Pro-Series PF Instruments
GPS, Data Logging and Transfer

RDS Part No.:	S/DC/500-10-384
Document Issue:	2 : 10/8/04

Electromagnetic Compatibility (EMC)

CE

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

IMPORTANT: PLEASE READ THE FOLLOWING BEFORE USING THE CONTROL SYSTEM

The Apollo 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 Apollo instrument. Calibration and operation of the Apollo must be in accordance with these instructions. Use of the System is subject to the following disclaimer;

1. So far as is legally permissible RDS Technology ("RDS"), 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 whatsover (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 RDS (except clause 7), a copy of which is available on request, apply to the supply and operation of this System.

Service and Technical Support

PLEASE CONTACT YOUR NEAREST RDS DISTRIBUTOR If unknown then contact RDS Technology Ltd for further information,

Tel : +44 (0) 1453 733300
Fax : +44 (0) 1453 733311
e-mail : info@rdstec.com
web : www.rdstec.com

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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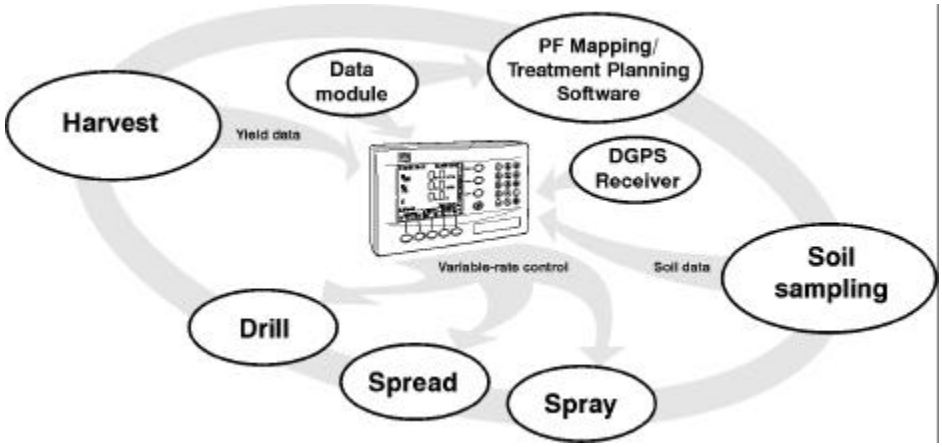
Acknowledgements:

SLXMon™ software courtesy of Satloc - a division of CSI Wireless Inc. <www.satloc.com>

Ashtech Evaluate™ software courtesy of Thales Navigation Inc. <www.thalesnavigation.com>

1. Introduction

1.1 Overview



The RDS Precision Farming System offers unrivalled flexibility for enabling mapping and variable rate treatment with a wide range of combines, sprayers, spreaders and seed drills. The heart of the system is the PS8000 controller which can either directly control a retrofitted RDS system, or can interface with a range of OEM control systems. (see section 6 for compatibility). In addition to the standard PS8000 head unit, some or all of the following component are required to enable Precision farming:

(i) Pro-Series Software Program

The PS8000 head unit is supplied with core software for the primary application, for example as a sprayer controller. By plugging in a secondary software module, the head unit can then be switched between applications, e.g yield monitoring/mapping (*RDS Ceres*), route/soil mapping, variable-rate sprayer control or variable-rate belt spreader control (*RDS Apollo*), or variable-rate seed drilling (*RDS Artemis*).

(ii) Installation kits

A number of standard kits containing all the hardware - sensors/actuators, electrical wiring and connectors, adapt the specified machine or implement for Precision Farming. Also includes the necessary **Data Leads.**

(iii) DPGS receiver

RDS supply either the *GBX MAX* receiver compatible for either satellite or coastal base station differential reception, or the *Jupiter 5* (satellite differential reception only). Both are 12-channel receivers, enabling sub-metre accuracy (under ideal conditions). Both receiver types are factory-configured for EGNOS reception.

Any receiver is suitable if it can output an NMEA 0183 : RTCM SC-104, GGA data message at 4800 baud, via an RS232-C port.

(iv) Data Module +16MB PCMCIA Memory Card

Required to upload and download PF data. The module accepts an industry standard pre-formatted PCMCIA Flash memory card The module is supplied as standard with one 16MB card. Additional cards are available from RDS.

(v) External PCMCIA Memory Card Reader (optional)

You need one of these for transferring data to a desktop PC if it does not have a PCMCIA slot as standard, unlike laptop computers. An external card reader is available from RDS.

(vi) Yield Mapping / Treatment plan software

Suitable third-party software for the PC for creating yield maps and preparing treatment plans for variable rate application.

1.2 Head Unit - communication ports

Here is what you need to check concerning connection to and configuration of the RS232 serial ports on the head unit. For more detailed information on individual hardware options, please refer to the appropriate sub-section of the manual.

(i) For a Precision Farming application, the software in the head unit must have the PF (Precision Farming) driver version 2.034 or higher.

The driver version appears at the bottom of the opening screen when the unit is switched on. The PF driver is integral to the Apollo core software and enables all the data logging and variable rate treatment functions in the PS Apollo. Except for the Ceres 8000 core software, these functions are common between the various software modules currently available, e.g.

PS515-xxx - PS Apollo Sprayer Controller
PS516-xxx - PS Apollo Belt Spreader Controller
PS517-xxx - PS Apollo Mapping Module

(ii) The external hardware must be connected to the appropriate RS232 serial port as follows:-

Top Port options

- Printer (RDS ICP 100/ICP 200 or other compatible printer)
- PCMCIA Data Card Module
- PC Download Cable
- System ERIS cable - receiving VRT instructions from OEM controller
  e.g. Fieldstar Type 1
  Soyl Opti
  Agrocom ACT
  Hydro-N Sensor

Bottom Port options

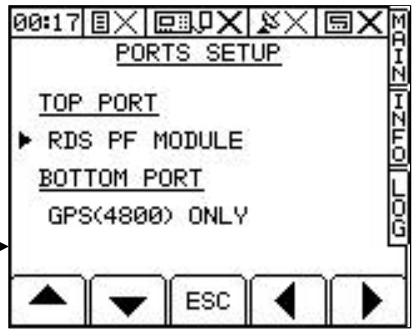
- *System ERIS cable** - sending VRT instructions to OEM controller. *Also connects DGPS.
  e.g. Vicon
  Bogballe
  Amatron
  Fieldstar Type 1
  LH5000 v4
  RAVEN
- *or: DGPS-only Cable* - S/CB/268-1-045
  e.g. CSI GBX Max
  RDS Jupiter 5
  Other compatible receiver

(iii) The RS232 ports must be configured in the software to suit the connected hardware as follows:-

Press  to select SETUP, then,

5. GENERAL PF SETUP

6. PORTS SETUP



The Ports Setup screen can also be accessed via the Technician Config menu (PIN=1234). Use the arrow keys to select the correct option and press ENTER to confirm.

2. DGPS Receiver Setup

Connect the DGPS MAX (see 2.4) or Jupiter 5 receiver (see 2.5) to the bottom RS232 port using the Pro-Jupiter lead S/CB/268-1-045.

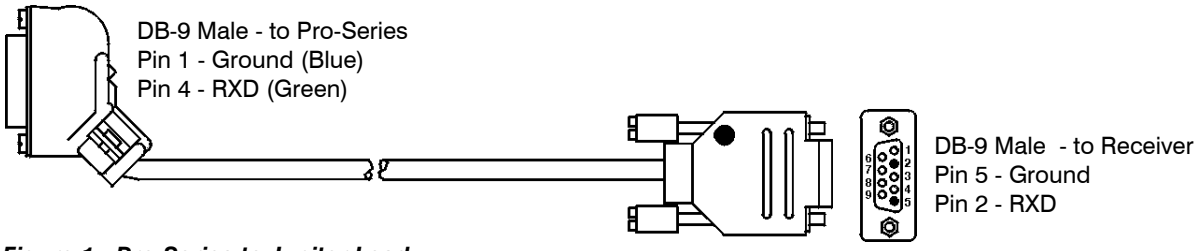


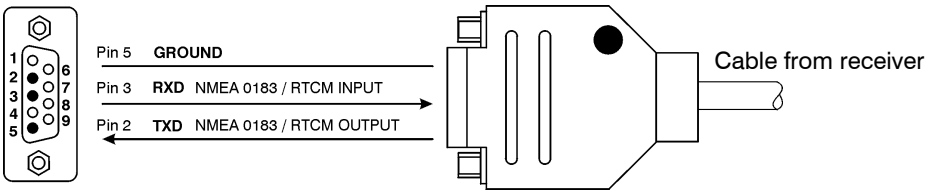
Figure 1: Pro-Series to Jupiter Lead

NOTE: If sending VRT instructions to a third-party controller (System ERIS), the bottom port shares DGPS data in and VRT data out via a custom lead. Refer to section 6 for further information on System ERIS applications.

2.1 Receiver requirement

Any other compatible receiver may also be used. It must be configurable to the following specification:-

Connection:- RS232-C interface (DB-9 **Female** Connector) with the following pin outs.



NOTE: The pin 3 function (NMEA/RTCM input to receiver) is not utilised with the Pro-Series.

Data Protocol:-	Data format	NMEA 0183 / RTCM-104, GGA, VTG and ZDA messages
	Baud rate	4800 /9600
	Data output rate	1Hz / 5Hz
	Data Bits	8
	Stop Bits	1
	Parity	None
	Flow Control	Off

2.2 NMEA 0183 Data Messages

GPS data is 'packaged' into a number of standard message sentences each with a data subset suited for specific communication requirements. The most common message sentences are listed below.

Message sentence	**Max. Rate**	**Contents**
GPGGA	5 Hz	GPS Fix Data
GPGLL	5 Hz	Geographic Position - Latitude / Longitude
GPGSA	1 Hz	GPS DOP (Dilution of Precision) and Active Satellites
GPGSV	1 Hz	GPS Satellites in view
GPRMC	5 Hz	Recommended Minimum Specific GPS Data
GPVTG	5 Hz	Track Made Good and Ground Speed
GPZDA	5 Hz	Time and Date

2.2.1 Message Rate settings

Although the Pro-Series only requires a 1Hz input, it will continue to operate satisfactorily with a 5Hz input. No configuration is required.

For certain applications e.g when using the Marker™ guidance system, the higher rate is essential to get good guidance performance, and therefore it is recommended to always configure the GPS receiver for 5Hz output.

2.2.2 Baud rate settings

By default, the GPS receiver and the Pro-Series are factory-configured to 4800 baud rate. However, you can re-configure the Pro-Series for 9600 baud rate for the GPS receiver input, in which case the receiver must also be configured to 9600 baud (section 2.6).

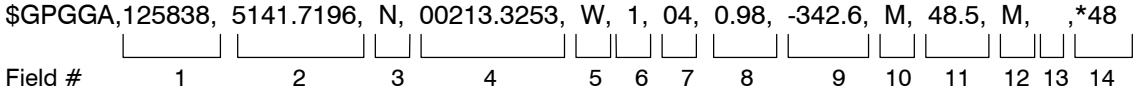
NOTE: Set the GPS receiver to 9600 baud for Marker™ operation.

2.2.3 GGA Message Sentence

The GGA message sentence is normally the only message sentence required by the Pro-Series, except for the Ceres 8000 or Mapping Module software, where you have the option to configure the instrument to calculate forward speed from the VTG message sentence.

Marker™also utilises the VTG message sentence for forward speed measurement.

Broken down into its components, ('fields' divided by commas or 'comma delimited'), a typical GGA message takes the following form:-



The meaning of each field is as follows:-

Field #	Syntax	Description
1	hhmmss.ss	UTC time (=GMT) in hours, minutes, seconds of the GPS position
2	ddmm.mmmmm	Latitude in degrees, minutes, decimal minutes
3	s	s = N or s = S for North or South latitude
4	ddmm.mmmmm	Longitude in degrees, minutes, decimal minutes
5	s	s = E or s = W for East or West longitude
6	n	GPS quality indicator, 0 = no position 1 = undifferentially corrected position 2 = differentially corrected position 9 = position computed using almanac
7	qq	number of satellites received
8	pp.p	Horizontal Dilution Of Precision (HDOP)* = 0.0 to 9.9
9,10	saaaa.aa,M	Antenna altitude and units, M = metres
11,12	±xxxx.xx	Geodial Separation*, M = metres
13	sss	Age of Differential correction in seconds
14	aaa	Differential Reference Station ID

* Resulting from the geometry of visible satellites i.e. their relative position over the arc of sky.

** The difference between Mean Sea Level (MSL) and the WGS-84 geo-datum (the Earth Ellipsoid).

2.3 General Installation Guidelines

The following sections give an overview which should in most cases, be sufficient to successfully install the DGPS receiver. These instructions are extracted from the CSI User manual supplied with the receiver kit. Please refer to section 2 of the CSI User manual for further information.

- *Mount the antenna in the location for which you desire a position* e.g. along the centre line of the vehicle and as close as possible over the working interface.

NOTE: As this may well be impractical to achieve, the Pro-Series can be programmed via the PF SETUP menu with GPS ANTENNA OFFSETS to compensate for the difference in position of the antenna from the cutter bar, spray boom etc (see section 4.4).

- *Mount the antenna to give an unobstructed hemisphere of sky.* This will ensure that GPS satellites are not masked by parts of the vehicle, potentially reducing system performance.
- *Wherever possible, avoid drilling holes in the roof* to avoid both water ingress and possibly wiring / air conditioning equipment etc. If drilling is unavoidable, use silicone sealant around fixing and cable entry points.
- *Mount the antenna as far as possible from any equipment that can cause Electromagnetic Interference (EMI*) including DC motors (e.g. air conditioner), alternator, solenoids, CB radio, power cables, display units, or other electronics. Excessive EMI will degrade system performance.

TIP: To detect possibly troublesome interference, tune a LW band portable radio off-station. With the aerial laid flat you can then (hopefully) pick up the direction and source of the interference from the increase in noise. The antenna can then be repositioned or if necessary, the source of the interference suppressed. If need be, contact RDS for further advice on suppression methods.

