Pro-Series 101
Machine Monitor
Operation and Calibration

RDS Part No.:	S/DC/500-10-462
Document Issue:	1 : 21/5/04
Software Issue:	PS303-007 rev.00

Electromagnetic Compatibility (EMC)

CE

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

Service and Technical Support

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

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

\UK462-1.DOC

1. Introduction

The Pro-Series 101 is primarily a machine operating monitor able to keep the operator comprehensively informed of the operational status of complex machines such as self-propelled harvesters.

The PS101 is a 'generic' monitor. That is, by utilising appropriate sensors from a wide range of standard RDS installation kits, the system can be customized for almost any type of self-propelled machine. Therefore, the information in this manual is not specific to any particular application. Example applications are given where it can help to illustrate how the instrument is used.

1.1 Input and Outputs

The instrument can monitor up to 14 inputs including;

(i) Forward Speed plus high/low speed alarm

(ii) Engine Speed plus high/low speed alarm

(iii) 8 Shaft Speed Inputs plus high/low speed alarms

(iv) 4 analogue Inputs (e.g. Oil Temp., Water Temp, etc) plus high/low alarms. The analogue inputs can appear on screen as a sliding bar display, or a numerical display.

(v) 2 switching inputs e.g. Hopper Level, Guard position etc. When either of these inputs ('Alarm A' and 'Alarm B') switches to 0V, the instrument will alarm.

(vi) 1 input (I/P 3) that when switching to 0V, triggers an output (O/P 1) after a programmable delay time.

1.2 Display functions

As well as displaying forward speed, engine speed 8 shaft speeds and analogue inputs, the instrument also calculates and displays the following,

(i) Part Total, Total and Grand Total of Area worked (hectares / acres)

(ii) Part Total, Total and Grand Total of Distance travelled (km / miles)

(ii) Part Total, Total and Grand Total of Time in Work

(iii) Part Total, Total and Grand Total Average Work Rate (ha/hr / acres/hr)

(iv) Accumulated Engine Hours.

(v) Programmable service intervals - time remaining to service points A and B, including alarm function.

1.3 Data Logging

The PS101 can record and store up to 75 individual job summaries to the internal memory (there is no provision to add a Data Card Module for external storage).

A job summary can also include up to 12 supplementary data e.g. Operator Name, Wind Speed, Air Temperature etc. The job number is generated automatically.

Data can be printed to an RDS ICP200 In-Cab Printer or downloaded via cable to a PC or PDA, either as an ASCII formatted text file or in comma-separated variable (.csv) format suitable for inclusion into spreadsheet applications.

1.4 Calibration and Setup

An extensive setup menu makes the instrument highly adaptable to suit a wide range of applications. Many of the settings need only be done on initial installation or if the system is transferred to another machine. Unauthorized access to these settings is preventable by means of user-programmable PIN access codes.

Settings that may need adjusting on a more regular basis during normal operation, are contained in a separate 'Operator' section of the setup menu.

2 Normal operating Mode

2.1 Startup

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

2.1.1 Menu keys

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

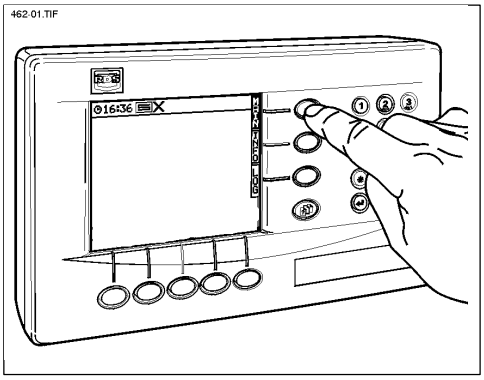


Figure 1

The four menu keys to the right of the screen access the primary screen pages (those viewed during normal operation). There are three primary screens MAIN, SHFT and INFO for normal operating functions, and another screen for calibration and setup 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.

2.1.2 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 preceeding a numerical entry, will set a MINUS value.

The 0 key will toggle between 0 and a SPACE.

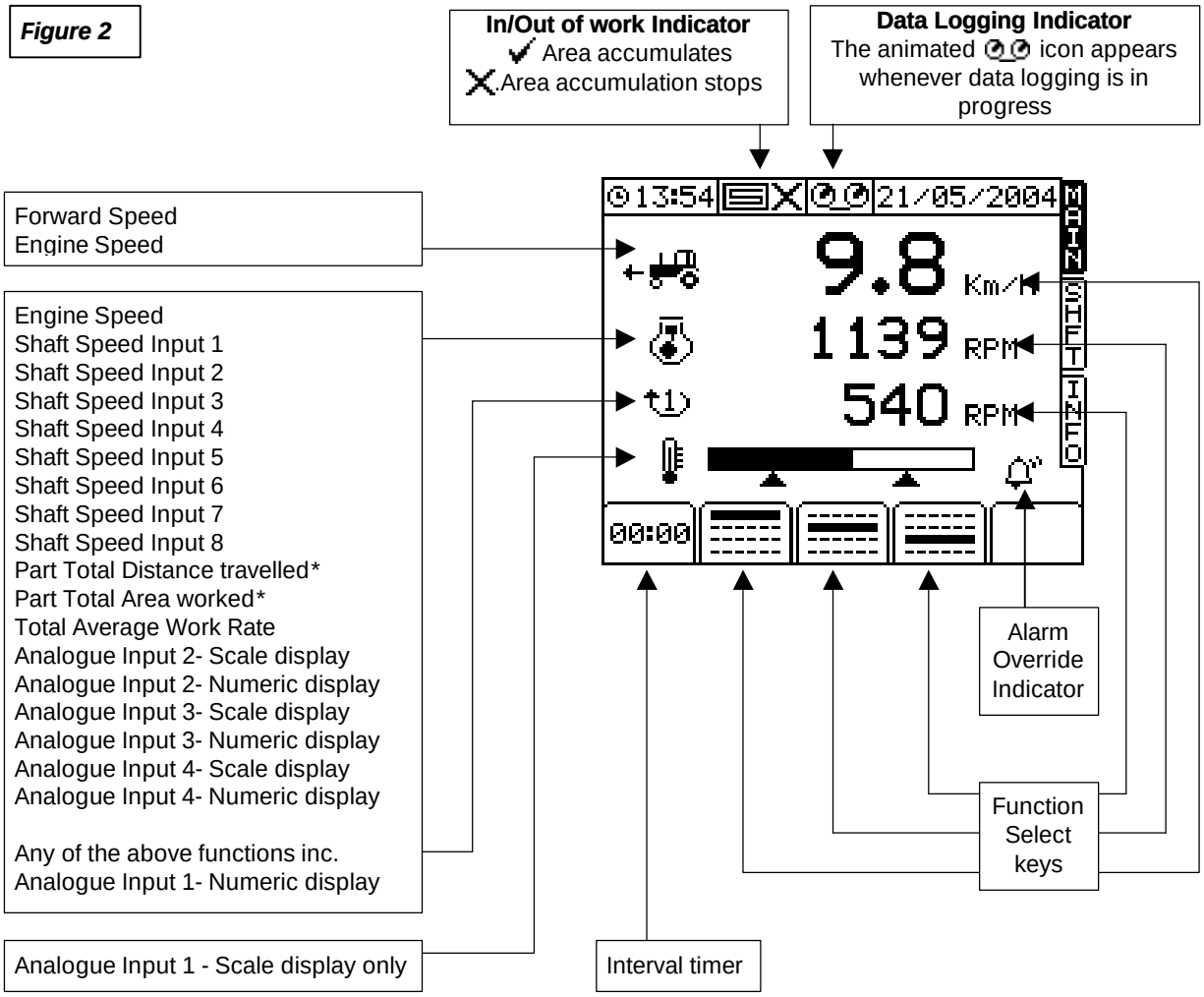
The ← key will BACKSPACE the screen cursor if you need to re-enter a character.

