LCM SYSTEMS
Solutions in Load Cell Technology

Serial Output Options for PMD & LD Series

-232   **RS232 ASCII Data output**

-485   **RS485 ASCII Data output**

RoHS 2
2011/65/EU

Software version F4.02

Warranty

We warrant this product against defects in materials or workmanship for a period of three (3) years from the date of purchase.

In the event of a defect during the warranty period, the unit should be returned, freight (and all duties and taxes) prepaid by the Buyer to the authorised distributor from where the unit was purchased.

The Distributor, at its option, will repair or replace the defective unit. The unit will be returned to the Buyer with freight charges prepaid by the distributor.

LIMITATION OF WARRANTY
The foregoing warranty shall not apply to defects resulting from:

    1. Improper or inadequate maintenance by the buyer.
    2. Unauthorised modification or misuse.
    3. Operation outside the environmental specification of the product.
    4. Mishandling or abuse.

The warranty set forth above is exclusive and no other warranty, whether written or oral is expressed or implied. We specifically disclaim the implied warranties of merchantability and fitness for a particular purpose.

EXCLUSIVE REMEDIES
The remedies provided herein are the buyer's sole and exclusive remedies.

In no event shall we be liable for direct, indirect, incidental or consequential damages (including loss of profits) whether based on contract, tort or any other legal theory.

Contents

* Need a manual urgently?
 You can download manuals from our website

General Description

This manual only covers the setup of the serial output option. Please refer to the main display's operating manual for full specifications, installation methods, safety notices etc. You can download manuals from our website.

The serial output option allows you to create an isolated RS232 or RS485 signal which provides data proportional to the nett or gross value shown on the front of your display.

This can be used to feed remote devices such as data loggers, displays, PLCs and other peripheral equipment.

There are 2 different option boards available:-

1.   An RS232 board, for short distance point to point transfer of data
2.   An RS485 board, which is suited for longer distance transmission and which may be part of a group of addressed instruments.

Both boards can be set to transmit continuously or can be requested to transmit by a data request.

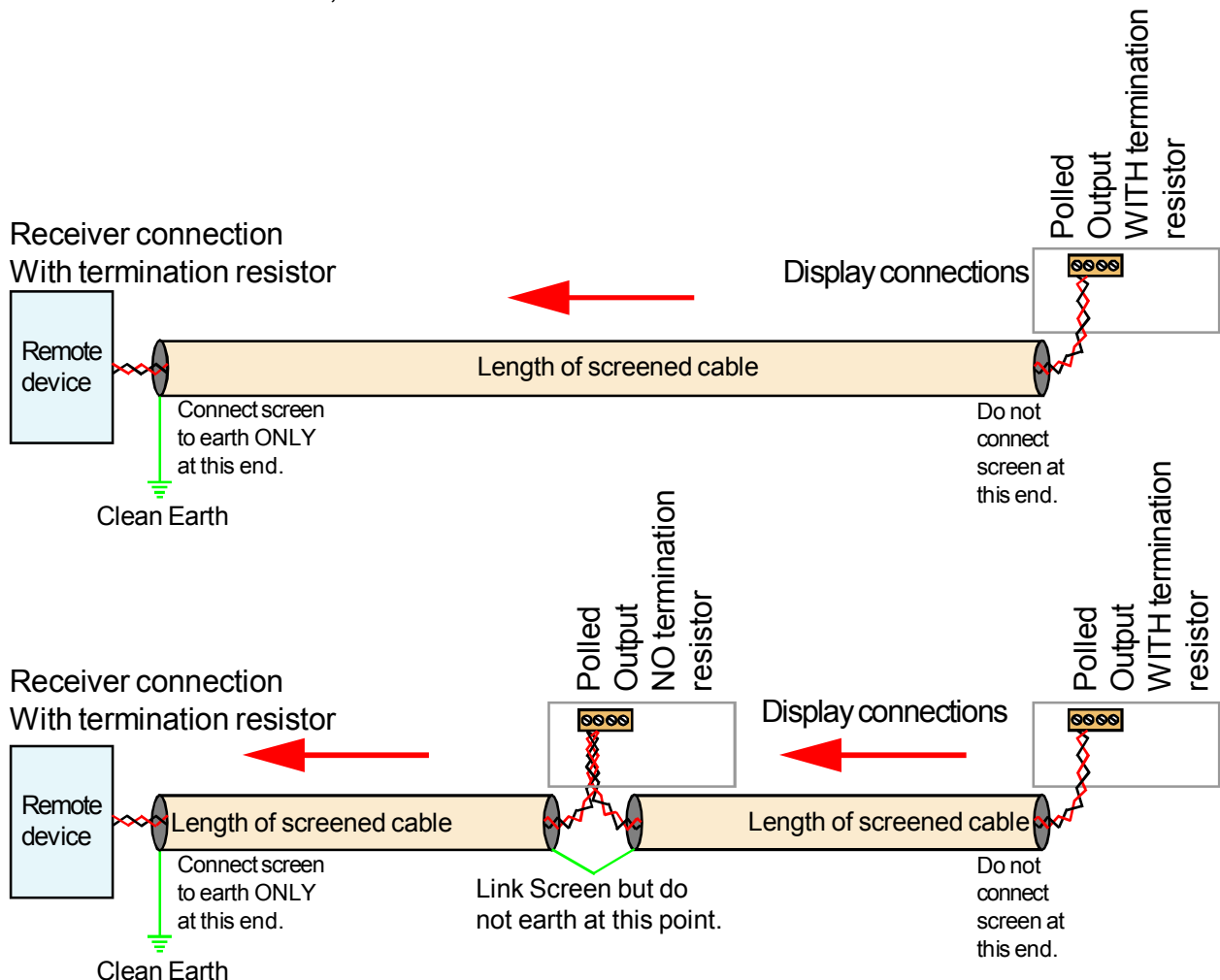| Maximum recommended cable distances if using LOW capacitance screened cable such as CAT5 cable.		
Baud Rate	**RS232**	**RS485 or RS422**
1200	50m	1200m
9600	20m	150m
19200	10m	75m
38400	5m	30m
115200	2m	10m

The serial output is derived from the displayed value, so if you adjust filtering for the display, the serial output will also be filtered and will respond to any input changes at the same speed as the display.