- *Secure the antenna cable close to the antenna mounting* (using cable ties) so that in the event the antenna is knocked off it's magnetic mounting, it will be restrained and minimise the possibility of further damage.

2.4 DGPS MAX Installation

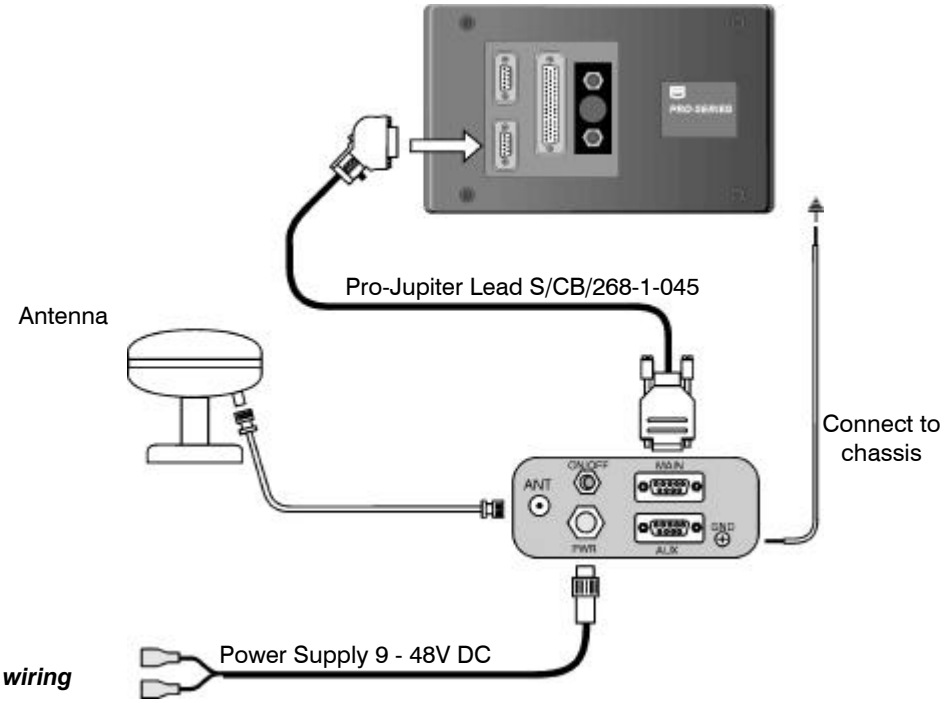
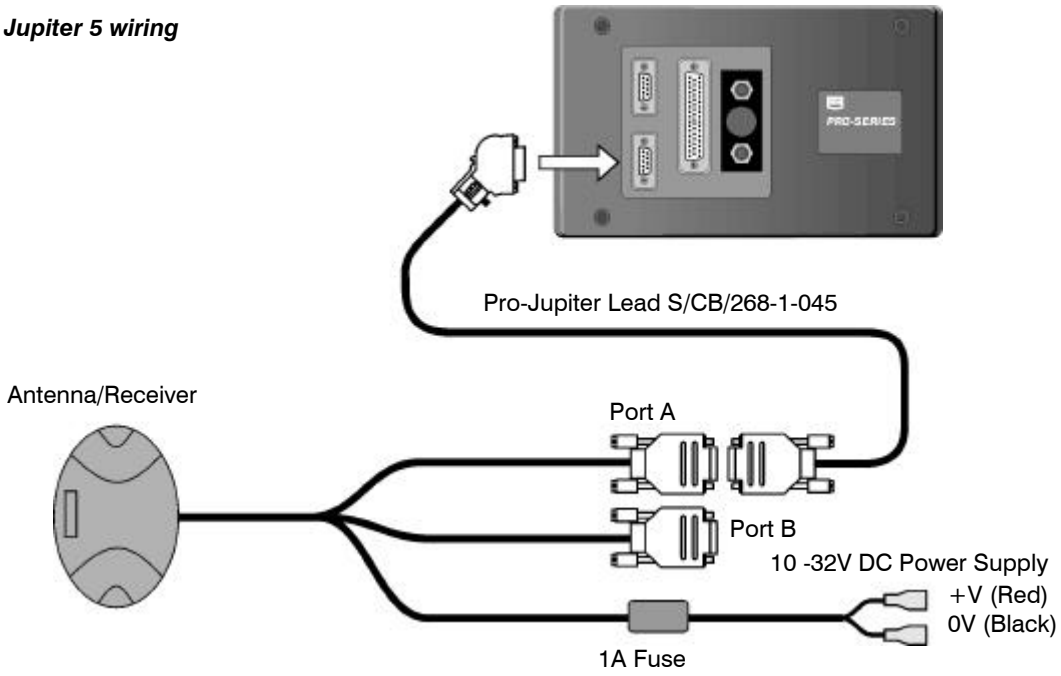


Figure 2: DGPS MAX wiring

The magnet mounting comes supplied with an optional self-adhesive mounting plate for attachment to plastic roofs. Run the antenna cable across the roof and down into the cab. The power lead has a 1.5A in-line fuse, which should be left accessible. For the best performance connect the GND terminal to the vehicle chassis. The receiver incorporates reverse polarity protection to prevent damage if the power leads are accidentally reversed.

2.5 Jupiter 5 Installation

Figure 3: Jupiter 5 wiring



NOTE: Either port A or B can be connected, however, port A must be used for a firmware update of the receiver (ref. section 2.6).

The Jupiter 5 may be mounted in 3 ways :-

- *Magnetic mounting base (pre-installed).* Suitable for any steel surface.
- *Surface-mounted using screws.* Remove the screw caps on the antenna. Drill 3/16" dia holes and fasten using the screws provided. Replace the screw caps. **Do not overtighten the screws!.**
- *Pole mounted. This option will minimise the possibility of radio electrical interference.* Thread the 5/8" - 11 UNC threaded mount onto a suitable threaded pole. **Hand tighten only!** Place the antenna (with magnetic mount) onto the threaded mount.

With each mounting method, ensure there is sufficient slack on the cable at the antenna end, so that minimal strain is applied to the cable entry point.

The power lead has a 1 Amp in-line fuse, which should be left accessible. Once the power lead is connected the receiver will be immediately powered. The receiver incorporates reverse-polarity protection to prevent damage if the power leads are accidentally reversed.

The receiver will proceed automatically through a startup sequence. Given satisfactory signal reception it should normally provide position within 1 minute. A full 3-D Diff position may take longer.

Please refer to section 4 of the CSI Seres User Manual if you require more in-depth information.

2.6 *Jupiter 5 / DGPS Max Configuration*

The following setup assumes that the differential source is EGNOS (the European Geostationary Overlay System). If you intend using beacon reception or the Omnistar service for differential correction, then please call RDS for further advice, as this manual does not cover these options.

Both receiver types are factory-configured for EGNOS reception, and the data protocol settings are as in section 2.1 to suit the Pro-Series.

Prior to configuration you should have installed on your PC the following files:-

TERMINAL.EXE	The programme used to send commands to configure the receiver.
SERESRDS.TRM	The file containing the custom settings required for an RDS installation.
SLXMON1.EXE	The programme used for real-time monitoring of the receiver output for diagnostic purposes.

If you don't already have these files then they can be emailed (or sent on CD-ROM) on request.

1. Connect the RS232 serial cable supplied with your receiver, from the MAIN port (DGPS Max) or the 9-way 'D' connector labelled "Port A" (Jupiter 5) to the COM port on your laptop/PC.
2. Start TERMINAL1.EXE. This provides a simple terminal window to configure the receiver.
3. Open file SERESRDS.TRM in the terminal window, (use File, then Open), to display some buttons which when pressed will upload commands into the receiver.

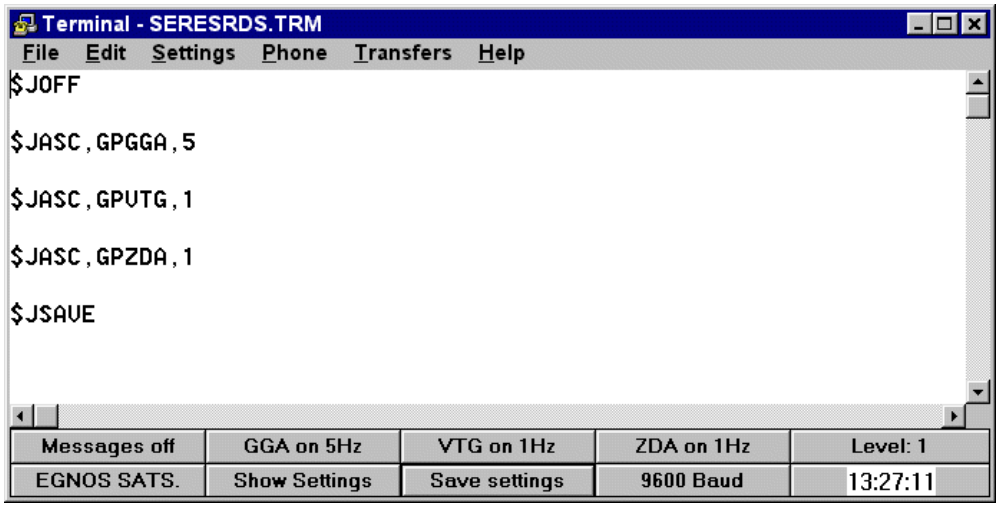


Figure4: Receiver configuration software

4. Click the following buttons in turn (as each button is pressed, the command is sent to the receiver and is displayed in the Terminal window):-

Messages off	Switches off the normal GPS message stream. Also deactivates binary data output (fig. 5) if you have previously run the 'SLXMon' diagnostic programme.
GGA on 5Hz	Configures the receiver to output a GGA message sentence...
VTG on 1Hz	...along with a VTG message sentence...
ZDA on 1Hz	...and a ZDA message sentence.
EGNOS SATS.	Configures the receiver to use EGNOS correction data (normally the factory-default setting).
9600 Baud	Sets 9600 baud rate for input to Marker™ (and for Pro-Series if a "GPS 9600" option is selected in the PORTS SETUP menu).
Save settings	Completes the configuration procedure.

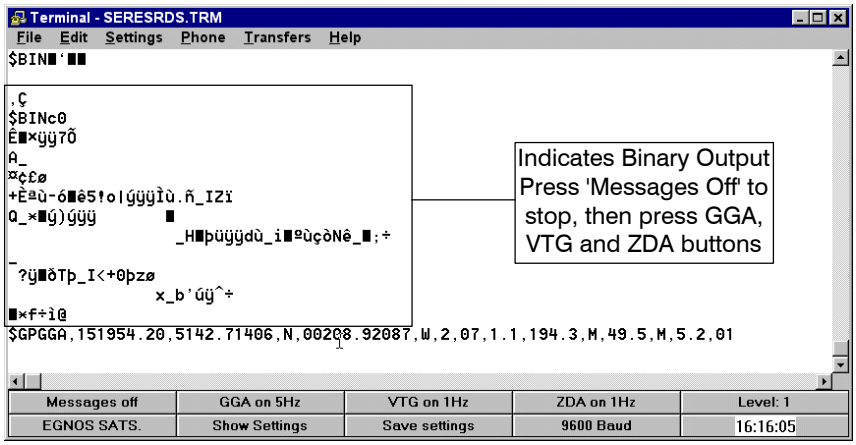


Figure 5: Deactivating Binary output

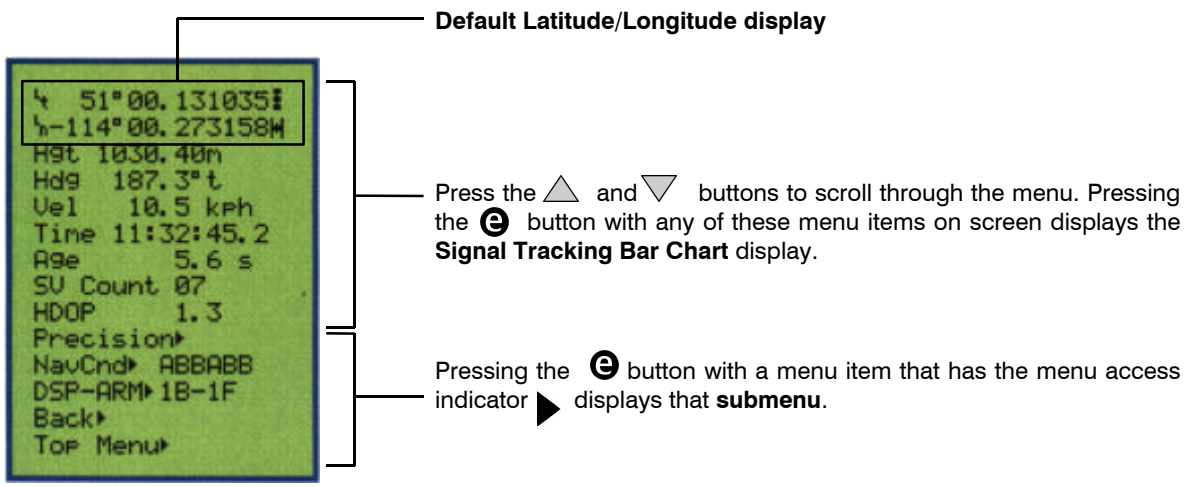
2.7 DGPS MAX Front Panel Display

The DGPS MAX is switched on and off using the On-Off switch located on the rear panel.

When you switch the receiver on, it will sequence through a startup screen followed by a prompt to use the Configuration Wizard. After 3 seconds the receiver will proceed to the top of the GPS Position Status menu (Latitude and Longitude display) unless the e button is pressed.

NOTE: If e is pressed the menu system will begin the Configuration Wizard.

Figure 6 : GPS Position Status display



Pressing the e button with a menu item displayed that does not have the menu access indicator ▶, switches to the Signal Tracking Bar Chart display.