The ↵ key is the RETURN key and is normally pressed to confirm the data entry into memory.

2.2 The MAIN Display

This is the main operating display which the instrument defaults to when switched on. It is possible for the instrument to monitor up to 14 different inputs, so you can select the 3 numerical displays most relevant to you at any time on the MAIN screen, using the softkeys (top line), (2nd line) and (3rd line).

Figure 2



**Part Total Area and Part Total Distance functions can also be viewed on the INFO screen*

Forward Speed, Engine RPM, Shafts 1 - 8 and Analogue Inputs 1 -4 all have programmable high and low alarms

2.2.1 Forward Speed / Engine RPM Alarms

When the forward speed or Engine RPM is too low or too high, the instrument defaults to a standard alarm display (fig. 3).

The instrument beeps continously until the alarm is manually overridden or the input is restored within the limits.

You can choose to override the alarm condition by pressing the key, in which case the instrument will return to the previous operating display. However, when an alarm is overridden, an icon will remain flashing on the MAIN and SHFT screens (as shown in figure 2) to indicate that the alarm has been ignored.

Figure 3

NOTE: The default settings are:-

Forward speed alarm - 40km/h (25mph) and 0 kph.
Engine RPM alarm OFF

The forward speed alarm thresholds are set in the 'Operator' Mode (section 4.1).

2.2.2 Analogue Input Scale

NOTE: The analogue input is only displayed when it is is enabled via the 'Factory ' menu.

The marker positions (fig. 4) are set in the 'Technician' mode and normally represent the alarm limits, although this may not necessarily be the case depending on the operators' requirements.

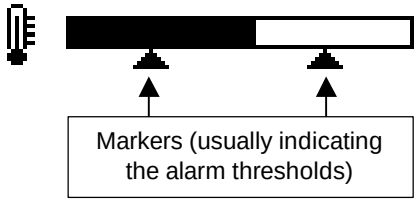


Figure 4

2.2.3 Analogue Input Alarm

When the analogue input (e.g. Oil Temperature, Water Temp., Air Pressure etc) is too low or too high, the instrument defaults to the standard alarm display (fig. 5) indicating both the analogue scale in question and its corresponding digital value.

The instrument beeps continously until the alarm is manually overridden or the analogue input is restored within the limits.

You can choose to override the alarm condition by pressing the [🔔×] key, in which case the instrument will return to the previous operating display. However, when an alarm is overridden, an 🔔 icon will remain flashing on the MAIN and SHFT screens (as shown in figure 2) to indicate that the alarm has been ignored and not corrected.

NOTE: You cannot reselect the alarm display once you have overridden it.

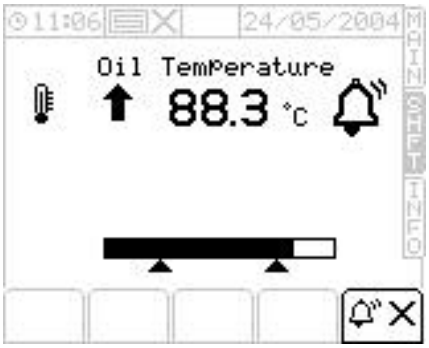


Figure 5

2.3 The SHFT (Shaft Speed) Display

Pressing the SHFT key selects the shaft speed display (fig. 6). The shaft name as programmed in the 'Technician' setup mode is displayed next to the shaft number icon. Press the appropriate lower key to view other shaft speeds, or [1234 5678] to view all 8 shaft speeds together (fig. 7).

Figure 6

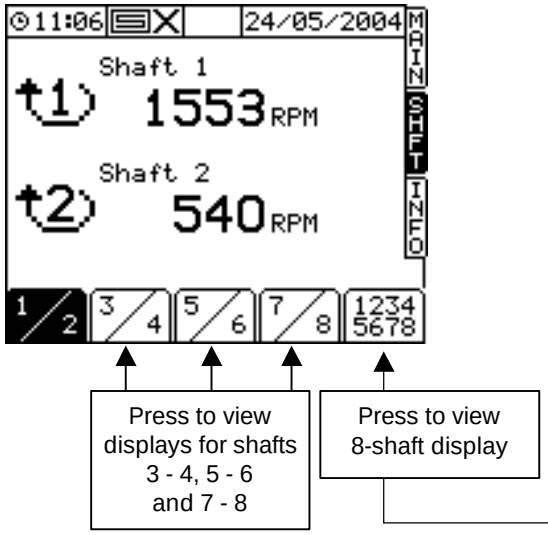
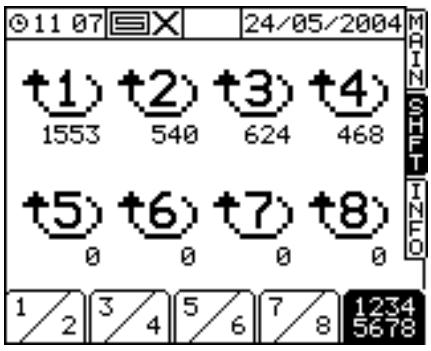


Figure 7



2.3.1 Shaft Speed Alarm Displays (Shafts 1 - 8)

An high speed and low speed audible alarm can be enabled for shafts 1 -8 in the 'Operator' setup mode. When a shaft speed is too low or too high, the instrument defaults to the alarm display (fig. 8) indicating the shaft or shafts in question, and the instrument beeps continously until the alarm is manually overridden or the shaft speed is restored within the limits.

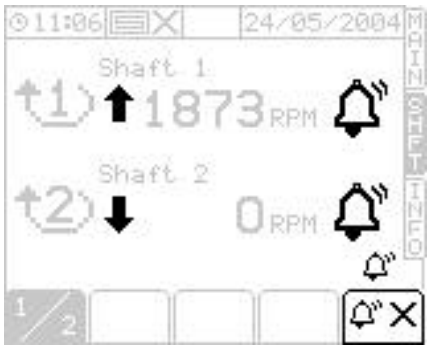


Figure 8

Press to override alarm(s)

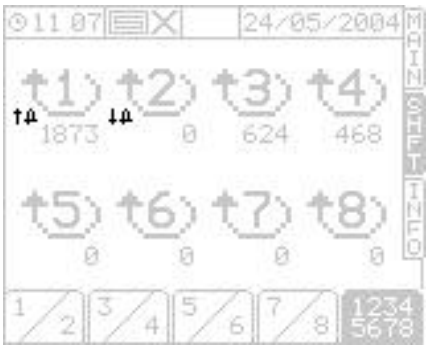


Figure 9

The ↑ icon indicates high speed and the ↓ icon indicates low speed. Similarly, on the 8-shaft display (fig.9), the ↑↑ icon indicates a high speed alarm and the ↓↓ icon indicates an low speed alarm.

You can choose to override the alarm condition by pressing the [🔔×] key, in which case the instrument will return to the previous operating display. However, when an alarm is overridden, an 🔔 icon will remain flashing on the MAIN and SHFT screens (as shown in figure 2) to indicate that the alarm has been ignored.

2.4 The INFO Display

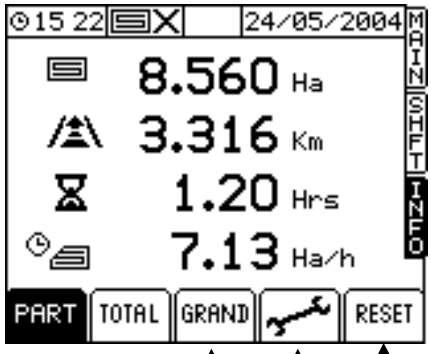
2.4.1 Totaliser functions

Figure 10

Pressing the INFO key displays the part total and full total (independently resettable to zero), and the grand total (not resettable by the operator) for the Area, Distance, Time worked and Work Rate functions.