The serial output is updated 10 times per second when in continuous mode.

Installation hints for best performance

This section offers several suggestions which will help you get the best performance from your serial output.

1. Use good quality low capacitance twisted-pair screened signal cable. CAT5 screened twisted-pair is ideal.

2. The cable should be routed away from noisy wiring and devices such as power feeds from inverters, discharge-lighting cables, welder cabling etc, and should preferrably be routed in a dedicated low voltage signalling/instrumentation conduit or cable tray.

3. Screened cable should be earthed at the destination end only.

4. All wires and screens coming out of the screened cable should be kept as short as possible to minimise pickup of noise.

5. If you are going to daisy chain several RS485 devices together on the same data line, you should earth your screen as shown below, paying particular care that you do not earth both ends of any run of of cable.

6. Remember to fit a termination resistor to the instruments at each extreme end of the cable run, but no termination resistor on intermediate units.

Receiver connection
With termination resistor

Polled Output WITH termination resistor

Display connections

Remote device

Length of screened cable

Connect screen to earth ONLY at this end.

Clean Earth

Do not connect screen at this end.

Receiver connection
With termination resistor

Polled Output NO termination resistor

Polled Output WITH termination resistor

Display connections

Remote device

Length of screened cable

Length of screened cable

Connect screen to earth ONLY at this end.

Link Screen but do not earth at this point.

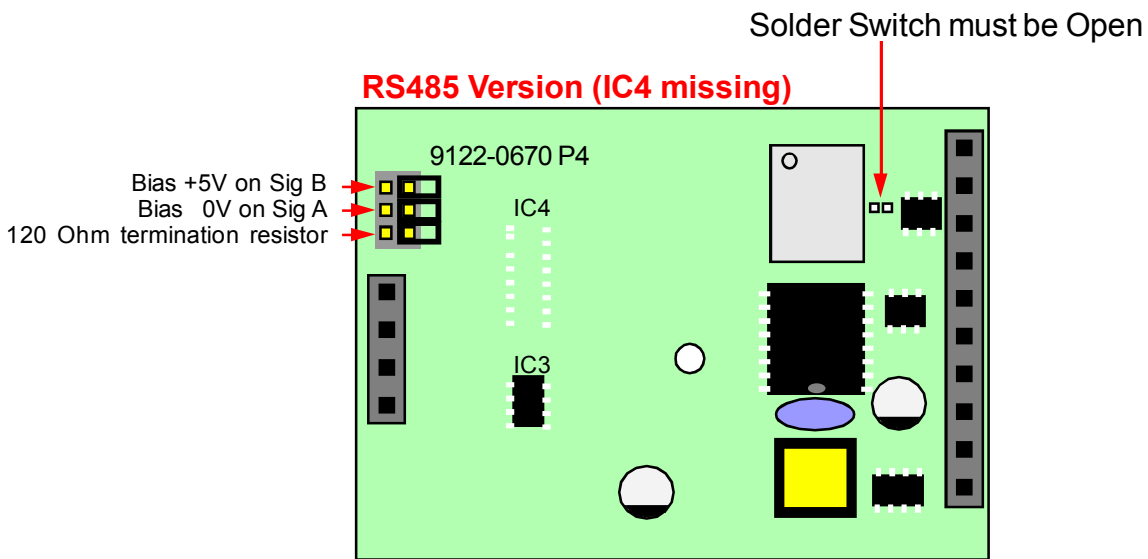Do not connect screen at this end.

Clean Earth

Serial output board configuring - ASCII output

The only board you may need to make adjustments to is the RS485 output option board. You can identify it as an RS485 board, because IC4 will be missing.

If the display is at the end of the data cable, you will need to fit the 120 Ohm termination jumper.

If you have several addressed displays sharing a data line, and find that you occasionally see errors in communication, it may be necessary to fit the line bias jumpers as shown below. This should only be done on the furthest display from the data receiver, so all three jumpers should be fitted.The input/output solder switch must be open - this configures the board as an output driver.

Solder Switch must be Open

RS485 Version (IC4 missing)

9122-0670 P4

Bias +5V on Sig B
Bias   0V on Sig A
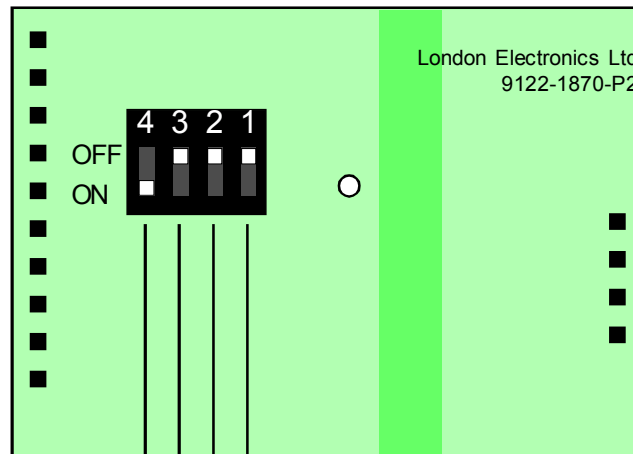120 Ohm termination resistor

IC4

IC3

The RS232 board looks similar to the RS485 board, but requires no jumpers to be fitted at any time. The input/output solder switch must be open - this configures the board as an output driver.

You can identify it as an RS232 board, because IC3 will be missing.