The bar chart consists of two main parts, providing an indication of the GPS satellite signal quality per receiver channel 1 to 10, and the signal quality of the differential source (channel 11/12). For each bar, the higher the bar, the greater the signal quality.

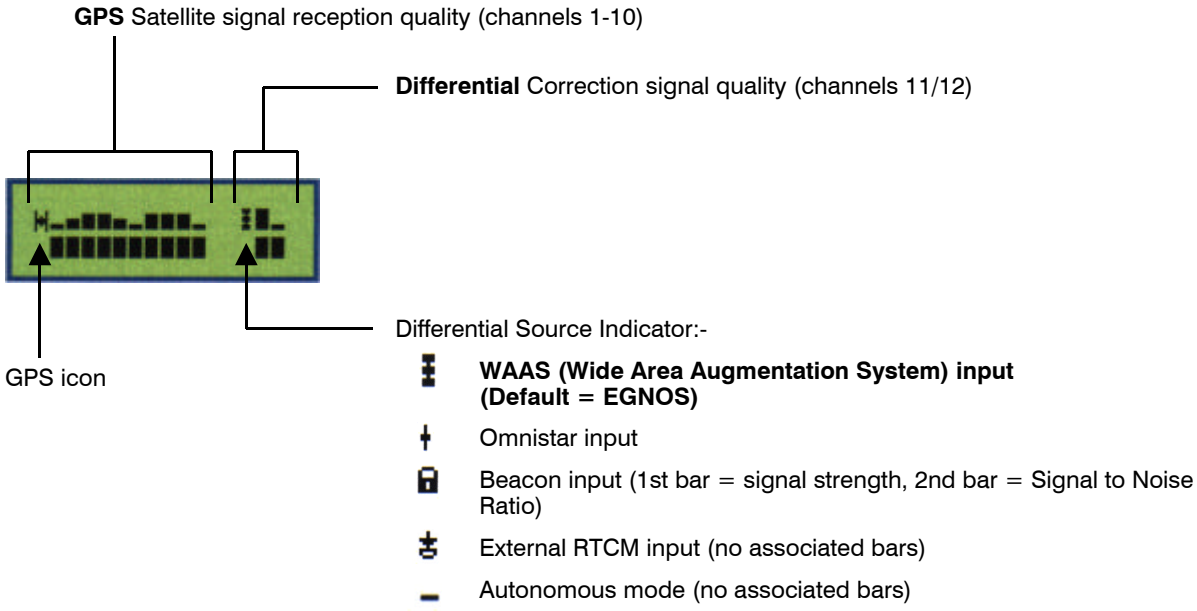


Figure 7: Signal Tracking Bar Chart display

Please refer to section 5 of the CSI User Manual if you require more in-depth information.

2.8 GPS Diagnostics

The following diagnostic tools are not specifically for the DGPS MAX and Jupiter receivers, and are useful for diagnosing the output from any GPS receiver.

2.8.1 '*SLXMon*' *software*

'SLXMon' is an in-depth diagnostic tool used to monitor receiver performance. SLXMon displays among other parameters, realtime satellite information and signal quality. It allows you to view diagnostic information from the receiver, send commands (although TERMINAL.EXE is recommended for this), view NMEA and RTCM messages, and also has other functions.

Connecting to SLXMon

1. Connect the RS232 serial cable supplied with your receiver, from the MAIN port (DGPS Max) or the 9-way 'D' connector labelled "Port A" (Jupiter 5) to the COM port on your laptop/PC, and power the receiver on.
2. Start SLXMon by double-clicking on the file SLXMON1.EXE and click '**File** > **Connect**'. Select 9600 baud rate and the COM port to which the receiver is connected and click '**OK**'.

   Now watch the status bar at the bottom of the SLXMon window. If you are properly connected, the '**Not Connected**' message is replaced with a '**Fix Status**' message, and the current COM port number and baud rate replaces the '**Not Open**' message.

NOTE: When you connect the receiver to SLXMon the software instructs the receiver to output *binary* data from the port connected. SLXMon uses this binary format to receive and display data. However, you must deactivate binary output before reconnecting the receiver on to your own equipment. This is best done from TERMINAL.EXE. (section 2.6).

Diagnostic Windows

Once communication is established, the channel data will then start to populate the window.

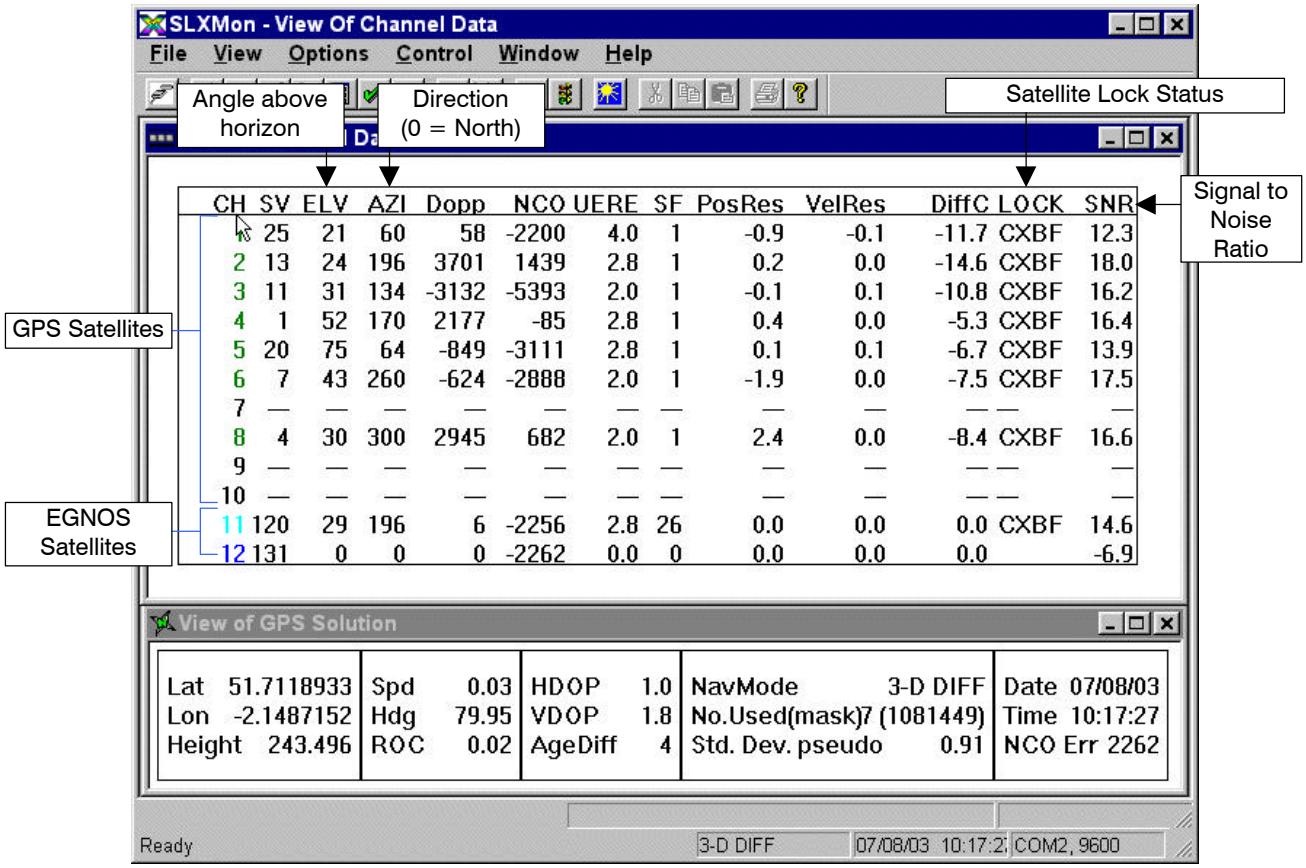


Figure 8 : 'SLXMon' Diagnostic software

The buttons along the top of the SLXMon window are used to open a number of different diagnostic windows.

The commonly useful ones are:-

'View GPS Solution'

Check these fields:

NavMode - This field reports the Fix Status and can show any of the following messages:

No Fix
2-D NO DIFF
3-D NO DIFF
2-D DIFF
3-D DIFF

If you see any of these fields except 'No Fix' then you are receiving GPS data. The receiver needs to find and use at least 4 satellites to receive a 3-D position. Ideally, you should see **3-D DIFF**, which means you have 3-D GPS and a differential solution fix.

No. Used(mask) - This field reports the number of GPS satellites being used by the receiver to acquire a position (ignore mask value). This number must be 4 or more to receive 3-D GPS. If the number is less than 4 you should check for obstructions near the antenna. Check your antenna and antenna cable if the number is 0. A good value would be in the range 5 - 12 satellites used.

NOTE: When your receiver is receiving GPS information from the satellites, the fields **Lat, Lon**, **Date** and **Time** will all report current information. If these fields remain at 0, then you likely have an antenna problem.

AgeDiff - This the age of differential and should remain somewhere between 1 and 20 (the lower the better). If it is 0, then you do not have Differential. If it counts to the Diff Age-Timeout (3600 default), then you will lose your differential lock.

'View of Channel Data'

Each channel represents a satellite. Channels 1 to 10 are the GPS satellites. Their position in the hemisphere is indicated by elevation and azimuth (the compass heading). The higher the elevation, the stronger the signal is likely to be as it will be less affected by atmospheric conditions or line of site obstructions e.g. the surrounding topography, buildings trees etc.

Channels 11 and 12 are the two geostationary satellites broadcasting EGNOS correction data. Depending on your geographic location, either one will be visible. No values for any given channel indicate that a satellite is not in line of sight.

The important fields in this window are:

CH - The channel numbers are colour coded to show whether or not a specific satellite is being used in the solution (has Lock). The channel number will turn Green when the receiver has a full lock on the satellite. The number of satellites with green numbers is the same as the number of satellites used.

ELV - This is the elevation of the satellite in degrees above the horizon. By default, the receiver will ignore any satellite lower than 5 degrees above the horizon. This can be changed by setting the Elevation Mask with $JMASK command. The receiver is more precise when it has more than 4 satellites widely spread across the sky at various elevations. This is called good constellation geometry and is indicated by the HDOP/VDOP (Horizontal/Vertical Dilution of Precision) values in the 'View GPS Solution' window. A lower DOP indicates a stronger potential for better accuracy than a higher DOP.

LOCK - Use this column when you cannot distinguish the colours of the channel numbers. When a satellite has lock, this value will be **CXBF**.

SNR - The Signal to Noise Ratio of a satellite is used to illustrate the relative quality of the information packets being received. A good SNR value would be above 12.

2.8.2 *Ashtech Evaluate™ software*

Ashtech Evaluate™ generates a real-time graphical display of position error and other computed GPS information, and is a useful tool to indicate the relative accuracy of your receiver. This program can be emailed on request.

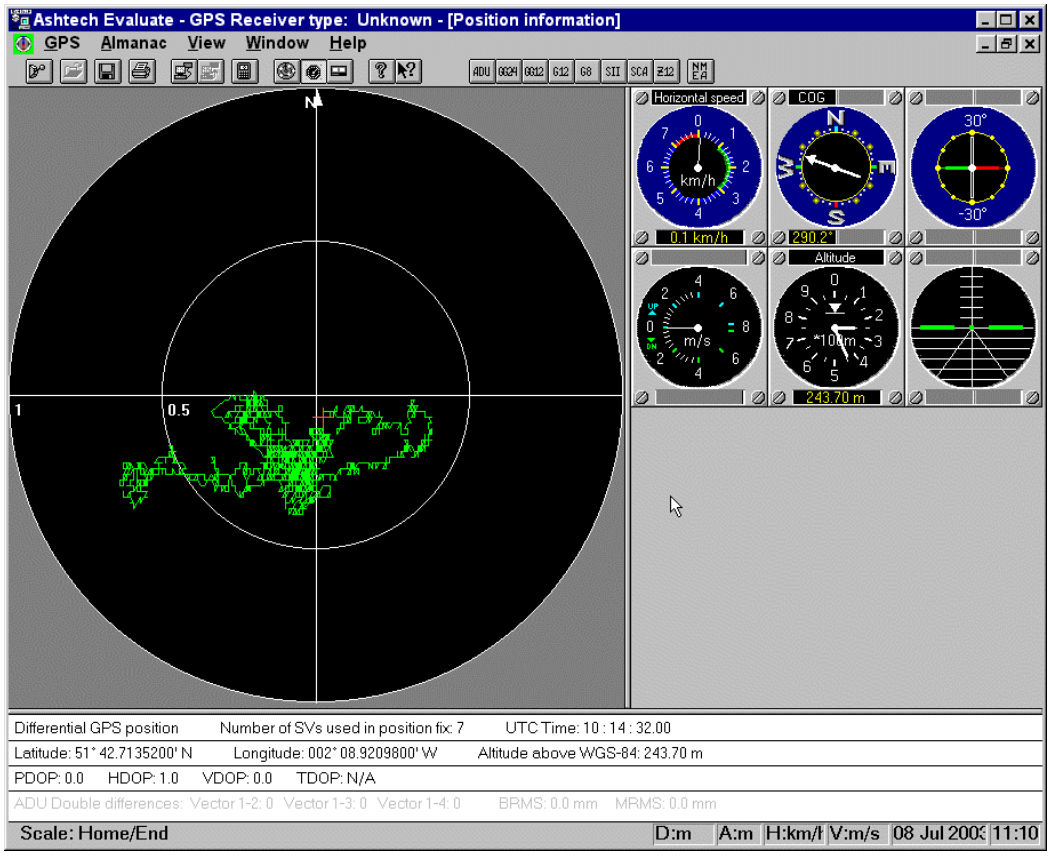


Figure 9 : 'Ashtech Evaluate' Diagnostic software

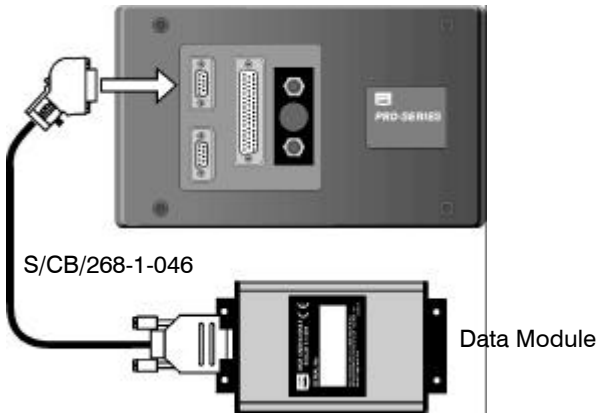
3 Data Logging and Transfer - Hardware Setup

There are a number of options available for logging and transferring data between the Pro-Series and the PC.