The Work Rate (⏱) is not an instantaneous rate. It is the *average* rate since the PART total or TOTAL was last reset,

The area and distance registers record to 99999 then go to zero.



Reversed graphic indicates which totals are displayed

The GRAND TOTALS are <u>not</u> resettable from the INFO screen.
They can however, be independently set to zero or adjusted to a desired figure via the 'Factory' mode (fig.25)

Press to select Service Interval display (2.4.2)

Press to reset either the 'PART' total or 'TOTAL' total depending on which is selected

NOTE: The PART Area and PART Distance functions can also be selected on the MAIN screen

2.4.2 Engine Hours and Service Interval Timer

Pressing the key selects the Service Interval display.

NOTE: The timer counts only while the engine is running.

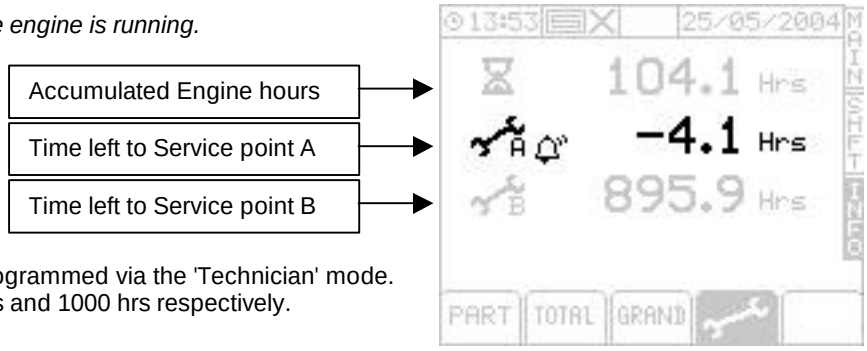


Figure 11

Service points A and B are programmed via the 'Technician' mode. The default settings are 100hrs and 1000 hrs respectively.

2.4.3 Service Interval Alarms

In the example shown by figure 11, note that service interval A has been exceeded, indicated by a minus hours count. To remind the operator that a service is overdue, a flashing icon appears by the relevant service interval.

The instrument defaults to the standard alarm display (as with other alarms) and beeps continously until the alarm is manually overridden or the service interval is reset via the 'Technician' mode.

You can choose to override the alarm condition by pressing the key, in which case the instrument will return to the previous operating display. However, when the alarm is overridden, an icon will remain flashing on the MAIN and SHFT screens (as shown in figure 2) to indicate that the alarm has been ignored.

2.4.4 'A' and 'B' Alarms

In addition to the Forward speed, Engine RPM and Shaft RPM alarm functions, the instrument can be configured for two additional alarm inputs to indicate the operational status of some part of the machine, e.g. hopper level low, unloading auger extended, guard open etc.

When the alarm is triggered, the instrument will default to the alarm screen in the same way as for the other alarm functions, and you have the option to override the alarm by pressing the key.

These alarms are configured via the 'Technician Mode (section 4.7).

3 Data Logging

The PS101 can record and store up to 75 individual job summaries to the internal memory. There is no provision to add a Data Card Module.

A job summary can also include up to 12 supplementary data e.g. Operator Name, Wind Speed, Air Temperature etc. The job number is generated automatically. Data can be printed out or downloaded via cable to a PC, either as an ASCII formatted text file or in comma-separated variable (.csv) format suitable for inclusion into spreadsheet applications.

3.1 Starting and Ending a Job Summary

1. Press the key and then press to display the logging page (fig. 12). Press '**1**' and the 'extended data function' page is displayed (fig.13).
2. Entering extended data is optional. If you do not want to edit the extended data functions, simply press again to start logging.

Figure 12

Figure 13

Whenever the instrument is logging, the animated icon appears at the top of the MAIN, SHFT and INFO displays.

3. Press '**2**' and then press to end the job.

   The display will automatically increment to the next job number.

Figure 14

3.1.1 Editing Extended Data Functions

The job summary can include up to 12 supplementary data. All 12 data fields can be user-defined to suit your requirements e.g. Operator Name, Wind Speed, Air Temperature, Growth stage etc.

The factory default function description is "Function (#)". This can be re-programmed from the 'Operator' mode.

1. The factory default function data is "Name (#)" (as in fig. 13). To edit this, move the cursor to the appropriate line and press to clear the entry.
2. Enter the new data (up to 20 alpha-numeric characters) via the keypad.
3. Press to confirm the entry. Repeat this procedure as required for other 'F' functions.

NOTE: The programmed data will be stored in memory and appears for subsequent job summaries until re-edited.

4. Move the cursor to and press to start logging.

3.2. Print / Download / Reset Summary Data

You can view, delete, print or download one or more jobs. Each job includes all the basic data listed below (fig. 17) along with any extended data that was programmed. As data is transmitted from the instrument a "progress bar" will be displayed on the Pro-Series.

3.2.1 Printing / Downloading Summary Data

NOTE: If you do not already have a printer connected to the instrument, refer if necessary to section 3.2.4 on how to set up.

1. From the logging page (fig. 12), press '**3**' to display the 'Data Out' page (fig.15).

   For printing to an RDS ICP200 In Cab Printer (or similar type printer), ASCII text output is selected, indicated by the TEXT MODE key icon.

   If downloading data to a PC or PDA, then select data (.csv format) indicated by the DATA MODE key icon.

2. By default, the last job only is selected for printing. Press PRNT to print the last summary...

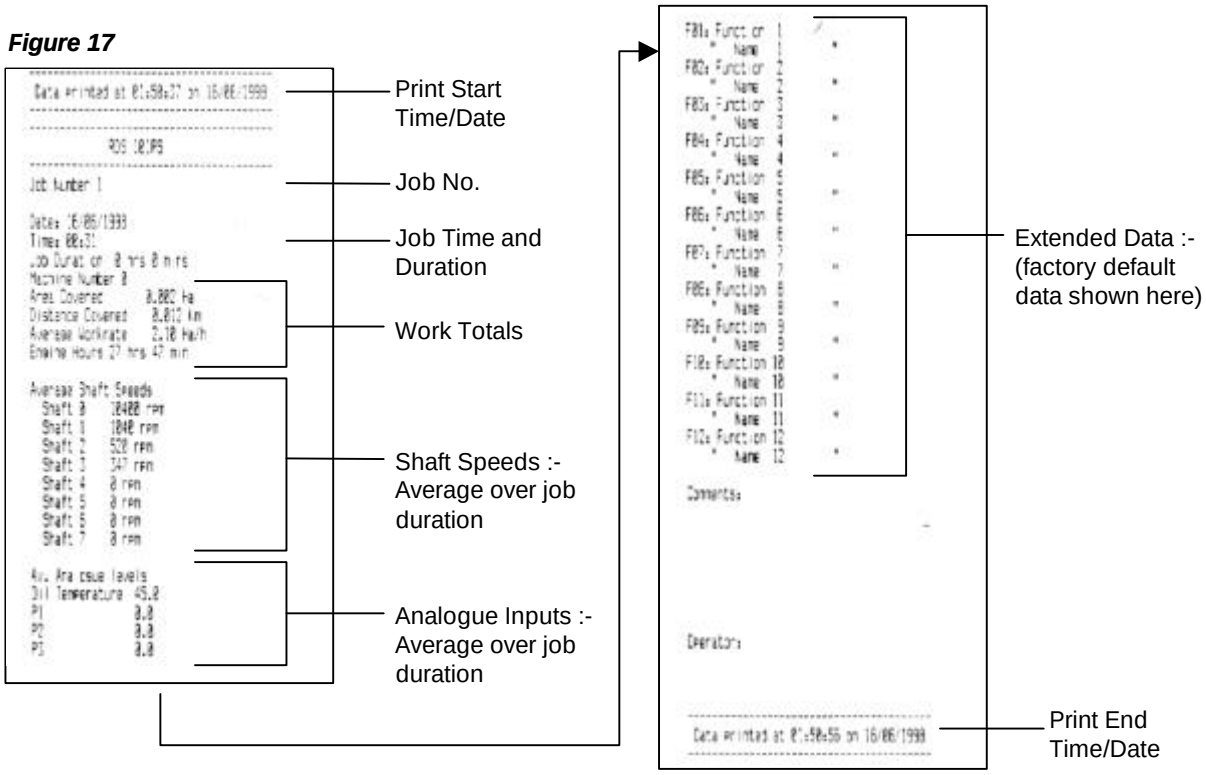
Figure 15

Figure 16

3. ...or press RANGE and enter the job numbers for the range of job summaries (fig. 16), and then press PRNT.