Solder Switch must be Open

RS232 Version (IC3 missing)

9122-0670 P4

IC4

IC3
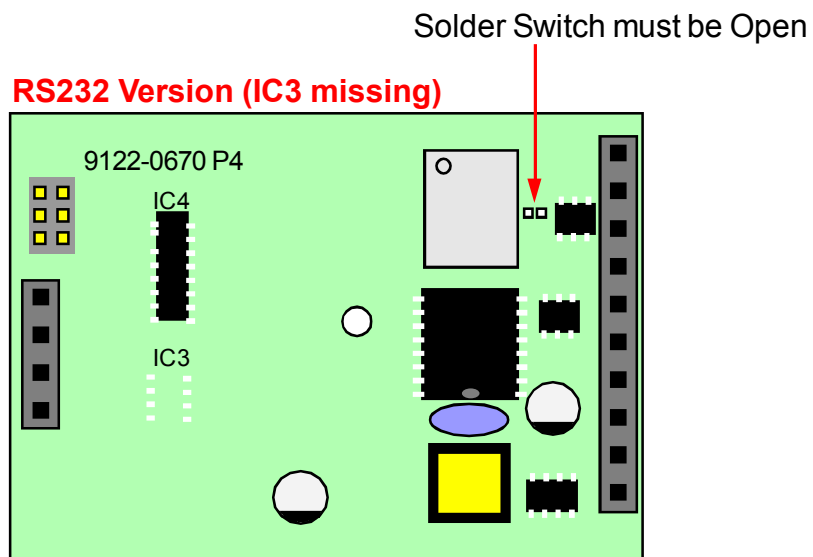
Serial output board configuring - modbus RTU

RS485 Modbus RTU Version

London Electronics Ltd
9122-1870-P2

4 3 2 1
OFF
ON

	Mode	Spare	Format	Baud
Off	Normal	Set off	8E1	19200
On	Tiger *	Set off	8N1	9600

* For Tiger mode (when used with TeleRadio Tiger system) register 0x002C must be set to 0x0001 using the London Electronics Ltd QuickSet utility or RealTerm

Connect 120 Ohm terminal to terminal A for line termination
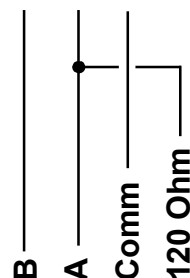
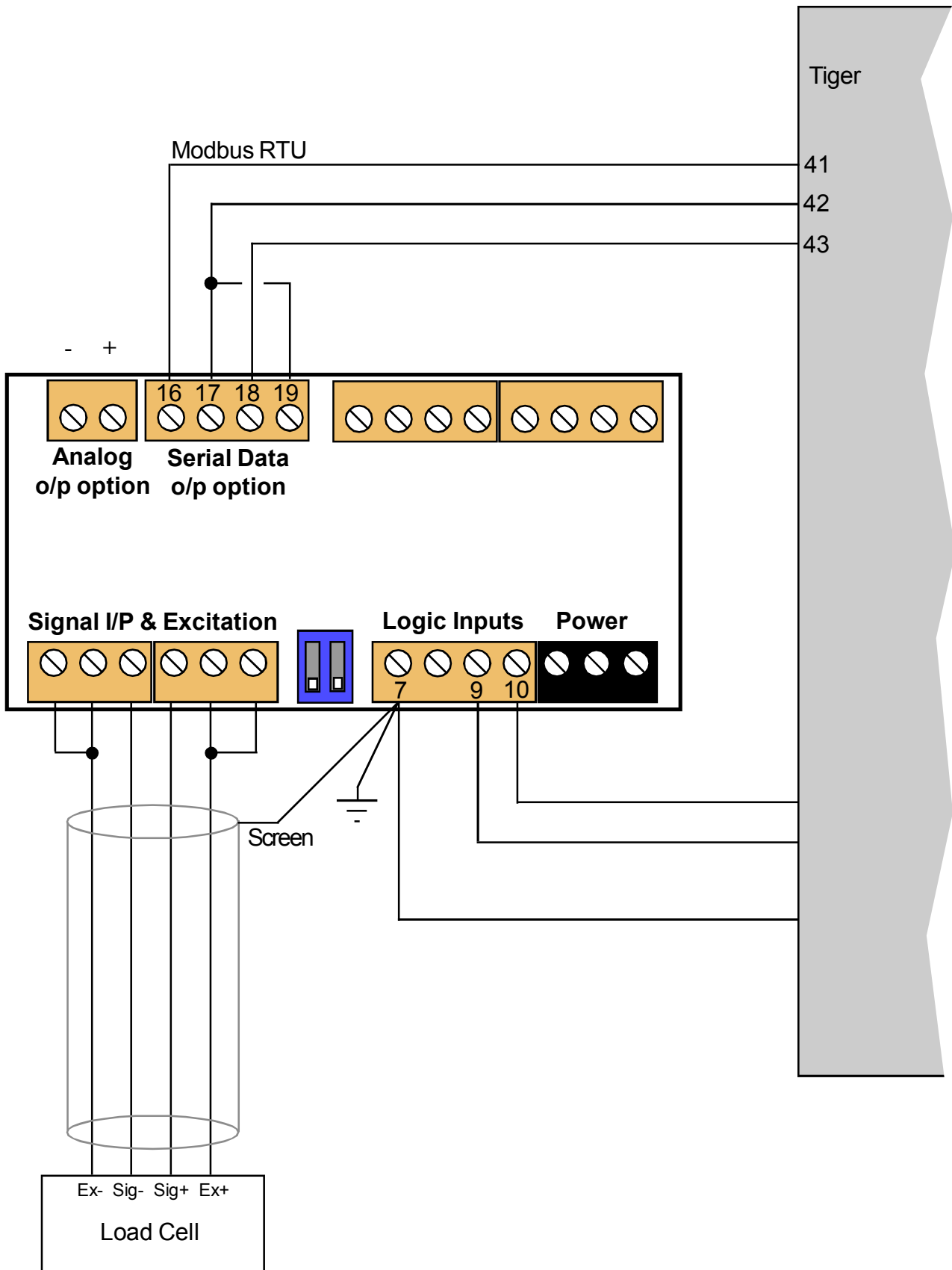With this module, you must set the internal comms parameters on Page 8 as follows:-

These are **not** the Modbus RTU comms parameters, which are set only by the 4 switches shown above.

