPM	'RPM LOW' 'RPM HIGH'	The limits can be set by the operator on the '**RPM Setup**' screen in the SETUP menu.

2.9.1 Setting the Alarm thresholds

1. Press ⟨image⟩ to select the "SETUP" menu.

2. Select the "ALARMS SETUP" button at the base of the screen ⟨image⟩.
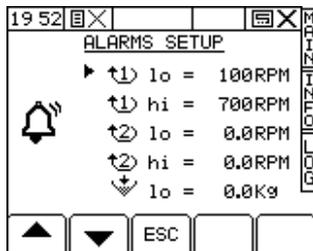
2. Select the appropriate alarm threshold using the arrow keys, and enter the value via the numeric keypad.

Service and Technical Support

PLEASE CONTACT YOUR NEAREST DIGI-STAR DISTRIBUTOR If unknown then contact DIGI-STAR for further information,

Toll Free: 800-225-7695 *(For Use in the U.S.A. only)*
Phone: +1-920-563-1400
Fax: +1-920-563-9721
Email: sales@digi-star.com
web :   www.Digi-Star.com
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