3.2.2 Text (ASCII) Output Format

Figure 17



For comparison, the same data is also shown in .CSV format (section 3.3.6).

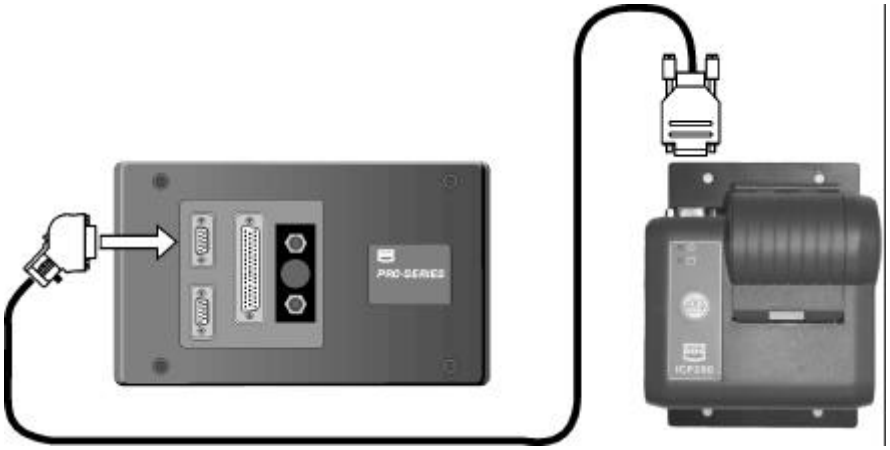
3.2.3 Reset Summary Data

1. From the logging page (fig. 12), press '4' to display the 'Data Reset' page (fig 17).
2. As with printing, you can select either the last job or a range of jobs.
3. Simply press RESET to delete the job(s) and return to the logging page (fig. 12).

Figure 17

3.2.4 Pro-Series Setup for ICP 200 Printer

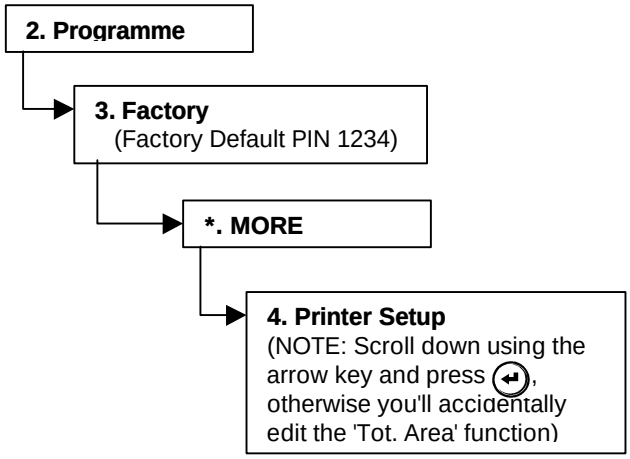
Connect the printer to the TOP port on the instrument using Cable Pt No. S/CB/268-1-**049**. The RDS printer is also powered via this cable).



S/CB/268-1-049

In-Cab Printer

Configure the top port to recognize the ICP 200 printer by selecting the 'Printer Setup' page from the setup menu...



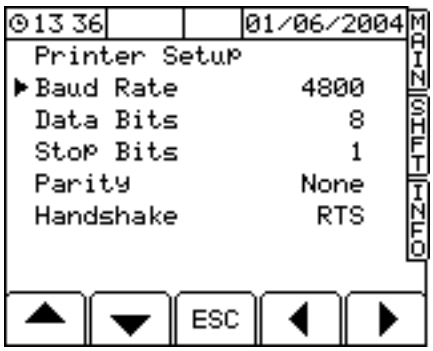


Figure 18

and set the protocol to 4800,8,1,No Parity, and either RTS or XON handshaking.

3.2.5 Pro-Series Setup for other Printers

NOTE: The power supply from the top port of the instrument is exclusively for the ICP200 printer.Other printers can of course be connected, but must utilise a separate power source.

A standard serial interface cable is available for connection to other printers ref. RDS Pt. No. S/CB/268-1-**031.** cable. The protocol settings may be different to the RDS printer. Refer to your printer manual.

3.2.6 Pro-Series Setup for PC/PDA Download

Set the protocol to 4800,8,1,No Parity, and **XON** handshaking (see 3.2.5). Refer to section 3.3 / 3.4 for configuring PC/PDA.

3.3. Downloading Summary Data to a PC

You can send data as a **.txt** or **.csv** file. The CSV format is ideal for importing the data into a spreadsheet. The data is saved to the PC using a terminal emulator programme such as 'Windows Hyperterminal' or the 'RDS Data Capture' utility (free download available from www.rdstec.com).

3.3.1 Pro-Series to PC link

1. Connect from the TOP port on the instrument to the COM 2 port (COM 1 is generally used by the pointing device) on the PC, using a 'Pro-Series to PC Upload' cable Pt No. S/CB/268-1-**032** (NB. some laptops only have USB ports. In this case you will require a USB - Serial adapter available from any computer store).
2. Configure the top port of the Pro-Series (ref.section 3.2.6)

3.3.2 Creating a HyperTerminal Shortcut on Windows Desktop

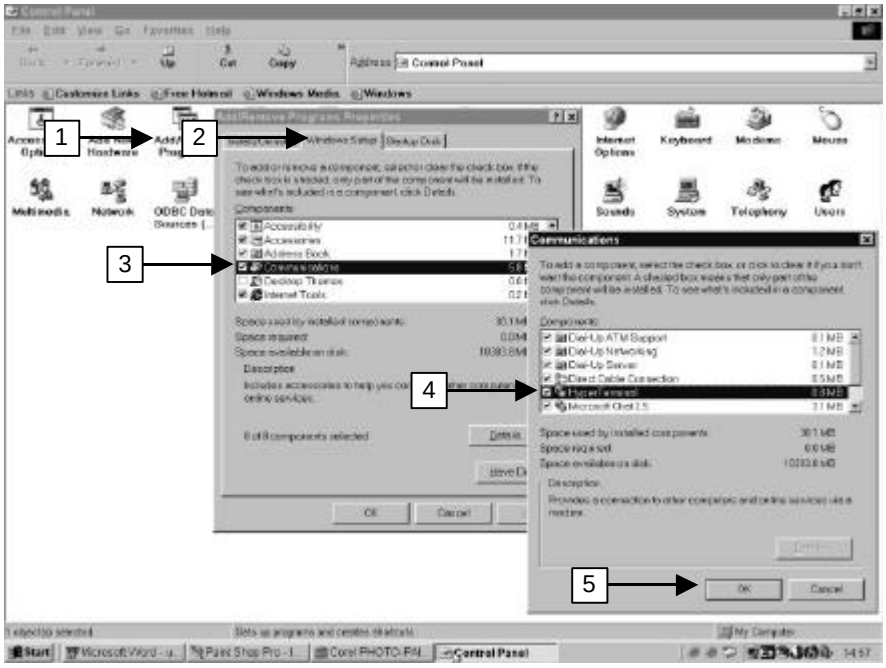
1. From the desktop, click on an empty area of the desktop background with the right hand mouse button. A message box will appear.
2. Click on '**New**' → '**Shortcut**'. The 'Create Shortcut' box will appear.
3. Click on '**Browse**' then select **C:\Start Menu\Programs\Accessories\Communications,** and select '**HyperTerminal**'. If you cannot locate it, refer to section 3.3.3 .
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.