B   A   Comm   120 Ohm

Analog o/p option   R S 4 8 5   0, 2 or 4 Alarm Relay o/p options

Baud	115200
Protocol	P2
Address	01 to F7
t.reP	0
t.Chr	0
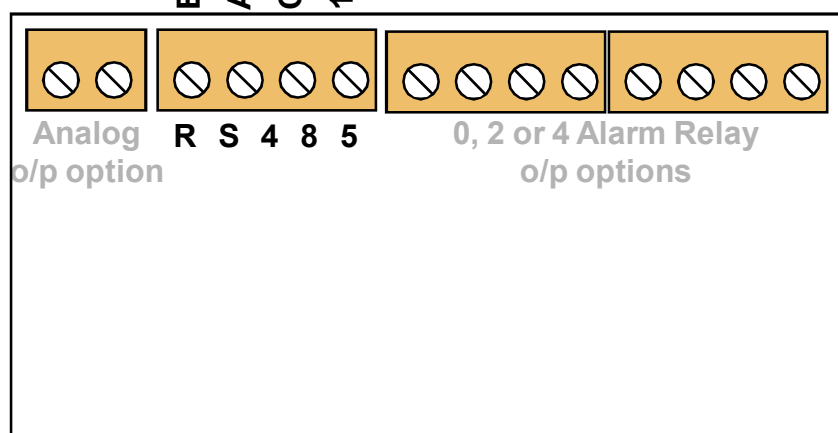
See following page for an example of a connection to a Tiger load alarm system via RS485 modbus...

Tiger module connection example

Tiger

Modbus RTU

41

42

43

- +

16 17 18 19

Analog o/p option

Serial Data o/p option

Signal I/P & Excitation

Logic Inputs **Power**

7   9 10

Screen

Ex- Sig- Sig+ Ex+

Load Cell

Setting up your Serial output port
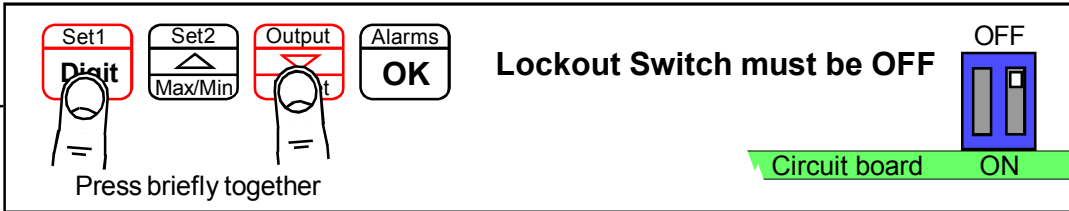
You can choose from :-

Baud rates in the range 300 to 115200
Data formats of 8n1,7n1,7e1 or 7o1
Protocol C1 for continuous output (Link "Enable" to "Common" on output connector)
Protocol P1 for polled output
Protocol P2 for Modbus ASCII mode

1 | Set1 **Digit** | Set2 △ Max/Min | Output ▽ | Alarms **OK** | **Lockout Switch must be OFF** | OFF
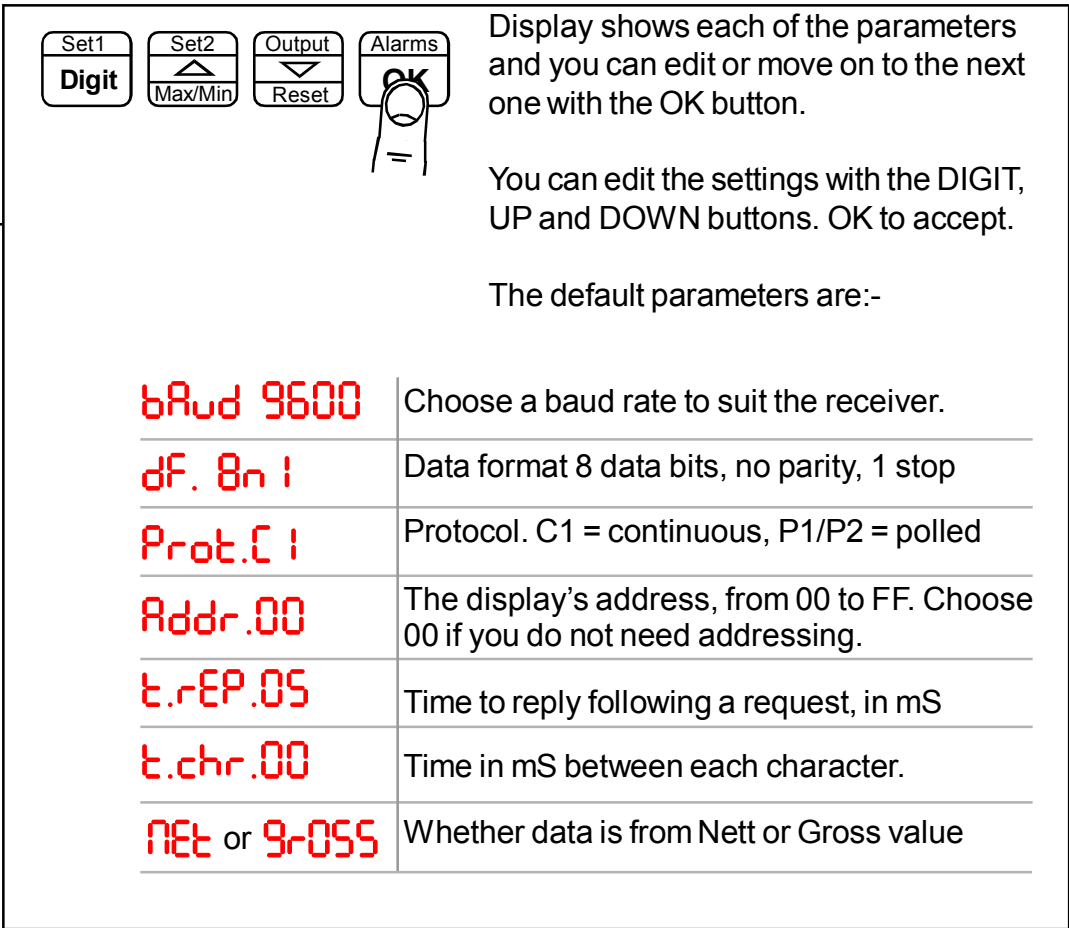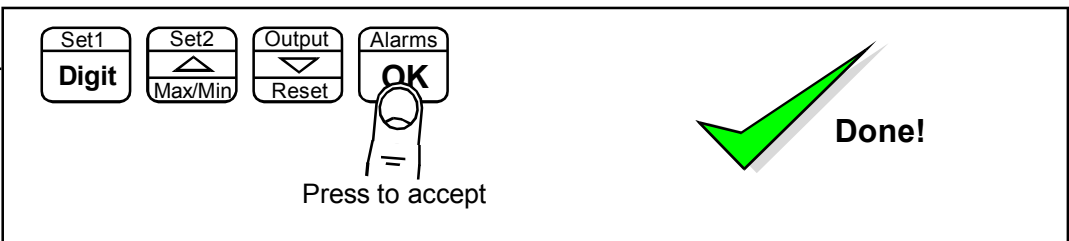
Press briefly together | Circuit board | ON