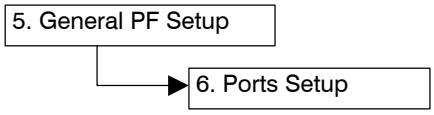
3.1 Data Card Module

The Data Module accepts a PCMCIA Flash Card to store data generated from harvesting, soil sampling, variable-rate treatment, or upload data e.g treatment plans or navigation data for soil sampling. A maximum of 16Mb of data can be stored on the card (typically enough for about 600 hectares).

Figure 10



1. Configure the top port to recognize the Data Module by selecting from the calibration menu,

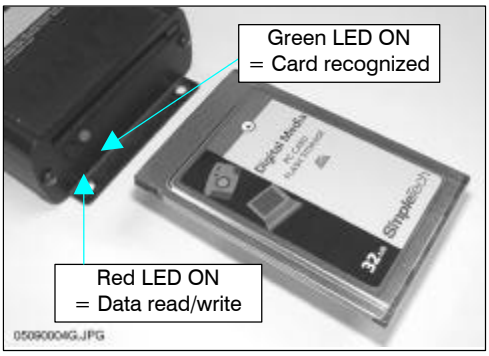


and setting the top port option to "**RDS PF MODULE**" .

2. Connect the module to the top port. The module is powered from the head unit. Insert the card as shown in figure 11 and the green LED will come on indicating that the head unit has detected the card. The red LED indicates when data is being written to or read from the card.

NOTE: Do not remove the card while the red LED is on as this may cause an irretrievable loss of data on the card.

Figure 11



3.1.1 Card Compatibility and Formatting

The PCMCIA data card conforms to the ATA interface standard. The maximum formatted capacity is 15.2 Mb regardless if it is a higher capacity card. The head unit will not recognize a card formatted larger than 16 Mb. Cards supplied by RDS are pre-formatted ready for use.

Earlier compatibility issues with externally sourced cards have largely been resolved, therefore if you are using a card not supplied by RDS, then format it in Windows Explorer i.e. if it is Drive D:,

1. Right-click on "Removable Disk (D:) and select "**Format**".
2. From the "Format" window, select the "**Full**" checkbox for the format type, enter a volume description if desired, and then press "**Start**".

Cards must have a directory called "**Rds_data.xxx**" in which all data is stored and retrieved. This directory should be automatically created when you first insert the card into the Data Module. All PF data is written to this directory. If the folder "Rds_data.xxx" is not created automatically, manually create it in the normal way from Explorer.

3.1.2 PC Card reader - transferring data

PCMCIA cards can be inserted directly into laptop computers however, an external card reader may be required for a desktop PC and connects via the USB port. They are available from most computer shops however, a suitable kit is also available through your RDS distributor:- Part No. S/AC/311-1-005.

For desktop PC's connect the card reader to the PC according to the instructions supplied with the reader unit. You will have to load the appropriate driver software found on the setup disk supplied with the reader unit.

1. Transfer the flash card to the card slot on your PC card reader.

   Under Windows® 95/98, the PCMCIA card will normally appear in either the 'My Computer' window, or Explorer as 'Removable Disk [D:]'.

2. Double-click on this drive to access the card and the folder "Rds_data.xxx".

3. From the **File** menu in Explorer, download yield data files or upload treatment plan files using the normal commands e.g. **Cut** or **Copy** and **Paste**, or 'drag and drop' the files.

   Similarly, delete files from the card using the **Delete** command.

NOTE: Never remove the card while data is being written to it (i.e. when the red LED is on).

3.2 Pro-Series to ICP 200 Printer

You can print out a summary for each or all of the jobs logged to the internal memory (75 jobs maximum).

Figure 12

S/CB/268-1-049 In-Cab Printer

1. Configure the top port to recognize the ICP200 printer by selecting from the calibration menu,

   5. General PF Setup
   → 6. Ports Setup

   and setting the top port option to "**ICP 200 PRINTER**" .

2. Connect the printer to the top port using cable S/CB/268-1-049 that also provides a power supply from the head unit (fig 12).

NOTES: For more information on the printer, please refer to the ICP200 printer manual. For further information on printing from the Pro-Series, please see section 5.5.5

The printer protocol is 4800,8,1,No Parity, Hardware handshaking. If you wish to connect another type of printer, then it must be configurable to this protocol.

3.3 Pro-Series to PC Link Cable

Any Pro-Series instrument equipped with data logging and download facility can transmit data to a PC or laptop running Windows 95 or 98 and a terminal emulator programme such as Windows HyperTerminal or the RDS 'Data Capture' utility.

1. Configure the top port (Apollo setup) by selecting from the calibration menu,

5. General PF Setup
→ 6. Ports Setup

and setting the top port option to "**PC DOWNLOAD**" .

NOTE: Ceres 8000 setup is different to Apollo setup. Please refer to the Ceres 8000 user manual.

Connect the instrument to the serial port of the laptop/PC using a 'Pro-Series to PC Upload' cable S/CB/268-1-032. N.B. some laptops do not have RS232 ports but only have USB ports. In this case you will require a USB - Serial adapter.

3.3.1 Creating a HyperTerminal Shortcut on Windows Desktop

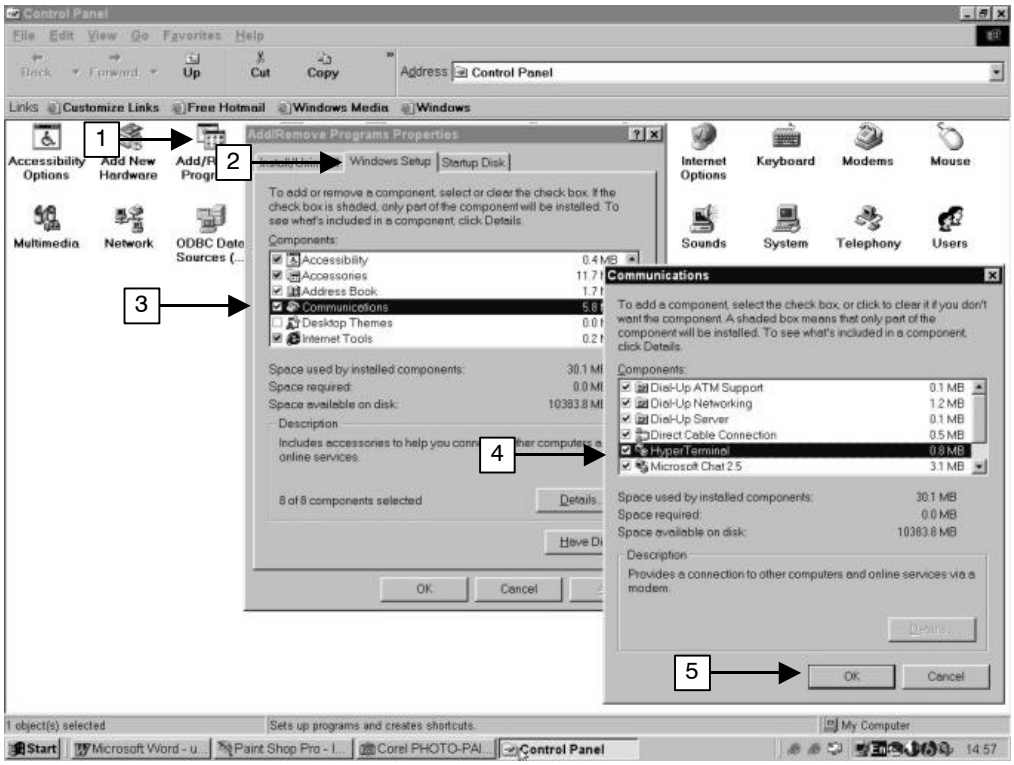
1. From the desktop, click on an empty area of the desktop background with the right hand mouse button. A message box will appear.
2. Click on '**New**' → '**Shortcut**'. The 'Create Shortcut' box will appear.
3. Click on '**Browse**' then select **C:\Start Menu\Programs\Accessories\Communications,** and select '**HyperTerminal**'. If you cannot locate it, refer to section 3.3.2 .
4. Click "**Open**' then '**Next**' and change the name for the programme if desired e.g. "RDS Download",
5. Click on '**Finish**'. The HyperTerminal folder is now on the Desktop.

3.3.2 Enabling HyperTerminal

Hyperterminal is a standard accessory supplied with Windows 95 and Windows 98, however it may not have been enabled when Windows was setup. If Hyperterminal is not available in the Accessories folder :-

1. Click on '**Start**'→ '**Settings**' → '**Control Panel**' → '**Add/Remove Programmes**'
2. Select the "Windows Setup" tab on the top tab list

Figure 14



3. Double click on "**Communications**", check the "**Hyperterminal** " box and click '**OK**'. (fig.14). You may require your Windows installation disc to install it.

3.3.3 Setting up HyperTerminal

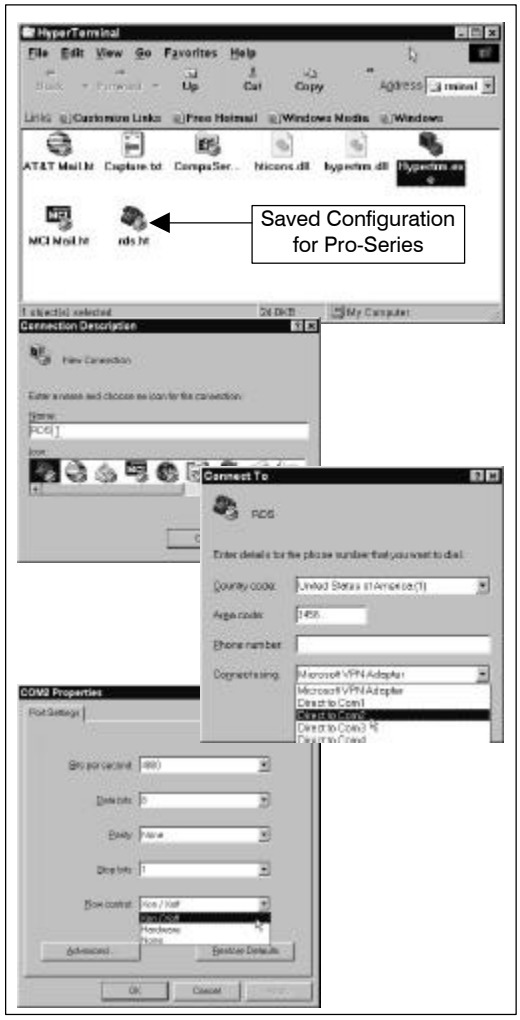
1. From the Windows 95/98 desktop, double-click on the shortcut to open the HyperTerminal folder (if you have not already created a shortcut, see section 3.3.1), and then double-click on the '**HyperTerminal.exe**' icon.
2. A 'Connections Description' box will appear. Enter a name, e.g. RDS , select an icon and click '**OK**'.
3. A 'Connect To' box will appear. In the 'Connect Using' window, select '**Direct to Com 1**' or '**Direct to Com 2**', depending on which port you will be using. Generally on a laptop it will be Com 1. On a PC it will be Com 2 (or Com 3).
4. Click '**OK**'.
5. A 'Properties' box will appear for the selected port.

   Set Bits per second: 4800
   Data bits: 8
   Parity: None
   Stop Bits: 1
   Flow Control: Xon/Xoff

   and click '**OK**'.

   HyperTerminal should now be in communication with the instrument. If not, a common reason is that the wrong COM port has been specified in the 'Connect Using' window' (On a PC, COM 1 is commonly used for the mouse).
6. When you exit HyperTerminal, you are prompted to save a configuration file with the name as previously entered in the 'Connections Description' window. Click '**Yes**' and an '**RDS.ht**' icon will appear in the 'HyperTerminal' folder (fig.15).

Figure 15

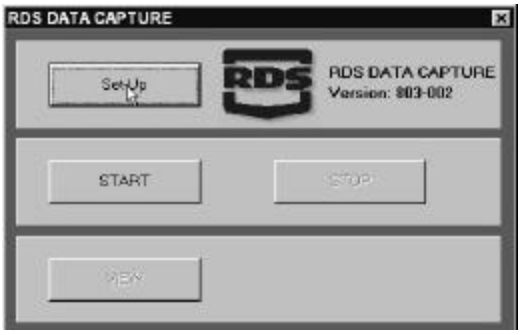


3.3.4 Setting up RDS '*Data Capture*' *Utility*

This utility programme is available to download from the RDS website at <www.rdstec.com>. RDS Data Capture is a simple terminal programme that enables data logged and stored on an RDS Pro-Series instrument to be downloaded to a PC via RS232 serial port and saved either as formatted text (*.txt) or as csv (*.csv) data. These files can then be opened in a word processor or in a spreadsheet (ex. MS Excel) for printing or analysis.

To install onto your hard drive you must have Winzip installed.

1. Simply double-click on the file 'Data Capture Install.zip' in the C:\TEMP directory to view the contents of the zip file.
2. Double-click on 'Setup.exe to run the install program. An icon is created on the desktop.
3. Double-click the icon to start the programme then click 'Set-Up' to configure the COM port setting, then click 'OK'.