3.3.3 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 19



3. Double click on "**Communications**", check the "**Hyperterminal** " box and click '**OK**'. (fig.19). You may require your Windows installation disc to install it.

3.3.4 Setting up HyperTerminal

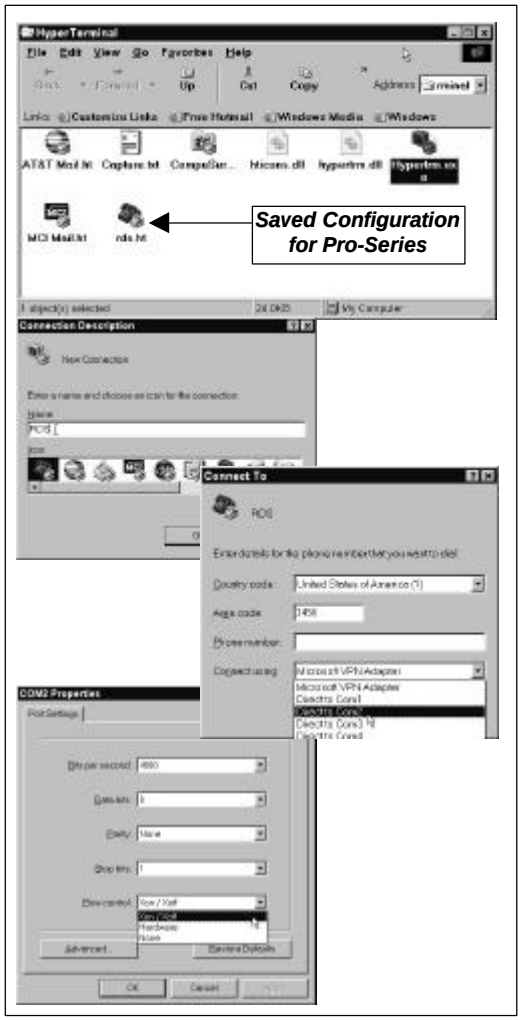
1. From the Windows 95/98 desktop, double-click on the shortcut to open the HyperTerminal folder (if you have not already created a shortcut, see section 3.3.2), and then double-click on the '**HyperTerminal.exe**' icon.
2. A 'Connections Description' box will appear. Enter a name, e.g. RDS , select 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.20).

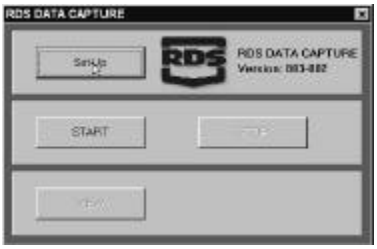
Figure 20



3.3.5 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.

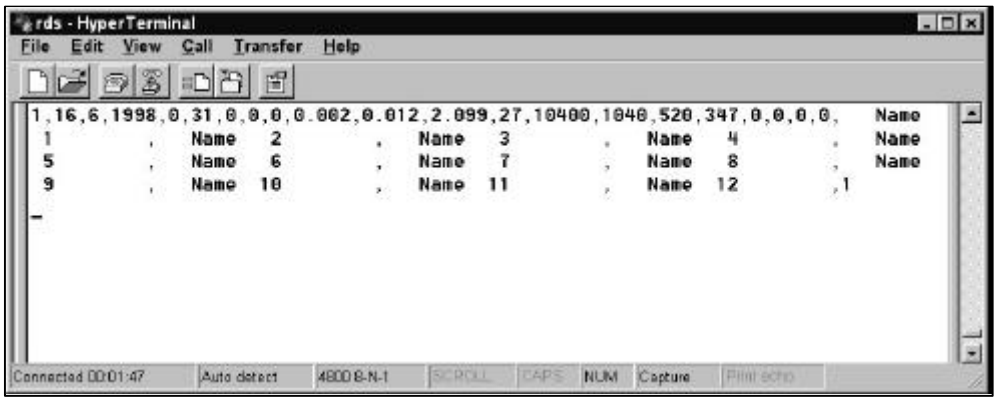
1. Simply double-click on the file 'Data Capture Install.zip' in the C:\TEMP directory to view the contents of the zip file.
2. Double-click on 'Setup.exe to run the install program. An icon is created on the desktop.
3. Double-click the icon to start the programme then click **'Set-Up**' to configure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



4. Type a filename for the data to be saved and click '**Save**'. Data will now be saved to that file any time you press the PRNT key on the Pro-Series screen.
5. To view the data as it is transmitted, press the 'VIEW' button in the 'Data Capture' window.

3.3.6 Data (.CSV) Output

Figure 21



For comparison, the same data is shown as text output (section 3.2.2).

3.4 Downloading to a 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;

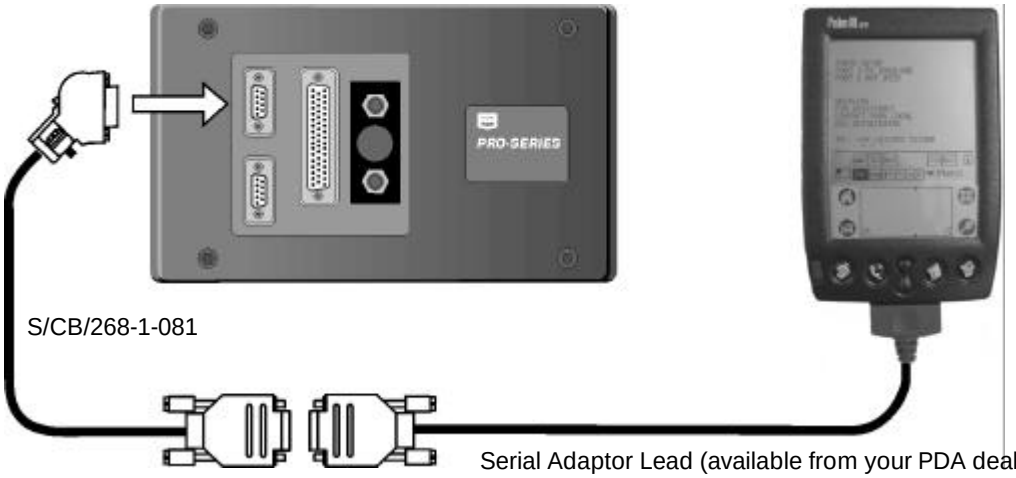
Baud:	4800
Data bits:	8
Parity:	None
Stop Bits:	1
Flow Control:	Xon/Xoff

(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 of the Pro-Series (ref.section 3.2.6)
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. 22).

Figure 22



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.

Typing "Windows CE Terminal Emulator" (leave out the quotes) into a search engine should provide plenty of information, including forums where the latest advice on installation and configuration is freely available.