2 | Set1 **Digit** | Set2 △ Max/Min | Output ▽ Reset | Alarms **OK**

Display shows each of the parameters and you can edit or move on to the next one with the OK button.

You can edit the settings with the DIGIT, UP and DOWN buttons. OK to accept.

The default parameters are:-

bAud 9600	Choose a baud rate to suit the receiver.
dF. 8n1	Data format 8 data bits, no parity, 1 stop
Prot.C1	Protocol. C1 = continuous, P1/P2 = polled
Addr.00	The display's address, from 00 to FF. Choose 00 if you do not need addressing.
t.rEP.05	Time to reply following a request, in mS
t.chr.00	Time in mS between each character.
nEt or 9rOSS	Whether data is from Nett or Gross value

3 | Set1 **Digit** | Set2 △ Max/Min | Output ▽ Reset | Alarms **OK**

Press to accept | **Done!**

Specifications

Output signal	RS232 or RS485 depending on installed board.
Isolation	250 VAC Optically isolated from input, logic, excitation, power, alarms and serial communications ports
Response speed	Derived from displayed value, which is updated 10 times per second. Any filtering applied to the display will be applied to the serial data output also.
Linearisation	The analogue output is derived from the displayed value, so if your display has a non linear response, and you are using the display's lineariser function, the output will follow the display directly.
Calendar/Clock option	Accuracy better than +/- 10 seconds per month (DS3231SN) Battery backup during power loss. Battery = CR1620 3V Lithium

Data strings:-

Protocol C1 – Continuous output (Enable line to common gives output)

Meter sends: 8 characters<CR><LF>

e.g.

20 20 20 20 20 2D 31 37 0D 0A	(-17)	decimal position = 0
20 20 20 20 2D 31 2E 36 0D 0A	(-1.6)	negative value
20 20 20 20 20 31 2E 38 0D 0A	(+1.8)	positive value
20 20 20 20 20 20 4F 52 0D 0A	(OR)	over range
20 20 20 20 20 20 55 52 0D 0A	(UR)	under range

Protocol H1 - GPS clock data format for use with ASR-GPS

Protocol P1 – Polled ASCII

Controller sends: <STX> ADDRH:ADDRL r <ETX> e.g. 02 46 37 72 03 (to device F7)

Meter replies <STX> 8 characters <ETX>

e.g.

02 20 20 20 20 20 2D 31 37 03	(-17)	decimal position = 0
02 20 20 20 20 2D 31 2E 36 03	(-1.6)	negative value
02 20 20 20 20 20 31 2E 38 03	(+1.8)	positive value
02 20 20 20 20 20 20 4F 52 03	(OR)	over range
02 20 20 20 20 20 20 55 52 03	(UR)	under range

Protocol P2 – Polled ASCII Modbus - See next page

When you have finished setting the meter, put the lockout switch in its ON position now, to prevent your settings from being changed.

Select protocol **P2**, using the previous page.

The displayed value is available as a 32 bit 2's compliment signed integer in registers 0x0000 and 0x0001

Register 0x0000 Display value low word
Register 0x0001 Display value high word

The decimal point position is available in the low byte of register 0x001E.
The high byte is not currently used, but should be masked off to guarantee compatibility with future firmware releases.
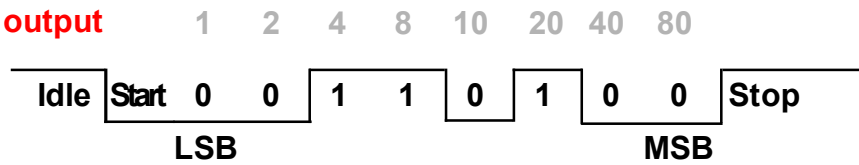
Some examples:-

If meter shows 9   Display value reads 9   Decimal position reads 0
If meter shows 9.9   Display value reads 99   Decimal position reads 1
If meter shows 9.99   Display value reads 999   Decimal position reads 2
If meter shows 9.999   Display value reads 9999   Decimal position reads 3

Signal levels

These examples show the transmission of a single ASCII character 2C (0010 1100) which is a Comma, so that you can see the voltages in RS485 and RS232 systems.
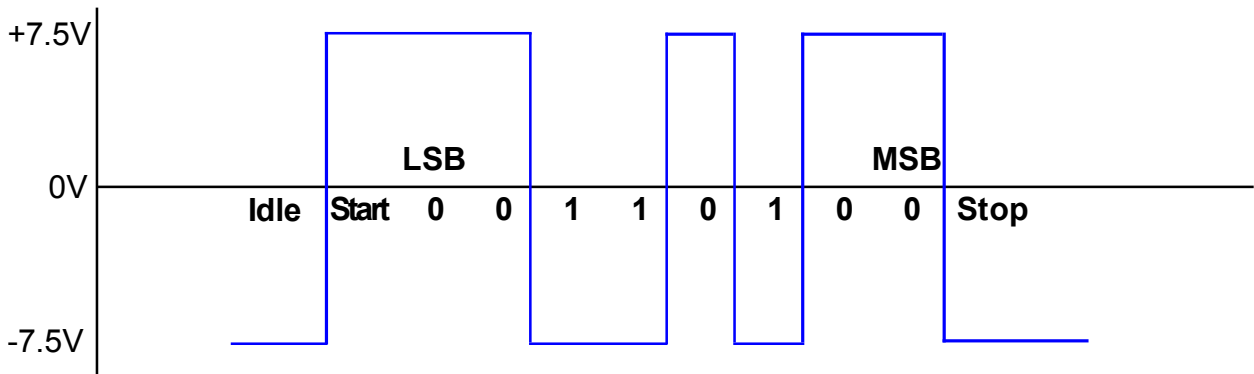
Typical UART output