3.4 Pro-Series to PDA

It is not feasible for RDS to give specific instructions for every PDA model due to the constant development of new hardware and software. In general however, whichever PDA and the operating system it uses, to link to the Pro-Series simply requires,

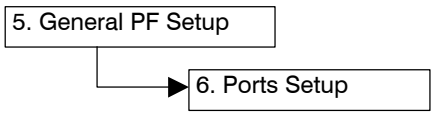
(i) a terminal emulation programme installed with the protocol settings;

Baud:	4800
Data bits:	8
Parity:	None
Stop Bits:	1
Flow Control:	Xon/Xoff

(ii) a RS232 9-way 'D' serial port connection.

The PDA docking station may already have a 9-way 'D' for connection to a laptop or PC in which case it can connect directly to the RDS Pro-Series-PDA cable, otherwise you will need to purchase an additional RS232 Serial Adaptor lead to link between the RDS cable and the PDA (normally available as a standard accessory from your PDA dealer).

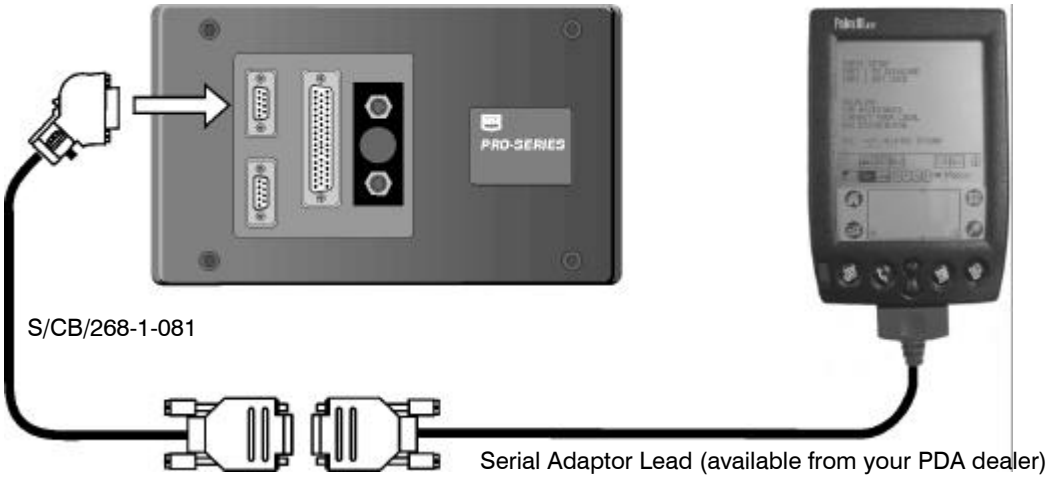
1. Configure the top port by selecting from the calibration menu,



and setting the top port option to "**PC DOWNLOAD**" .

2. Connect the instrument to the docking station serial port or serial adaptor lead of the PDA using a 'Pro-Series to PDA' cable S/CB/268-1-081 (fig. 18).

Figure 18



3.4.1 Terminal emulation for Palm OS operating system

Palm OS does not ship with a terminal emulator, however you can choose to download a suitable third-party emulator programme via the Internet.

One such programme is **Online,** a VT100 terminal emulator and Telnet client for Palm OS organizers with Palm OS 3.0 or later. It can be downloaded from Mark/Space (www.markspace.com).

3.4.2 Terminal emulation for Windows CE operating system

Windows CE Handheld PCs ship with a very weak terminal emulator. The Palm-size PC and Pocket PCs do not ship with a terminal emulator application. As with Palm OS, you are advised to download a suitable third party emulator programme via the Internet. There are plenty of forums where the latest advice on installation and configuration is freely available.

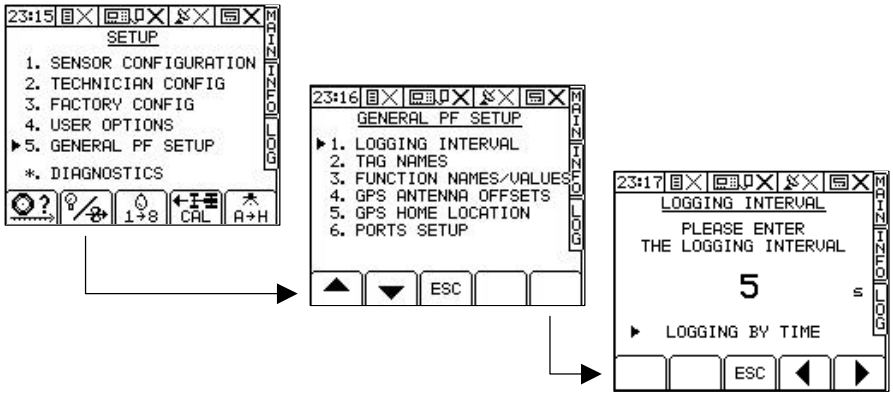
4. Logging / P.F. Functions - Software Setup for Apollo Instruments

Reference: PF Driver Version 2.036

It is assumed that the hardware e.g. Data module, GPS, Third party controller etc, has already been configured as per sections 2, 3 and 6 in this manual.

Before commencing PF operation, you should check and adjust if necessary any of the following parameters to suit your particular application. The PF settings are found under '**5. General PF Setup**' in the calibration menu.

4.1 Logging Interval



It is recommended that you use the default setting of 5 seconds. This should be adequate for variable-rate treatment with a typical 24-metre sprayer, and yield mapping. To ensure correct application from treatment plans with a smaller cell size may therefore, require a shorter logging interval to be set.

Decreasing the logging interval may affect the responsiveness of the control system and generate very large log files, therefore reducing the number of jobs that can be accommodated on the PCMCIA card. An exception is when you are boundary mapping (where less data is being generated), you can reduce the logging interval to get better definition of the field boundary.

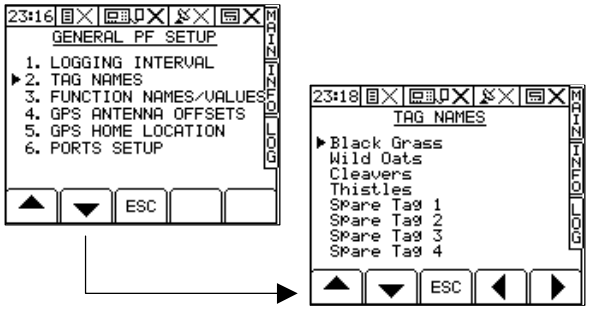
Simply enter the interval value and press the ENTER key to confirm.

NOTE: Although the option to select the logging interval by distance is available, it no longer recommended you do so.

4.2 Tag Names

Applies to yield mapping only.

While dynamic logging is in progress the operator can switch on or off any of up to 8 'tags' which effectively place markers on subsequent yield maps to denote particular features such as weed patches etc. Each tag can be named (up to 20 characters) to denote its meaning on the yield map. The first 4 tag names are factory preset as Black Grass, Wild Oats, Cleavers and Thistles.



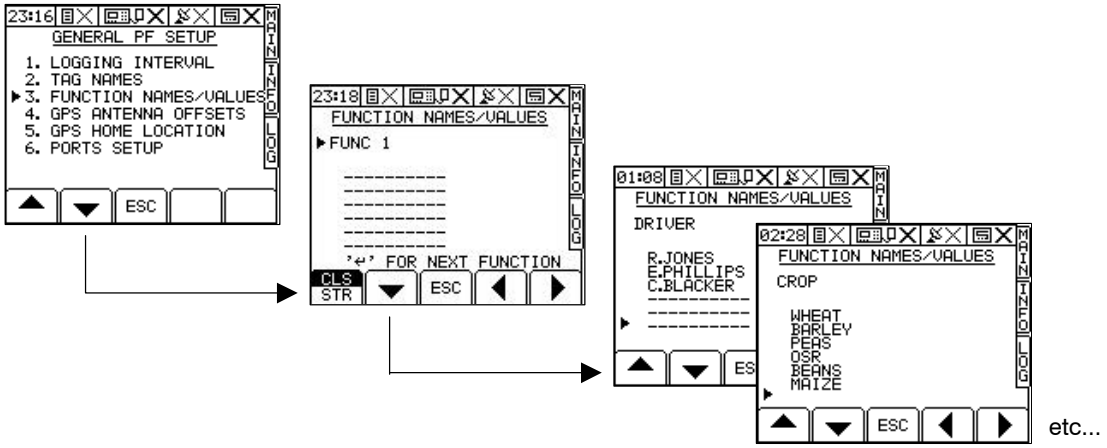
To change a name, first position the menu pointer against a tag. Using the RIGHT ARROW key, move the screen cursor across to the tag name and enter the data via the alpha-numeric keypad.

Press the ENTER key to confirm the data entry then repeat the procedure as required for further tag names.

4.3 Edit Function Names and Values

The default settings can be re-programmed for any of the extended data functions (default names = "FUNC 1" - "FUNC 12") e.g. Crop, Contractor, Driver, Product applied etc.

Further to this, for each function 1 - 12, you can then programme up to 6 different values e.g. Crop variety, Contractor name, Driver name, Product name etc.



To change a name, first select the function number using the ENTER key. Using the RIGHT ARROW key, move the screen cursor across to the function name and enter the data (up to 20 alpha-numeric characters) via the alpha-numeric keypad.

To enter a value, move the cursor down to the first line and enter the data. You can enter up to 6 lines each of 10 characters.

4.3.1 Clear Store function CLS STR

In normal operation, each time you start a job you are prompted to select a value for each extended function that is enabled on the 'Job Startup' page. The 'Clear Store' function control whether or not the default value prompt is the one selected for the previous job.

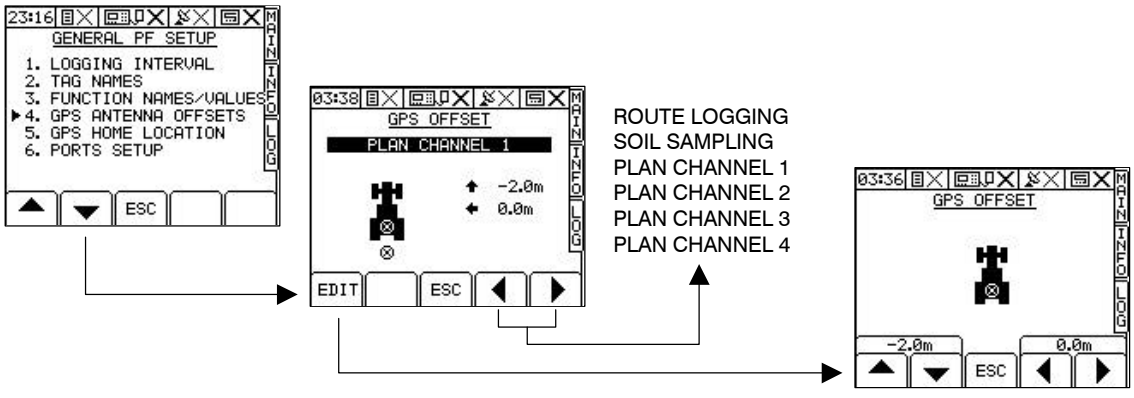
If a function on the 'Function Names/Values' page is set to CLS STR (Clear Store), no default value will appear on the 'Job Startup' page or be logged for that function, unless the operator manually selects a value via the LIST key.

If a function is set to CLS STR (Store), then when a new job is started, the value set for the previous job will appear on the 'Job Startup' page. It then becomes the responsibility of the operator to change the value via the LIST key if so desired.

In nornal operation, it is less likely that mistakes will occur in setting the value for an extended function if 'Clear Store' is selected on the 'Function Names/Values' page. For this reason it is the factory default setting for all 12 functions.

4.4 Set GPS Antenna Offset

The "Antenna Offset" allows you to compensate for the difference in position between the GPS antenna and the feature being logged, centre of the spray boom/cutter bar/coulter bar, or the centre point of a spreading pattern.



You can have 6 separate configurations for,

ROUTE LOGGING
SOIL SAMPLING
PLAN CHANNEL 1
PLAN CHANNEL 2
PLAN CHANNEL 3
PLAN CHANNEL 4

(Default for all configurations = No offset).

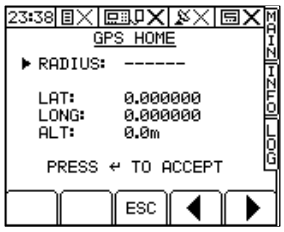
For example, you might need a 2-metre side offset for boundary mapping from a quad bike, so you would edit the 'ROUTE LOGGING' configuration.

Say for example, that you were going to use a front-mounted spreader (that was controlled via channel 1) and a rear-mounted spreader (that was controlled via channel 2) together, you would set the offsets for each. You would edit the 'PLAN CHANNEL 1' configuration for the front-mounted implement, and the 'PLAN CHANNEL 2' configuration for the rear-mounted implement.

Select the configuration that you wish to edit and press the **EDIT** key.

Use the arrow keys to offset the antenna position in 0.5 metre increments, and press the ENTER key to confirm.

4.5 GPS Home Location



This page displays your current position. Press the ENTER key to store this position as the "home location" e.g. the farm.

The 'RADIUS' setting enables the instrument to filter out spurious positional data, which if logged as normal could cause problems when importing the data into mapping and treatment planning software. Any position received outside the operating radius is assumed to be corrupt data and will be ignored.

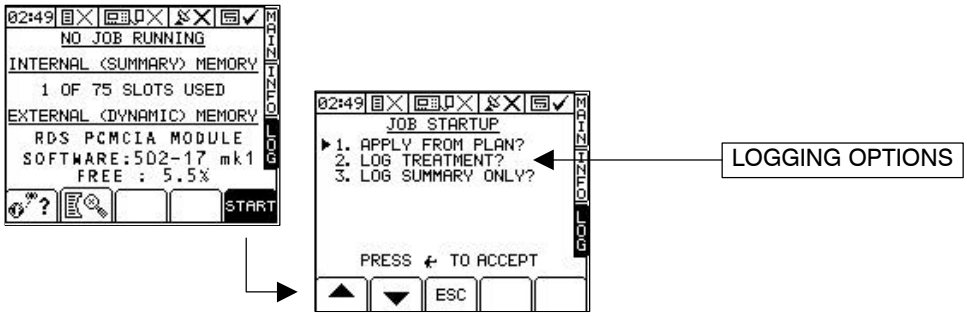
Set the radius to an appropriate figure e.g. to encompass the total farmed area.