4 Setup and Calibration Menu

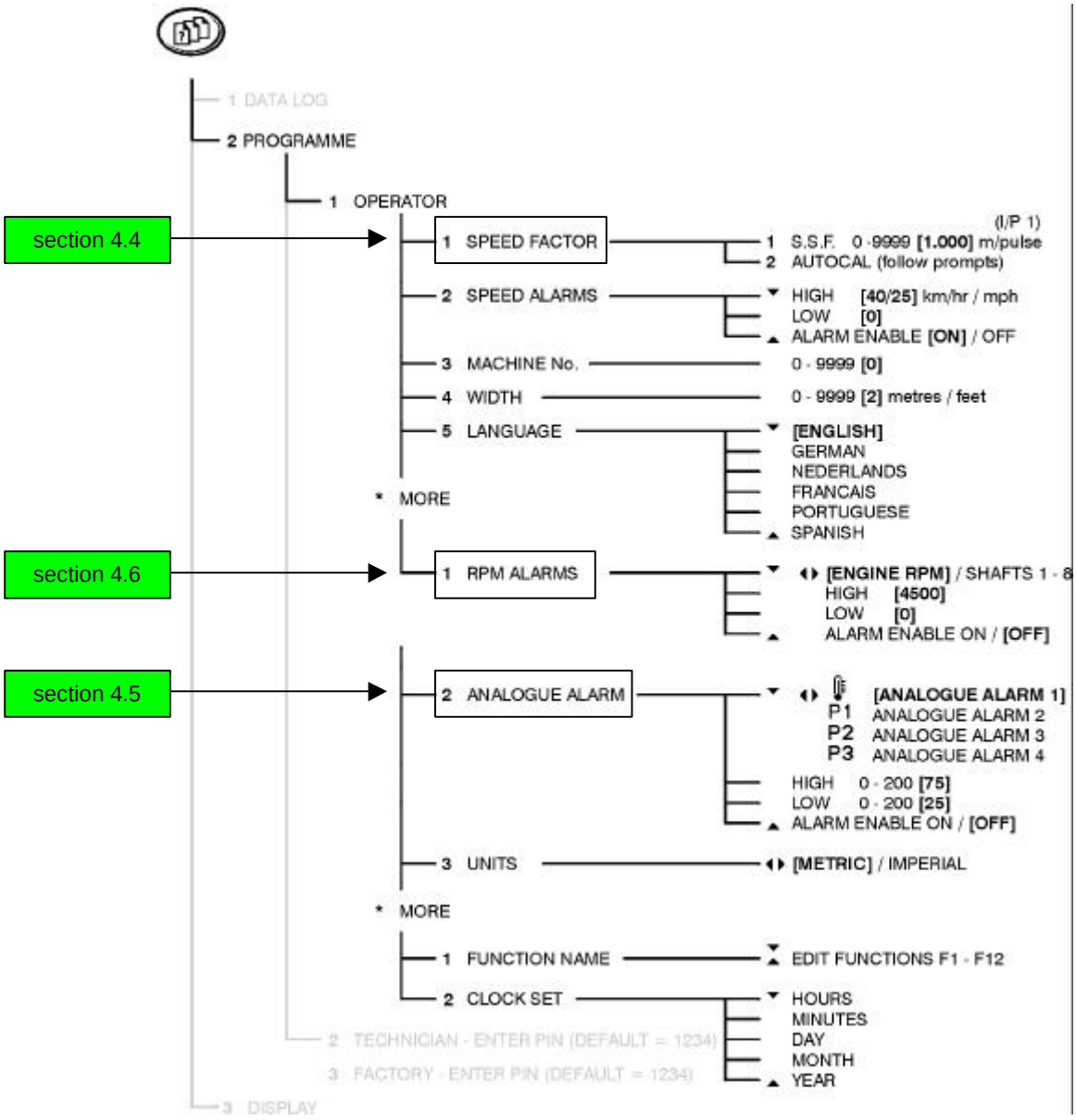
Many settings in the menu are self-explanatory, however, for settings highlighted by [ ] , refer if necessary to the appropriate section for additional information.

It is not usually necessary for the operator to access the 'Technician' or 'Factory modes during normal operation, hence the need to enter a PIN code. It is recommended that to prevent unauthorized access to these menus, that the factory default PIN is changed after completing installation and calibration. If you do change the PINs, make sure to note them elsewhere for future reference.

NOTE: Wiring connections where given, refer to the 40-way head unit lead Pt No. S/CB/174-2-021 being fitted, not the standard 30-way Pro-Series lead.