		1	2	4	8	10	20	40	80	
Idle	Start	0	0	1	1	0	1	0	0	Stop
			LSB					MSB		

RS485 data line levels 8n1

+5V

A(+)
B(-)

Idle | Start | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | Stop

A(+)
B(-)

LSB   0V   MSB

RS232 data line levels 8n1

+7.5V

LSB   MSB

0V

Idle | Start | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | Stop

-7.5V
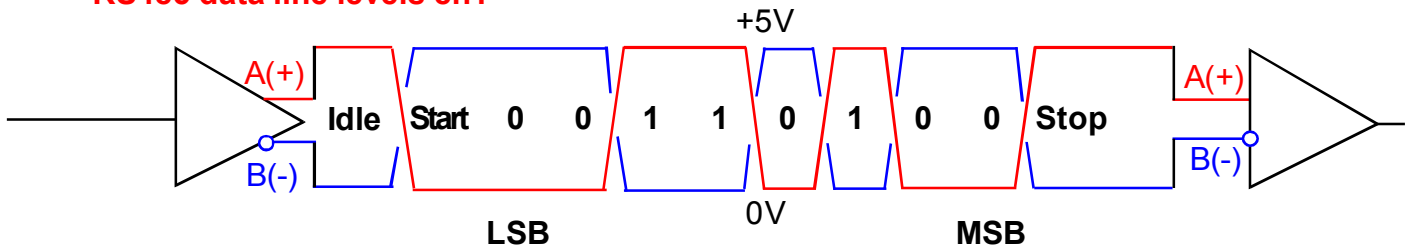
If you are having trouble getting serial data out of the display, first check that you have chosen the correct mode.

If you are using Continuous Mode C1
Ensure that you have put a link between terminals 18 and 19 to enable the data output.

You can test for data with a simple data monitor which you can make with 2 diodes and a resistor, as shown below.

Provided the baud rate is 9600 or higher, the Green LED should be on for most of the time, and you should see the red LED flicker as data is sent.

Check to see if data is arriving at the remote location. If the red LED is lit most of the time, with the green flickering, your wiring may be transposed.

If neither LED is lit, check the meter to make sure it is configured to transmit continuously, and check your connections to make sure the cabling and connector terminals used are correct.

If you are using Polled Mode P1
Check to see whether there is any data activity, using the simple data monitor shown below. If not, check the settings in the polling device.

If the polling device is working correctly, check the settings on the display.

You can check to see whether a serial output board has been installed in the display - press the outer 2 buttons for around 3 seconds and the display will give a summary of installed software and options.

General
You can use your PC to generate and monitor serial data, with a free program called RealTerm which you can download from :-
http://sourceforge.net/projects/realterm/

This can be very useful in diagnosing communication problems. See end of manual for settings examples.

Simple Data monitor.
2 x LEDs connected back to back and a resistor.

Green LED on most of the time. Red LED flashes with data.

1K

| Terminal numbers on output connector of display	
RS232	RS422/485
16	16
18	17
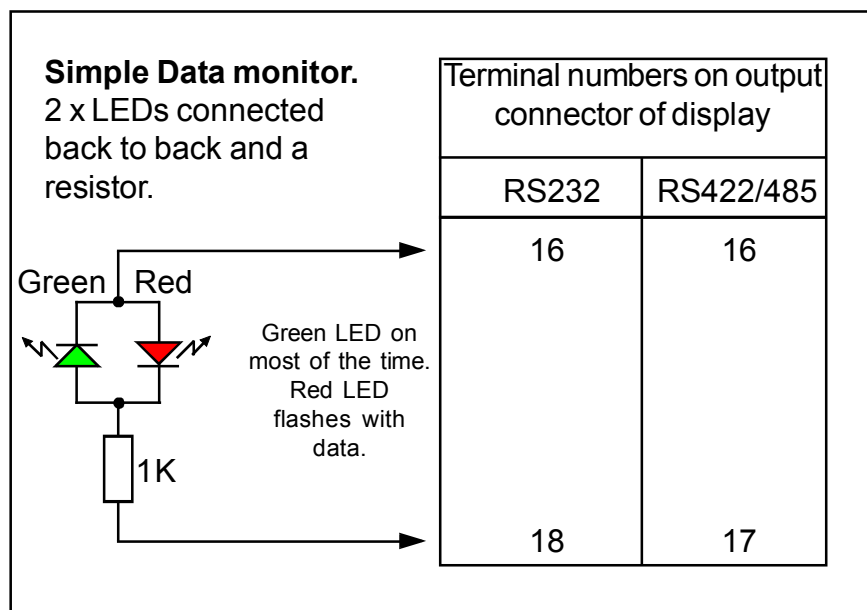
-RTC Real Time Clock option

The -RTC option board consists of a precision calendar/clock chip which is battery-backed to maintain timing during periods of power loss.

It can be set to automatically correct for summer and winter time clock shifts.