If you subsequently move outside the radius circling the home location, the instrument will automatically reset the "home location" to the current position ONLY IF it receives 10 consecutive, full differential GPS signals.

At any time, you can press the ENTER key while on this page, to manually set the home location to your current position.

5. The LOG Screen - Logging Options for Apollo Instruments

The Pro-Series has a separate LOG screen. Data is logged to internal (summary) memory and/or external (dynamic) memory depending on the logging option selected.



(i) APPLY FROM PLAN (Variable-Rate Treatment)

The variable rate instruction is implemented in one of the following setups,

(a) the Pro-Series receives the rate from a treatment plan on the RDS Data Card Module and controls the application via the RDS control system. A full application record of the *actual* application is generated and saved on the Data Module.

(b) the Pro-Series receives the rate from a treatment plan on the RDS Data Card Module and sends it to a third party controller, which controls the application via the OEM control system (System ERIS).

(c) the Pro-Series receives the rate from a third-party controller and controls the application via the RDS control system (System ERIS). The Pro-Series can send back the actual application rate to the other controller

All setups allow the operator to commence a full VRT application.

For (a) and (b) a full application record of the *actual* application is generated and saved on the Data Module. The associated work record file can be viewed in the mapping/treatment plan software. Job summary data (iii) is also appended to the work record file.

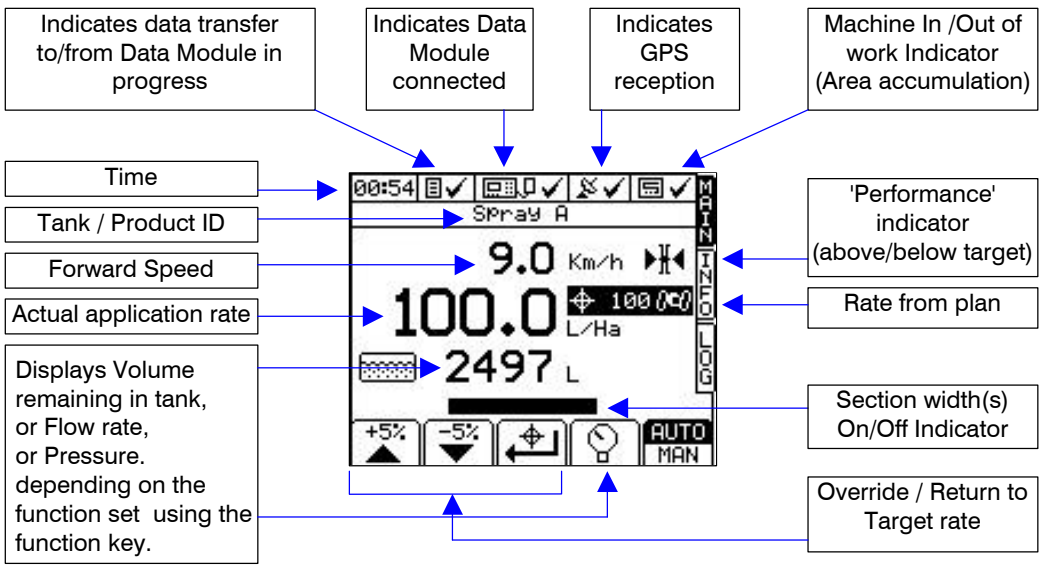
(ii) LOG TREATMENT (Dynamic Data Logging)

A full application record is generated, logging rate and other parameters (e.g. "tags") in real time, attributing this data to a specific location. The associated "Dynamic Logging" file is viewed in the mapping/treatment plan software. A large amount of data is generated by dynamic logging and therefore must be saved onto an RDS Data Card Module. Job summary data (iii) is also appended to the dynamic logging file.

(iii) LOG SUMMARY ONLY (Field Data Logging)

For simple farm record keeping and traceability purposes, you can record a summary of each job or work session in the internal memory, and subsequently download directly to a PC, to a Data Module, or print to an RDS ICP200 In-Cab Printer. The amount of summary data for each job is small, and is saved in the internal memory. The instrument can store up to 75 individual job summaries.

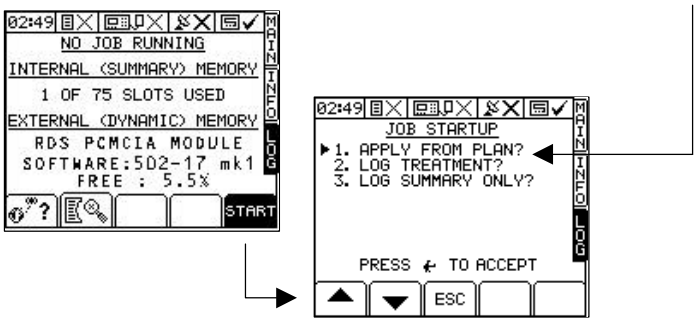
5.1 MAIN Screen Information



5.2 Running a Variable Rate Treatment plan

1. Press the LOG key. The screen will display the current logging status, the number of jobs (job summaries) stored in memory, and the status of the PCMCIA card if found. If the module is not detected the message "NO MODULE FOUND" is displayed.

2. Press the START key. The JOB STARTUP page is displayed. Select the logging option "1. APPLY FROM PLAN".



3. Key in the 'FARM NUMBER' and 'FIELD NUMBER'.

NOTE: If there is more than one "machine" (i.e. distribution system) enabled, the 'SELECT MACHINE' page is now displayed. Scroll the cursor to the appropriate machine and press the ENTER key to confirm.

4. Select the appropriate plan from the list on screen and press the ENTER key to confirm.

NOTE: If there is more than one "machine", the display will then revert to the 'SELECT MACHINE' page. If required, select another 'machine', press the ENTER key to confirm and then select the appropriate plan.

5. After selecting plans for each 'machine', press the 'START' key. The "EXTENDED DATA FUNCTIONS" page is then displayed (section 5.2.4). If you don't wish to programme any extended functions. then press SKIP FUNCS .

6. Wait while the work plan file is loaded and a work record file is created on the Data Module. Once the plan is loaded, the 'RUNNING A PLANNED JOB' page appears, and displays the tag list. See section 5.2.3 about tagging.

While VRT mode is in operation a flashing satellite symbol is displayed alongside the Target Rate on the MAIN screen. The icon appears animated at the top of the screen while logging is in progress.

The target rate on the MAIN screen now becomes the application rate according to the treatment plan data (Base rate x Multiplier) and the position in the field. The treatment rectangle size is defined in the treatment plan software.

Plan Status Display

Press the key to display the current application rate according to the treatment plan, for each distribution system in operation. This is displayed as 'Base Rate x Multiplier = App. Rate'

Application Rate without a GPS Signal

If you lose the DGPS signal the treatment rate will revert to the 'Base Rate' specified in the plan.

Application Rate outside the Field Boundary

If you go outside the field boundary but are still within the treatment rectangle, a icon flashes on the display and the instrument beeps continuously. The application rate reverts to the base rate. If you are outside the field boundary and treatment rectangle, then the application rate goes to zero.

5.2.1 Overriding the VRT application rate

You can vary the actual application rate at any time using the +5% -5% keys.

The target rate display will flash until you press to return to the target rate.

5.2.2 Stop a VRT job

To stop running a job, simply press the 'STOP' key on the LOG screen. The job summary is appended to the work record file on the data module, and saved to the internal memory.

5.2.3 Tagging

During application, you can log the presence of up to eight different features in the field, e.g. different weed infestations, pest damage etc. To switch a tag on or off, simply press the appropriate number key.

1 indicates the tag is off

1 indicates the tag is on

Tags 1 to 4 are preset for Blackgrass, Wild Oats, Cleavers and Thistles. You can however, edit the tag names from the 'GENERAL PF SETUP menu (section 4.2).

5.2.4 Extended Data Functions

Dynamic log files and simple job summaries can include up to 12 additional data. All 12 data items can be user-defined to suit individual requirements e.g. Operator, Wind Speed, Air Temperature, Growth Stage, Product etc. Entering extended data is optional.

If you do not want to change the default value, simply press the ENTER key to accept it, and then the next 'F' function appears. If you do not need to programme any of them, simply press SKIP FUNCS at any time to start logging.

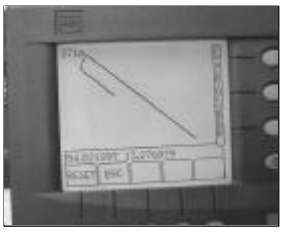
NOTE: If a function on the 'Function Names/Values' page in the setup menu is set to CLS STR (Clear Store), no default value will appear on the 'Job Startup' page or be logged for that function, unless the operator manually selects a value via the LIST key.

Likewise, If that function a function is set to CLS STR (Store), then when a new job is started, the value set for the previous job will appear on the 'Job Startup' page. It then becomes the responsibility of the operator to change the value via the LIST key if so desired.

Refer to section 5.2 to programme function names / values.

5.2.5 Display vehicle track - "MAP"

From the LOG screen, press the "MAP" key. The screen displays the real time position of the vehicle (the "+" cursor), and the vehicle track for the last 100 logged data points.

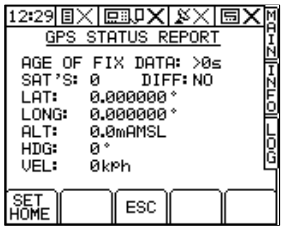


The screen also displays the latitude and longitude in decimal degrees, and the number of points. As the vehicle proceeds from the start of the job, the screen plots and automatically zooms out to display up to a maximum of 100 logged data points. Beyond this, as the job progresses, the display pans in the direction of movement to keep the previous 100 data points on screen.

Press the 'RESET' key to start the plot again from the current position. If you selected the "LOG TREATMENT" option from the LOG screen page, the track data is saved to a dynamic logging file on the data module, which can then be viewed in PLOT/PLAN.

5.2.6 Display GPS Status

From either the LOG page, "RUNNING TREATMENT PLAN" page or "RECORDING A DYNAMIC JOB" page, press the  key to view the current GPS status.



This page displays; Age of Fix Data (when reception is good, the time should not be more than 1 second); Number of Satellites (minimum of 4 for full differential fix); Differential Status; Latitude and Longitude (in decimal degrees); Altitude; Heading and Velocity. All this data is read directly from the NMEA GGA and VTG messages. You can also set the "Home Position" from this screen (section 4.5).

5.3 Dynamic Data Logging

An RDS Data Card Module and a GPS receiver must be connected.

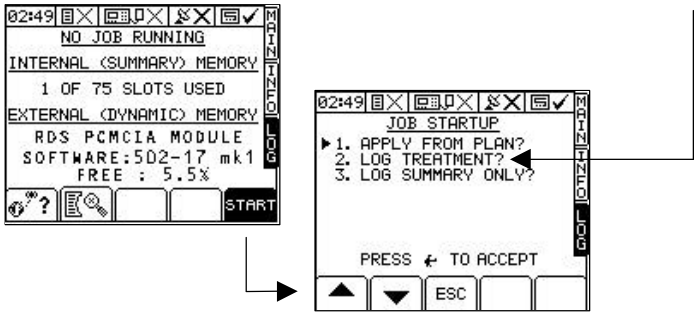
When spraying conventionally (i.e. not VRT mode), you have an option to generate a full spray application record, logging rate and other parameters (e.g. "tags") in real time, attributing this data to a specific location. The associated "Dynamic Logging" file is saved onto the Data Card Module and can subsequently be viewed in PLOT/PLAN.

5.3.1 Start recording a Dynamic Job

1. Press the LOG key.

   The screen will display the current logging status, the number of jobs (job summaries) stored in memory, and the status of the PCMCIA card if found. If the module is not detected the message "NO MODULE FOUND" is displayed.

2. Press the START key. The JOB STARTUP page is displayed. Select the logging option "2. LOG TREATMENT".



   When prompted, enter the FARM NUMBER and FIELD NUMBER reference. The "EXTENDED DATA FUNCTIONS" page is then displayed (section 5.2.4). If you don't wish to programme any extended functions. then press SKIP FUNCS .

   The screen will display "NEGOTIATING FILE STORAGE - JOB NUMBER #" as it creates the dynamic log file on the data module. Once the plan is loaded, the "RECORDING A DYNAMIC JOB" page appears, and displays the tag list. You can at any time apply the Tag functions to log features in the field (see section 5.2.3).

   While dynamic logging is in progress, the icon appears animated at the top of the screen.

NOTE: If more than one machine is enabled, the summary job record will include data for each machine.

5.3.2 Stop recording a Dynamic Job

To stop running a job, simply press the "STOP" key on the LOG screen. The job summary is appended to the dynamic log file on the data module, and saved to the internal memory.

5.4 Field Data Logging

For farm record keeping and traceability purposes, you can record a summary of each job or work session in the internal memory, and subsequently download directly to a PC, to a Data Module, or print to an RDS ICP200 In-Cab Printer. You can store up to 75 job summaries.

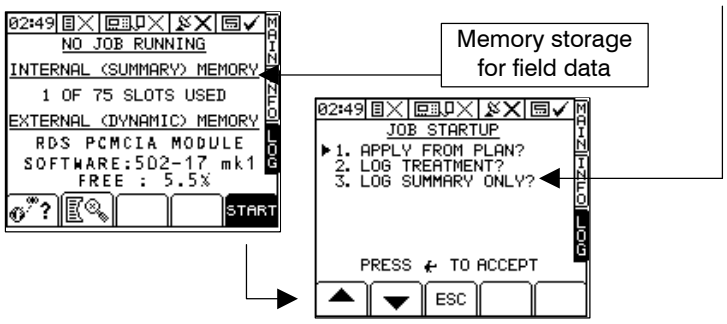
Refer to section 5.5 on downloading or printing data.

5.4.1 Start recording Field Data

1. Press the LOG key.

   The screen will display the current logging status, the number of jobs (job summaries) stored in memory, and the status of the PCMCIA card if found.