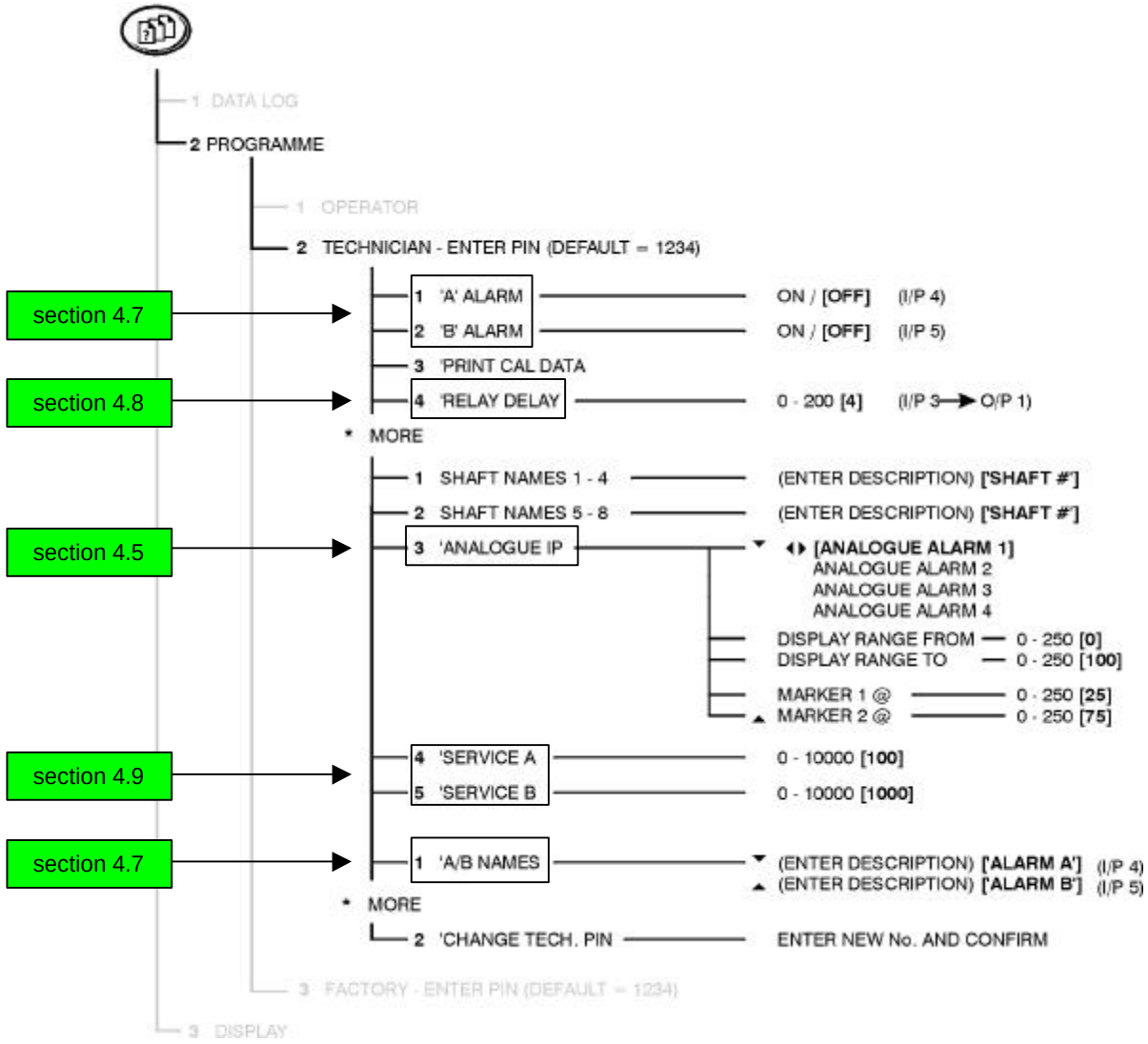
4.1 'Operator' Mode Menu

Figure 23



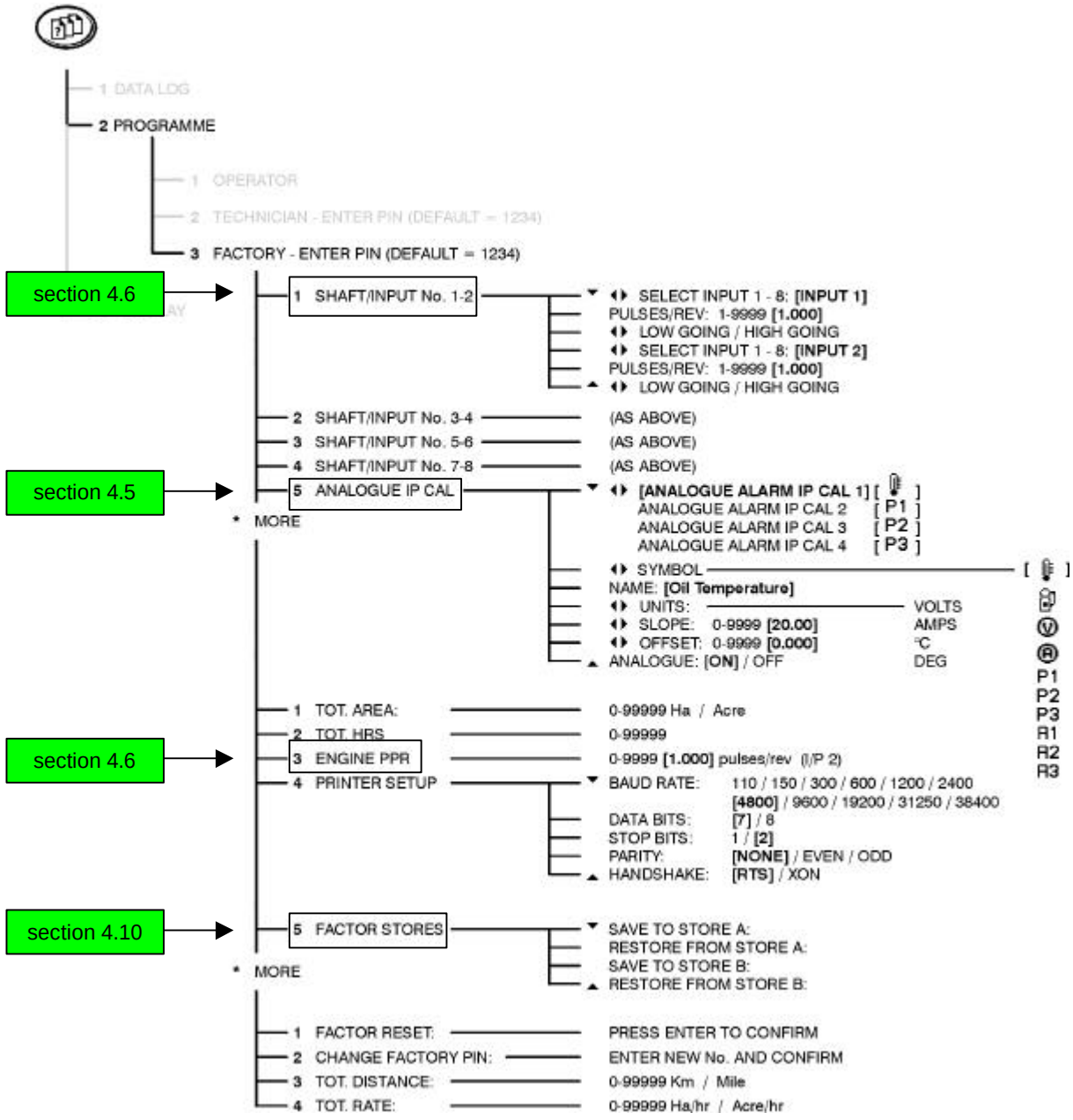
4.2 'Technician' Mode Menu

Figure 24



4.3 'Factory' Mode Settings

Figure 25



4.4 Forward Speed Sensor Calibration

The forward speed is displayed either in miles/hr or km/hr according to the units selected in the 'Operator' Mode. In order to display the correct speed and accumulate distance correctly, the instrument must be programmed with the correct Speed Sensor Factor (SSF).

The factory default setting is 1.000 m (39.39") per pulse.

This is the distance travelled between pulses received from the sensor. It can be calculated based on the nominal tyre diameter or rolling distance and then entered manually, however this does not take into account wheel slip, compaction or tyre deformation under practical operating conditions. The best method is to do and 'Autocal' (see below)

4.4.1 'AutoCal'

The "Auto Cal" procedure is the same for a wheel sensor or a Radar Sensor.

1. Mark a set distance of 100 metres (or 100 yards depending on the units set on the instrument) by suitable means. The surface should be representative of the average field conditions (i.e. not a paved surface). Position the vehicle with the first marker level with a suitable reference point on the vehicle.
2. From the 'Speed Factor' page, select "**Auto Cal**'. Press (↵) and then follow the screen instructions.
3. Stop the vehicle when the second marker lies up with the pre-determined reference point on the vehicle and press (↵) to end the "Auto Cal" procedure. The Speed Sensor Factor is automatically re-calculated and stored in memory.

NOTE: If you overrun the marker, do not simply reverse - repeat the "Auto Cal" procedure from the beginning.

4.4.2 Manually calculating the Forward Speed Factor

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

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

(i) ***If a single magnet is installed (as with a standard RDS Propshaft Sensor kit),*** the distance travelled for each turn of the prop shaft must be determined. To determine this distance, drive the vehicle forwards for exactly **10** revolutions of the prop shaft. Measure this distance (in inches or metres) and divide by **10**, to find the Speed Sensor Factor.

(ii) ***If 2 magnets are installed (as with a standard RDS Wheel Sensor kit)***, the distance is 1/2 the effective rolling circumference of the wheel. To determine this circumference, drive the vehicle forward in field conditions (with the implement attached if applicable), for exactly **10** revolutions of the sensed wheel. Measure this distance (in inches or metres) and divide by **20** to find the Speed Sensor Factor.

(iii) ***If 4 wheel magnets are installed***, the distance is 1/4 the effective rolling circumference of the wheel. To determine this circumference, drive the vehicle forward in field conditions (with the implement attached if applicable), for exactly **10** revolutions of the sensed wheel. Measure this distance (metres) and divide by **40** to find the Speed Sensor Factor.

Carry out this test whenever soil conditions or wheel sizes change.

(iv) ***If an RDS Radar sensor is installed,*** the Speed Sensor Factor is **0.008** m (or **0.312** inches).

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

Number of Sensor magnets required

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

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

Example Calculation

A vehicle is fitted with a single magnet mounted on the propshaft. The measured distance for 10 rotations of the sensed wheel is 47'-6".

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

4.5 Analogue Inputs

4.5.1 Analogue I/P - Configuration/Calibration

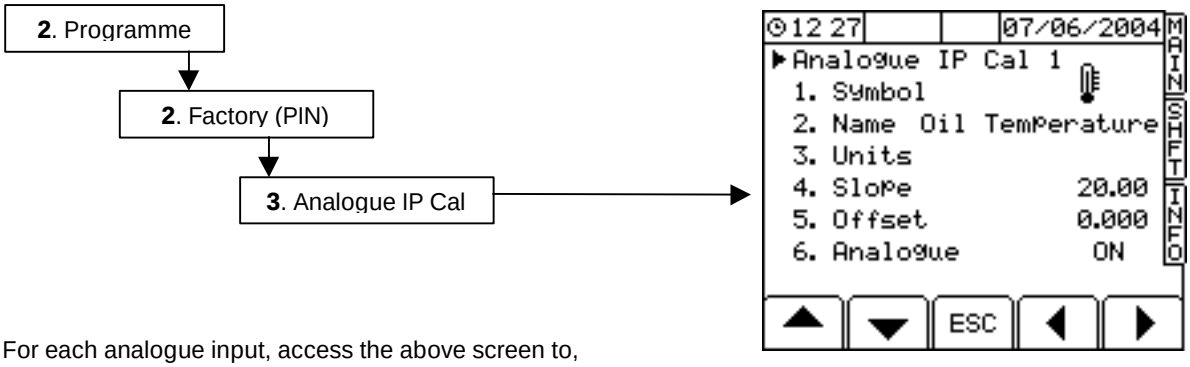


Figure 26

For each analogue input, access the above screen to,

(i) Enable/disable the input.