It may be used to include date and time in serial data, along with descriptive text, if required. Normally supplied in conjunction with a custom function.
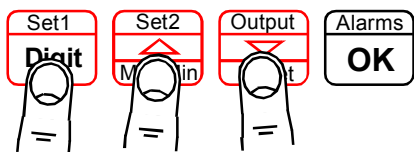
Real Time Clock board

9122-1270-P1

Location of the RTC board
on the main board
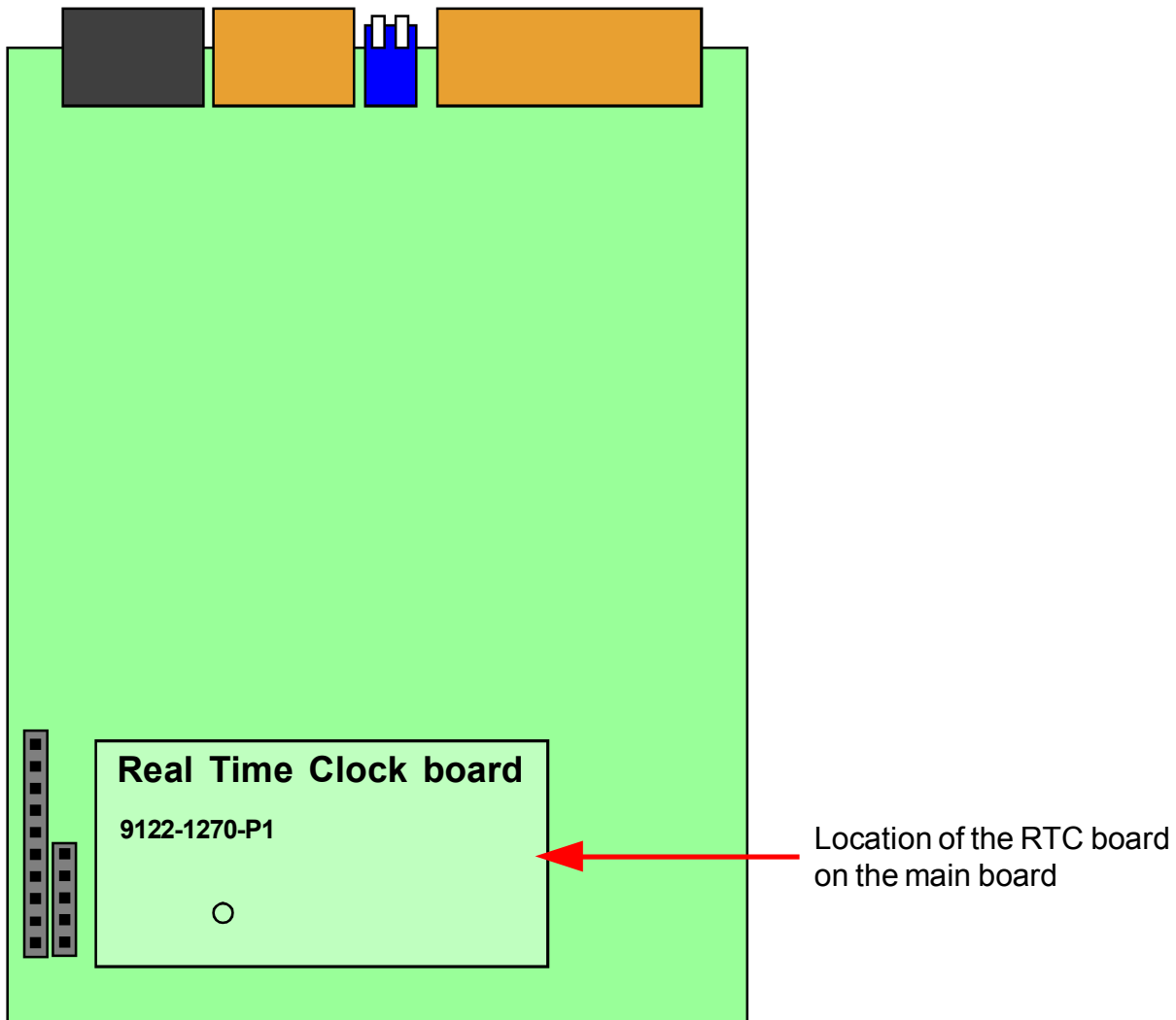
In some systems, the board can also be corrected automatically by our ASR-GPS atomic time receiver.

Because there are so many ways in which the-RTC board can be used, we provide only basic setup details here, with additional information, specific to your application, supplied with the unit.

1 — | Set1 **Digit** | Set2 △ Max/Min | Output ▽ t | Alarms **OK** | **Lockout Switch must be OFF** | OFF ... Circuit board ON
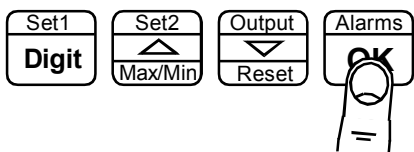
Press together for 3 seconds

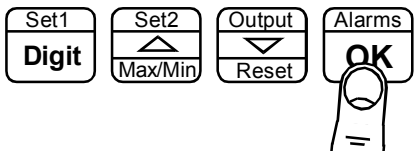**2** — | Set1 **Digit** | Set2 △ Max/Min | Output ▽ Reset | Alarms **OK** |

Display shows each of the parameters and you can edit or move on to the next one with the OK button. You can edit the settings with the DIGIT, UP and DOWN buttons. OK to accept. Let us assume it is March 24 2011 and the time will shortly be 14:59 you want to set

Display	Description
Yr. 11	Set the last 2 digits of the year
n 03	Set the month. 1=Jan, 12 = Dec
dt.24	Set the date 1=1st , 31=31st
1459	Set the hour
1459	Set the minutes
1459 ▥	The time will brighten and the 4 leds to the right of the display will flash. At exactly 14:59, press the OK button. No menu timeout.

3 — | Set1 **Digit** | Set2 △ Max/Min | Output ▽ Reset | Alarms **OK** |

Press to accept

Done!