2. Press the START key. The JOB STARTUP page is displayed. Select the logging option "3. LOG SUMMARY ONLY".



When prompted, enter the FARM NUMBER and FIELD NUMBER reference. The "EXTENDED DATA FUNCTIONS" page is then displayed (section 5.2.4). If you don't wish to programme any extended functions. then press SKIP FUNCS .

The "RECORDING A JOB SUMMARY" page appears.

While field data logging is in progress, the icon appears animated at the top of the screen.

NOTE: The Tag functions are not available in this logging mode.

5.4.2 Stop recording Field Data

To stop running a job, simply press the "STOP" key on the LOG screen. The job summary is saved to the internal memory.

5.5 Review / Reset / Print or Download Summary Data

You can view, delete, print or download one or more jobs. Summary data downloads either in a text format as a job ticket including space for comments and signature, or in a CSV format.

Depending on your hardware setup (ref. section 3) you can 'print' from the Pro-Series to a printer, to a .txt or .csv file on the data module, or to a .txt or .csv file saved in either the RDS 'Data Capture' or HyperTerminal programme on the PC.

It includes all the basic data listed below along with any extended data that was programmed, for each tank that is enabled.

Job Number
Start Date
Start Time
End Time
Job Duration
Channel No.
Machine ID / Name
Farm No.
Field No.
Product / Crop
Cal Factor
Area
Work Rate
Quantity spread
Quantity loaded
Average Application Rate
Extended Functions F1 to F12 values
Comments*
Operator*
Transmit Time and Date

* Not included in .CSV format

5.5.1 Select Summary Data to Reset or Download

On the Pro-Series, select the job or jobs summaries to download as follows,

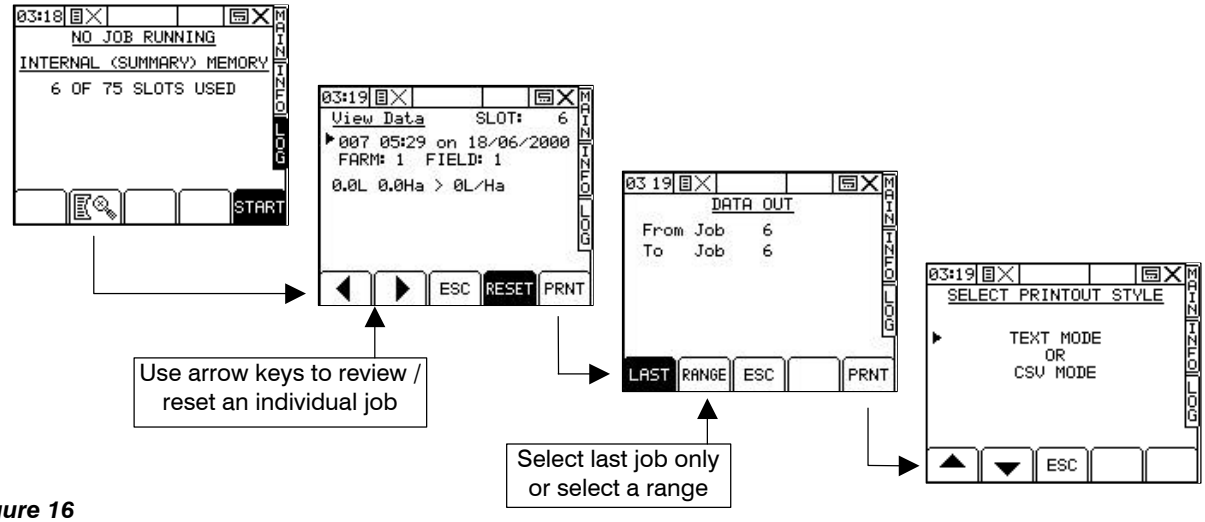


Figure 16

You have the option to download in Text or CSV format. CSV format is ideal for importing the data into a spreadsheet. As data is transmitted from the instrument a “progress bar” will be displayed on the Pro-Series.

Now refer to the appropriate section below on capturing the data.

5.5.2 Downloading Data to HyperTerminal

(Ref. section 3.3.1 - 3.3.3 for software setup).

1. On the laptop, double-click on the HyperTerminal icon on the desktop. This will open the HyperTerminal Folder.
2. Double-click on the '**RDS.ht**' icon.
3. From the menu, select '**Transfer**' → '**Capture Text**'. A 'Capture Text' message box will appear showing the name of the text file to which data will be saved.
4. Type in the name of the folder and the name of the file that you wish to save the data as.
5. Click on '**Start**'. The programme is now ready to receive the data from the Pro-Series.

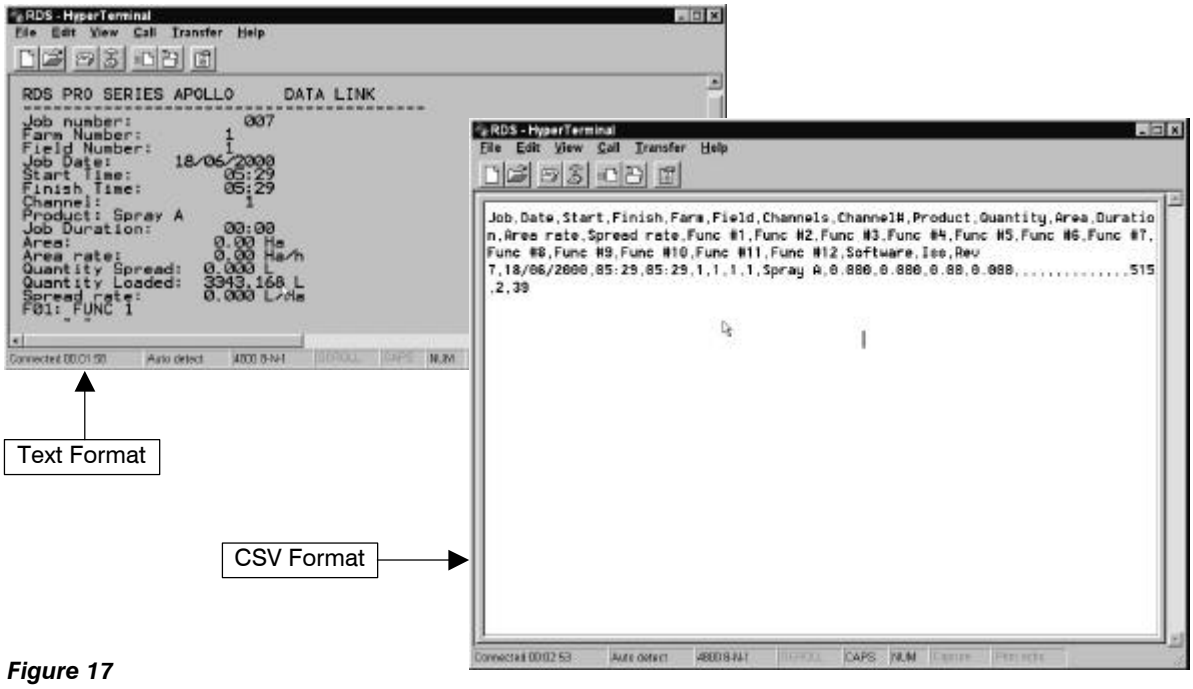


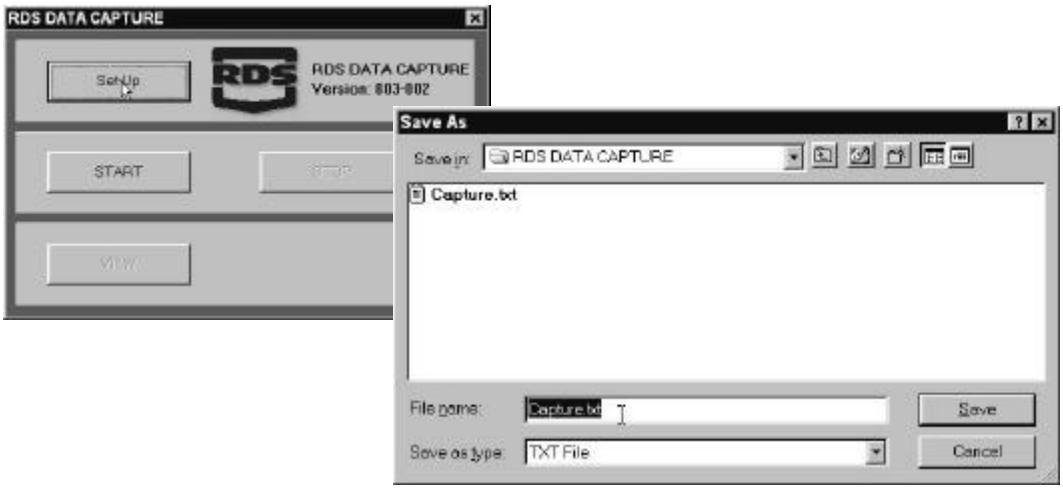
Figure 17

7. When the transfer is complete, from the menu, select '**Transfer**' → '**Capture Text**' → '**Stop**'. The data has now been saved to the designated file.
8. This file may now be opened as a text file in a text editor, e.g. Word, Notepad, etc and can be printed and edited as required.

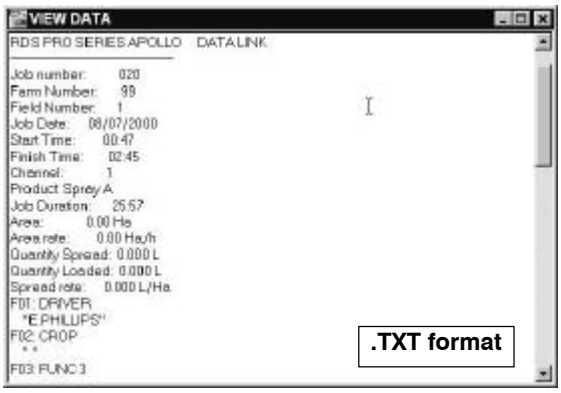
5.5.3 Downloading Data to RDS '*Data Capture*' utility

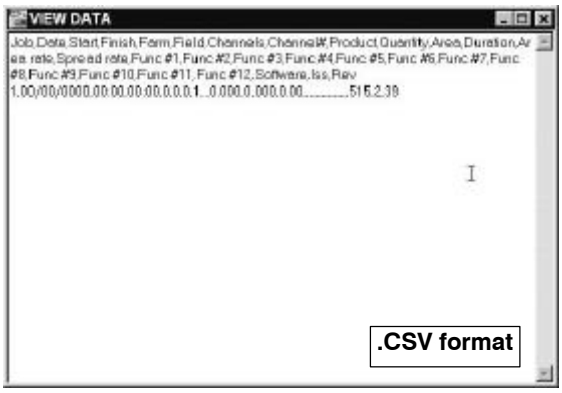
(Ref. section 3.3.4 for software setup)

1. On the laptop, double-click on the 'RDS Data Capture' icon on the desktop to start the programme.
2. Press '**START**' , select the file type (.TXT or .CSV) in the '**Save as type**' box. The default file name is 'capture'. Type in the desired filename for the data to be captured.



3. Click on '**Save**' and the programme is now ready to receive the data. Press '**VIEW**' to see the data on screen as it downloads.





4. All data will be saved to the current file until you click on '**STOP**', at which point the file is saved to disk. You can therefore download any number of jobs into a single file.

5.5.4 *Downloading Data to a Data Module*

(Ref. section 3.1 for hardware setup).

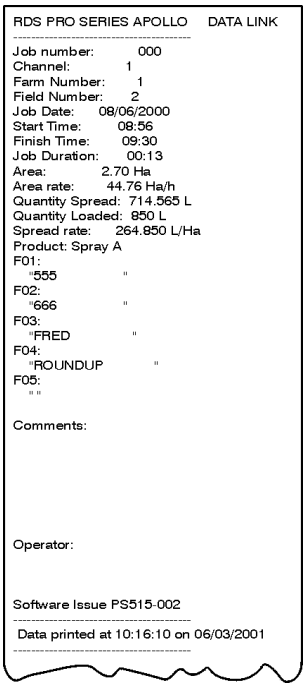
After selecting TEXT or CSV mode (fig. 16), the filename is automatically created as <jobxxxxx.txt> (or jobxxxxx.csv) where 'xxxxx' is the job number stored in memory. If you are downloading a range of job summaries, then a separate file is created for each summary.

If any file with the same name already exists on the data module, the instrument will prompt you to whether to overwrite that file or not. If you want to keep an existing file then make sure you transfer it from the flash card onto the PC and rename it.

5.5.5 *Printing Data to a Printer*

(Ref. section 3.2 for hardware setup).

Accept the default TEXT mode for printing and the job summary or summaries print out as a job ticket with space for comments and a signature as shown.



6. Yield Mapping with the Ceres 8000

6. System ERIS Setup

As an alternative to the PS8000 operating as a standalone controller directly controlling an RDS retrofit system, the PS8000 head unit can transmit a variable rate control signal via RS 232C to another implement controller also installed in the cab. Conversely, the PS8000 can operate as a slave controller, receiving a rate instruction from another implement controller and acting upon it.

NOTE 1: Although certain implement controllers are able to return a message confirming the actual rate delivered, you can't receive this data and log it to to the Data Module, because the RXD pin on the ERIS interface receives the GPS data.

NOTE 2: Section 2 describes setup and configuration of the GPS receiver. If your receiver is not supplied by RDS and you encounter problems setting it up, then you may have to refer to the documentation supplied with the receiver.

A custom interface cable is supplied to connect the PS8000 to the RS 232 port of the implement controller, and in most cases to also connect a GPS receiver and a power supply.