Set 'Analogue' 'ON' or 'OFF' (Default = All inputs ON).

(ii) Select the display symbol, Units, and enter a customized input name.

There is a range of symbols you can choose from. You can enter up to 20 alpha-numeric characters for the name. You can choose between Volts, Amps, °C or Deg for units.

(iii) Calibrate the sensor ('Slope' and 'Offset').

The slope (or 'Gain' of the sensor as sometimes referred to) = $\frac{\text{change in (unit measurement)}}{\text{change in } V_{\text{sensor output}}}$

It is assumed that the relationship is linear or close to linear i.e. a straight line on the graph.

The offset is the unit measurement (pressure, temperature etc) at $0V_{\text{sensor output}}$

If you do not already have the above information for the sensor e.g. from a data sheet, then you will need to establish the slope and offset, by the following *general method*,

1. Note the output voltage for a low measurement (e.g. a coolant sensor at ambient air temperature).
2. Note the voltage output for a higher measurement (e.g. a coolant sensor placed in boiling water).

NOTE: The greater the difference between the two measurements, the better.

3. Do the calculation as above,

   Example: You measured 1.75V at 18°C and 4.9V at 100°C.

   Slope = $\frac{(100 - 18)\ °C}{4.9 - 1.75)\ V} = \frac{82}{3.15}$ = 26.03 °C per V

   So you would programme in a slope of 26.03.

4. Plot the measured points on to a graph with voltage as the horizontal axis and the unit of measurement on the vertical axis. Draw a line through the points, extending the line back to the vertical axis (fig. 27).

   The offset is where the line meets the vertical axis (e.g. -30 °C).

   So you would programme in an offset of -30.0.

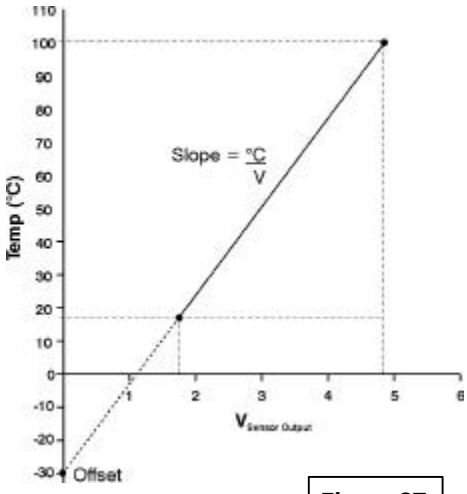


Figure 27

4.5.2 Analogue Alarm Setup

2. Programme → **1**. Operator → ***.** More → **2**. Analogue Alarm

1. Using the left and right arrow keys, select the analogue input you wish to configure.
2. Set the alarm to 'ON' (default = All inputs 'OFF')
3. Enter the 'HI' and 'LO' alarm threshold numerical values as required.

4.5.3 Analogue Display Setup

2. Programme → **2**. Technician (PIN) → **3**. Analogue IP

The '**Display Range'** settings determine the range of the analogue scale and numerical displays for each of the analogue inputs on the MAIN operating screen. You can define the numerical range between 0 and - 200, (e.g. °C, bar, angular degree etc) to suit the nature of the input.

Switching between the scale and numerical displays for the appropriate analogue input on the MAIN screen, will confirm the effect of this setting.

The '**Marker 1**' and '**Marker 2**' settings determine the position of the analogue scale markers on the MAIN screen (fig. 28). If marker 1 is set below the minimum value of the display range, and marker 2 is set higher than the maximum value, then they will not appear on the display.

These typically might be set to equal the alarm threshold numerical values in section 4.5.2.

NOTE: The 'Marker' settings DO NOT set the alarm thresholds which are set via the 'Operator' Mode.

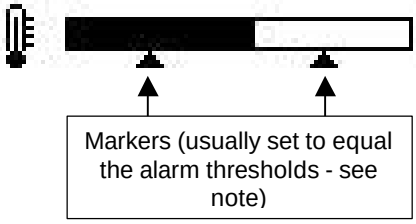


Figure 28

4.6 Shaft Inputs (1-8) and Engine PPR

2. Programme → **3**. Factory (PIN) → **1.** Shaft Input No. 1-2

2. Programme → **3**. Factory (PIN) → ***.** More → **3**. Engine PPR

Each shaft speed input must be programmed with the number of pulses per revolution of the sensed shaft, and also whether it is a low-going or high-going input. A standard RDS magnetic sensor installation, or NPN type inductive/active sensors are low going.

NOTE: Although menu items 1 -4 cover the 8 shaft inputs, you can also select all 8 shaft inputs from just menu item '1. Shaft/Input No. 1-2'.

4.6.1 Calibrating an RPM Sensor

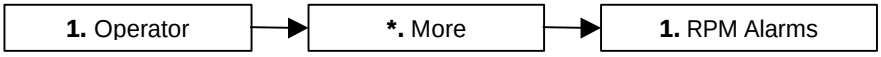
The following calibration procedure applies regardless of the speed output being sensed e.g. Engine RPM, PTO Speed, Shaft Speed, Fan Speed etc, depending on the particular installation.

In all cases, run the sensed component at a known speed. If necessary, measure this speed using a hand-held tachometer. Note the speed displayed on the "INFO" screen.

The correct factor = Initial Factor x $\frac{\text{Displayed Speed}}{\text{Actual Speed}}$

Default: 1 pulse per rev (PPR)

4.6.2 Engine/Shaft Speed Alarms Setup



1. Using the left and right arrow keys, select the input you wish to configure.
2. Set the alarm to 'ON' (default = All inputs 'OFF')
3. Enter the 'HI' and 'LO' alarm threshold numerical values as required.

4.7 'A' and 'B' Alarms

In addition to the forward speed, and RPM alarms, the instrument has two extra alarm inputs that can be assigned for monitoring particular aspects of machine operation.

Digital High speed Input 4 (Pin 21 - Red/Black wire) switching to 0V will trigger Alarm 'A'.

Digital High speed Input 5 (Pin 38 - White/Red/Red wire) switching to 0V will trigger Alarm 'B

By default, these alarm functions are disabled. Go to **1. Alarm 'A'** and/or **2. Alarm 'B'** and select '**ON**' on for the alarm to function in the normal operating mode.

You can also enter your own description for these alarms. Go to '**A/B Names**' and enter the description of up to 20 alpha-numeric characters.

4.8 Delayed Output Function

This is an independent function of the instrument. This function can be utilised where the status of a particular aspect of machine operation is required to automatically trigger a response, after a preset time delay.

Input 3 (Pin 37 - Tan wire) switching to 0V switches Output 1 (Pin47 - White/Grey wire) after a programmed time delay. The default time delay is 4 seconds. You can set this between 0 and 200 seconds.

4.9 'Service A' and 'Service B'

After servicing, reset the time in hours until the next service.

4.10 Storing and retrieving Calibration Data

Each time the instrument is powered down, all current calibration data is automatically saved to Store 'A', overwriting the previously stored data.

For extra security, the same calibration data can be manually saved to Store ' B'. This data is not overwritten each time the instrument is switched off.

All calibration data in store 'A' is however reset to factory default values after a FACTOR RESET, and store 'B' data will be cleared.

Document History

Issue 1:	21/5/04	Original Issue