Figure 1: Typical ERIS Setup- sending rate instructions

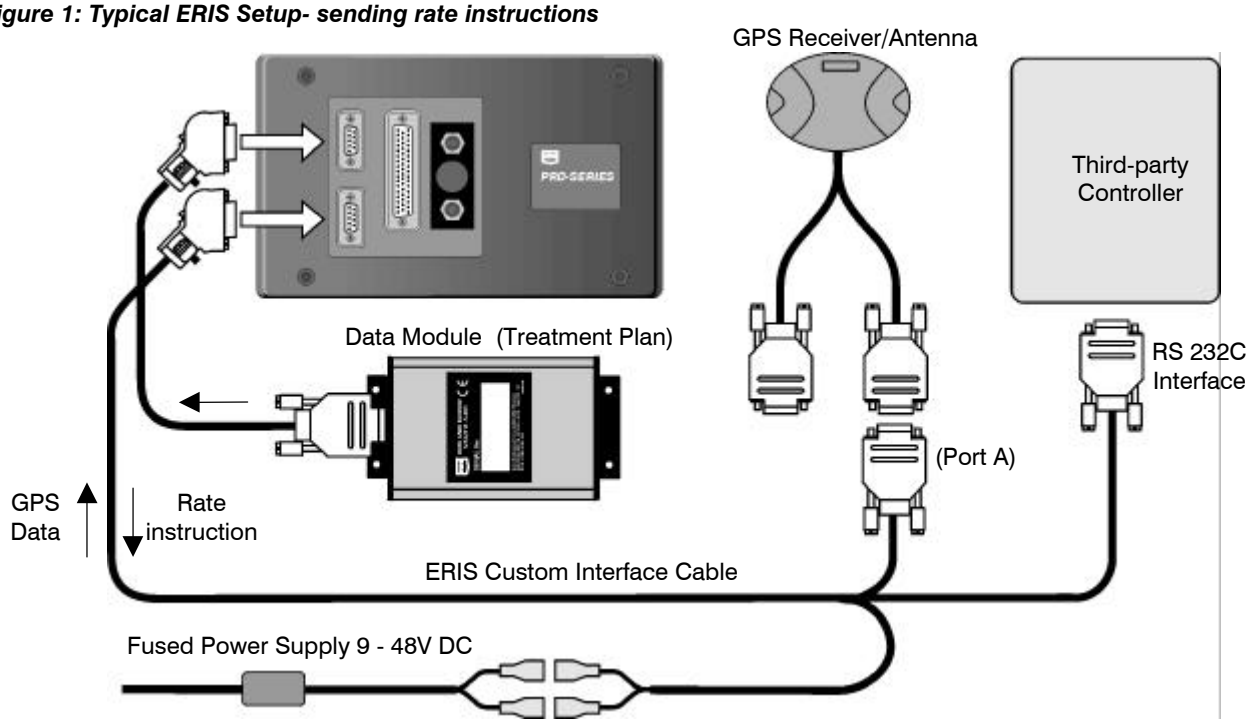
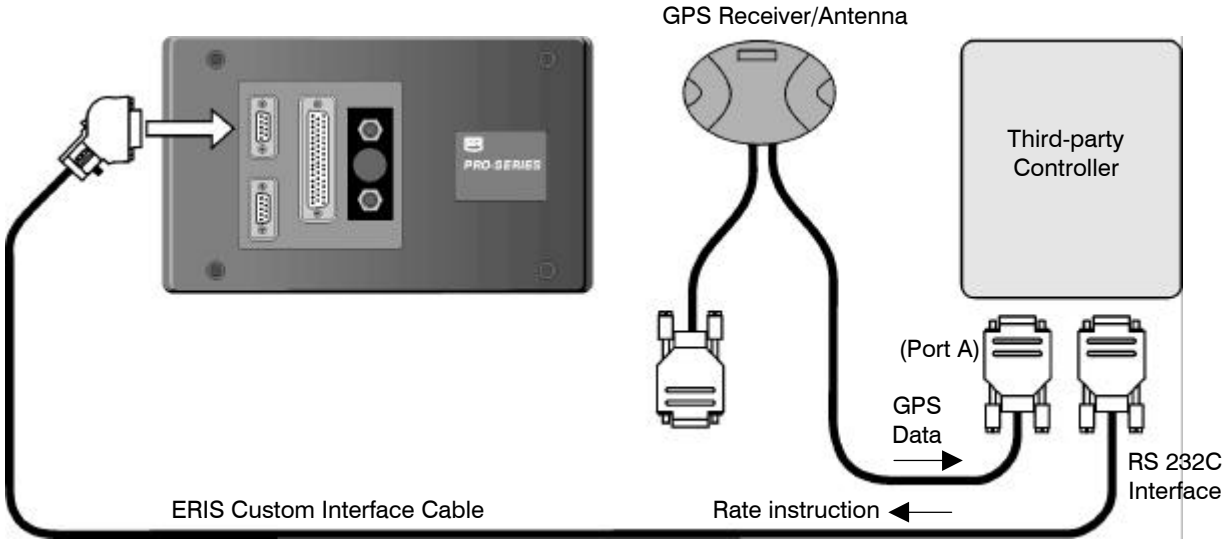


Figure 2: Typical ERIS Setup- receiving rate instructions



NOTE: Power Supply as normal via Pro-Series 50-way 'D' connector

The following sections give specific information for each type of implement controller. The sample messages given, allow you to verify that the correct data is being transmitted via the RS232 serial interface. To verify the message stream, connect the controller 9-way 'D' connector of the RDS interface cable to the COM port of the PC, and view the data using a terminal emulation program such as Hyperterminal within Microsoft Windows.

6.1 Sending Rate instructions to Vicon (EDW) / Berthoud (Bertronic) /Lely (Centronic) Tive (Tivetronic)

RDS Cable Pt No. Ref. Figure 1 : Use S/CB/268-1-**053** (Tivetronic - see note below)

PS Port setup Top port: 'RDS PF MODULE'

Bottom port: 'GPS(4800) + Vicon' / 'GPS(9600) + Vicon' depending on your GPS baud rate configuration.

Serial data format (Slave): RS232 C / NMEA: 4800, 8, 1, N, no handshake

Data Message (1Hz) The message starts with a '$' sign and ends with a '*' delimiter. Data fields are separated by a comma. Only the RATE data field is communicated. Checksum (error detection), Carriage Return and Line Feed are hexadecimal ASCII code.

Example message: **$RATE, 100.0 * 01 <13> <10>**

Message string identifier

Data field 1: Application Rate

Checksum

Carriage Return

Line Feed

NOTE: To connect to the Tivetronic controller requires the 'Tivetronic/AgroNet RS232 Setpoint Receiver Module'. This connects to the Tivetronic coaxial cable and has an RS232 connector on the back.

6.2 Sending Rate instructions to Bogballe Calibrator 2002 / 2003

RDS Cable Pt No. Ref. Figure 1 : Use S/CB/268-1-**047**

PS Port setup Top port: 'RDS PF MODULE'

Bottom port: 'GPS(4800) + Bogballe' / 'GPS(9600) + Bogballe' depending on your GPS baud rate configuration.

Serial data format (Slave): RS232 C: 4800, 8, 1, N, no handshake

Data Message (1Hz): 3 bytes are sent to set the application rate. Each byte is hexadecimal ASCII code.

Example message: **4F 00 64**

Byte 3: The lower 8-bit of the 16-bit binary application rate in kg/ha

Byte 2: The higher 8-bit of the 16-bit binary application rate in kg/ha

Byte 1
(The letter 'O')

In this example, Hex 0064 is a rate instruction for 100 kg/ha. The Calibrator 2003 can return a message confirming the actual rate (see note 1 above). The Calibrator 2002 can not.

6.3 Sending Rate instructions to Amazone Amatron IIA

RDS Cable Pt No. Ref. Figure 1 : Use S/CB/268-1-**052**

PS Port setup Top port: 'RDS PF MODULE'

Bottom port: 'GPS(4800) + Amatron' / 'GPS(9600) + Amatron' depending on your GPS baud rate configuration.

Serial data format (Slave): RS232 C: 4800, 8, 1, N, no handshake

Data Message (1Hz): The message consists of 11 bytes in hexadecimal code.

Example message: 00 FF 30 53 00 00 **01 25** 00 00 54

4-byte identifier

Rate instruction (e.g. 125 kg/ha)

Checksum

6.4 Sending Rate instructions to Fieldstar (or via Fieldstar to Väderstad / Horsch (Agtron))

RDS Cable Pt No. Ref. Figure 1 : You can use either S/CB/268-1-**047** (Bogballe), S/CB/268-1-**080** or S/CB/268-1-**053** (Tivetronic) cables. The only difference is the length of the lead.

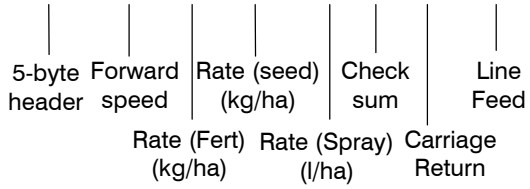
PS Port setup Top port: 'RDS PF MODULE'

Bottom port: 'GPS(4800) + FS TYPE 1' / 'GPS(9600) + FS TYPE 1' depending on your GPS baud rate configuration.

Serial data format (Slave): RS232 C: 4800, 8, 1, N, no handshake

Data Message (1Hz): The message starts with a '$' and ends with a '*' delimiter. 5 data fields are separated by commas. Field 0 is a 5-byte header. The PS8000 transmits the forward speed signal (field 1) and the rate instruction (the application rate will appear in fields 2, 3 and 4). Checksum (error detection), Carriage Return and Line Feed are hexadecimal ASCII code.

Example message: $DOSES,8.52,100.0,100.0,100.0,*7F<13><10>



6.5 Receiving Rate instructions from Fieldstar

RDS Cable Pt No. Ref. Figure 2 : Use S/CB/268-1-**054**

PS Port setup Top port: 'Fieldstar type 1'

Bottom port: 'NOT USED'

The data message (1Hz) sent from the Fieldstar terminal is in the format shown above.

6.6 Sending Rate instructions to Väderstad

RDS Cable Pt No. Ref. Figure 1 : Use S/CB/268-1-**080**

Otherwise, setup and the data format is the same as the Fieldstar terminal (see 2.2.4 above)

6.7 Receiving Rate instructions from Agrocom ACT

RDS Cable Pt No. Ref. Figure 2 : Use S/CB/268-1-**032** (Pro-Series-PC Upload Cable). The power lead with crimped terminals is not connected as the power supply to the PS8000 is via the 50-way 'D' connector.

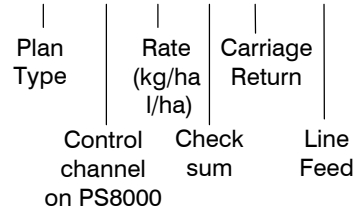
PS Port setup Top port: 'Agrocom ACT'

Bottom port: 'NOT USED'

Serial data format: RS232 C: 4800, 8, 1, N, no handshake

Data Message (1Hz): The message starts with a '$' and ends with a '*' delimiter. 3 data fields are separated by commas. Checksum (error detection), Carriage Return and Line Feed are hexadecimal ASCII code.

Example messages:
$FERT,1,100.0*1B<13><10>
$SEED,2,100.0*09<13><10>
$SPRAY,3,100.0*57<13><10>



6.8 Receiving Rate instructions from Hydro-N Sensor

RDS Cable Pt No. Ref. Figure 2 : Use S/CB/268-1-**032** (Pro-Series-PC Upload Cable). The power lead with crimped terminals is not required as the power supply to the PS8000 is via the 50-way 'D' connector.

The cable connects to the junction box of the Hydro Agri 'Tractor cable harness' (ref. section 5 of their operation manual).

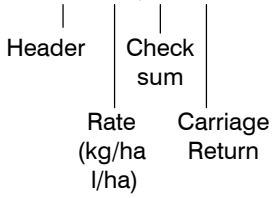
PS Port setup Top port: 'Hydro-N Sensor'

Bottom port: 'NOT USED'

Serial data format: RS232 C: 4800, 8, 1, N, no handshake

Data Message (1Hz): The PS8000 should be receiving the following message format,

Example message: $AR**0150**,1F<13>



6.9 Sending Rate instructions to LH5000 V4

RDS Cable Pt No. Ref Figure 1: Use S/CB/268-1-**073.** There is a 25-way female 'D' on the rear of the 5000 which is the 'GPS' port. This requires an LH5000 – DataLink RS232 cable to which the RDS cable is connected.

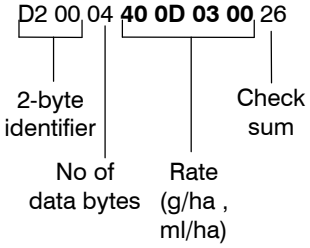
PS Port setup Top port: 'RDS PF MODULE'

Bottom port: 'GPS(4800) + LH5000 v4' / 'GPS(9600) + LH5000 v4' depending on your GPS baud rate configuration.

Serial data format (Slave): RS232 C: 9600, 8, 1, N, no handshake

Data Message (1Hz): NB. The LH 5000 must be configured to have the GPS switched OFF. This stops it looking for the LH Data Link. The message consists of 8 bytes in hexadecimal code. The rate instruction is a 4-databyte field. In the example, a rate of 200 l/ha set on the PS8000 is sent as '40 0D 03 00' or 200,000 ml/ha.

Example message: D2 00 04 **40 0D 03 00** 26



6.10 Sending Rate instructions to Raven SCS Console

RDS Cable Pt No. Ref Figure 1: Use S/CB/268-1-**053.**

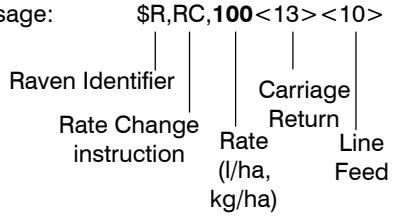
PS Port setup Top port: 'RDS PF MODULE'

Bottom port: 'GPS(4800) + RAVEN' / 'GPS(9600) + RAVEN' depending on your GPS baud rate configuration.

Serial data format (Slave): RS232 C: 9600, 8, 1, N, no handshake

Data Message (1Hz):

Example message: $R,RC,**100**<13><10>



Document History

Issue 1: 5/1/04 Replaces UK202-5.