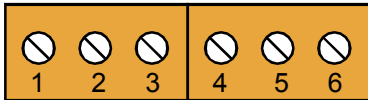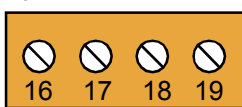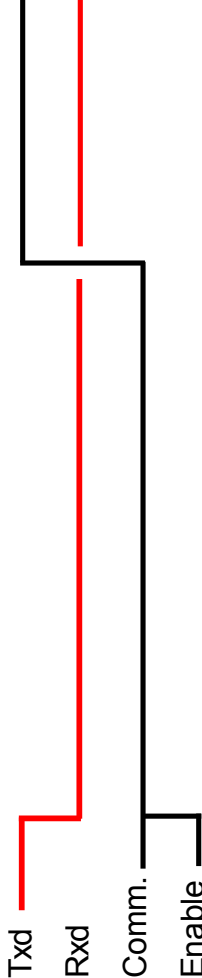## Connecting master and slave displays over RS232 or RS485

RS232 should be used over short distances only, preferrably under 10 metres of cable length

RS485 can be used over cable lengths from 0 to over 1000 metres of cable length.

RS232 Slave

1	2	3	4	5	6
Demand	Comm	Rxd	Txd	nil	nil

RS485 Slave(s)

1	2	3	4	5	6
Demand	Comm	Data A+	Data B-	nil	nil

Input settings on slave

Mode = Quant
Addr.00
S.Chr.00
E.Chr.0d
bAud 1200
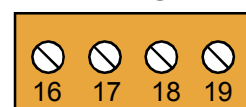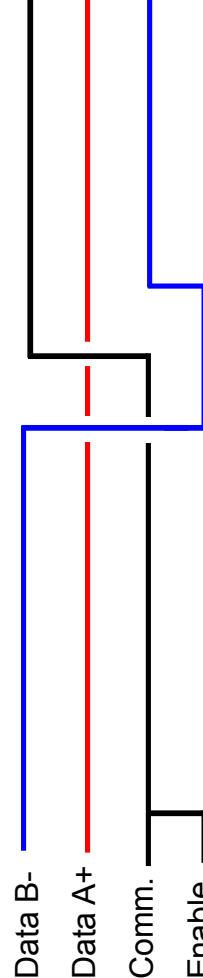dF8n1
t.reP.05
t.Chr.00
to.03
S.POS.00
d.LEn.00
dddddd.
dP.A

Output settings on master

Baud 1200
dF.8n1
Prot.C1
Addr.00
t.rep.05
t.chr.00

Txd	Rxd	Comm.	Enable
16	17	18	19

RS232 Master

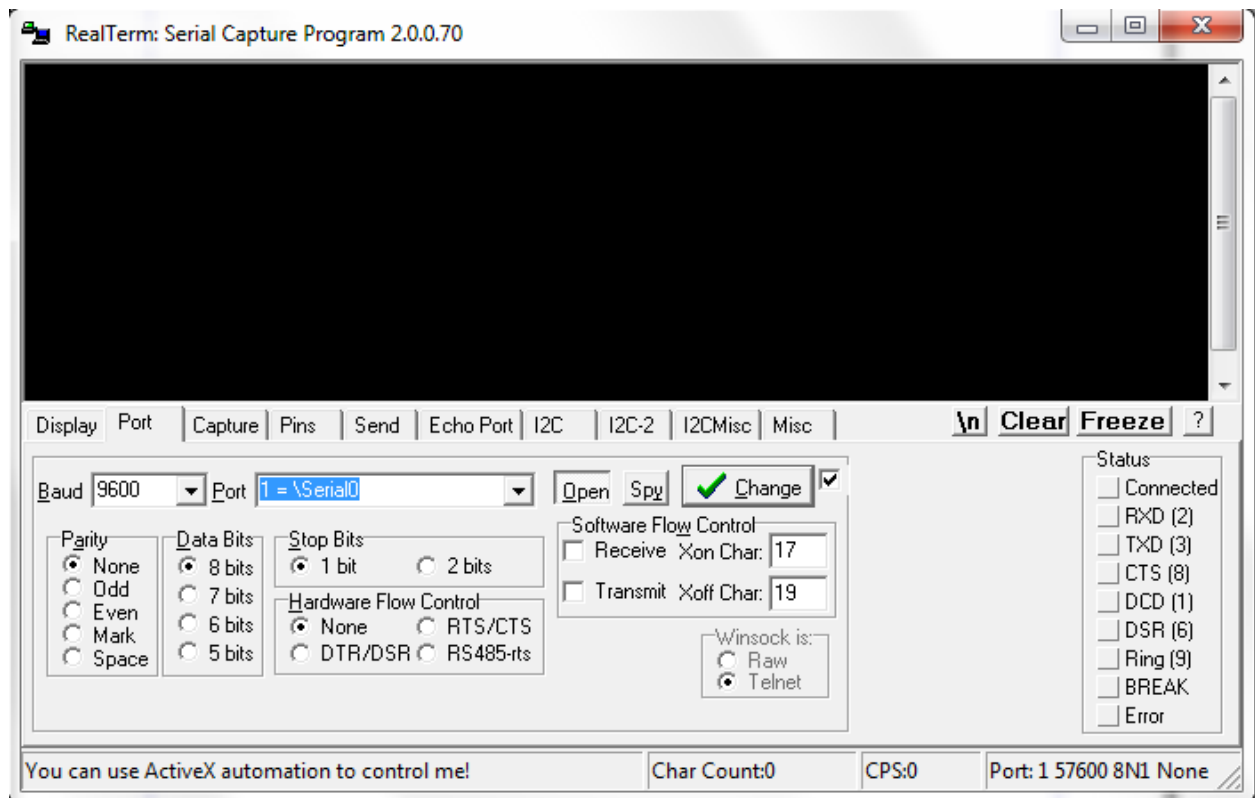| Data B-	Data A+	Comm.	Enable
16	17	18	19

RS485 Master

Refer to installation hints in the master and slave manuals, for guidance on cable types and screening.

RealTerm 'getting started' guide

1. Select Baud Rate & Port to suit, other settings as shown. Click 'Open' then click 'Change'


2. Type any data you want to send in the top text box, next to the 'Send Numbers' button.
To send hex characters, prefix them with \x . So to send <STX> which is hex 02, you would type
\x02. For example, to get data from unit address 07, we need to send <STX>07r<ETX>
which is \x0207\x72\x03 (\x72 is HEX72 which is lower case r) Then click top 'Send ASCII' button
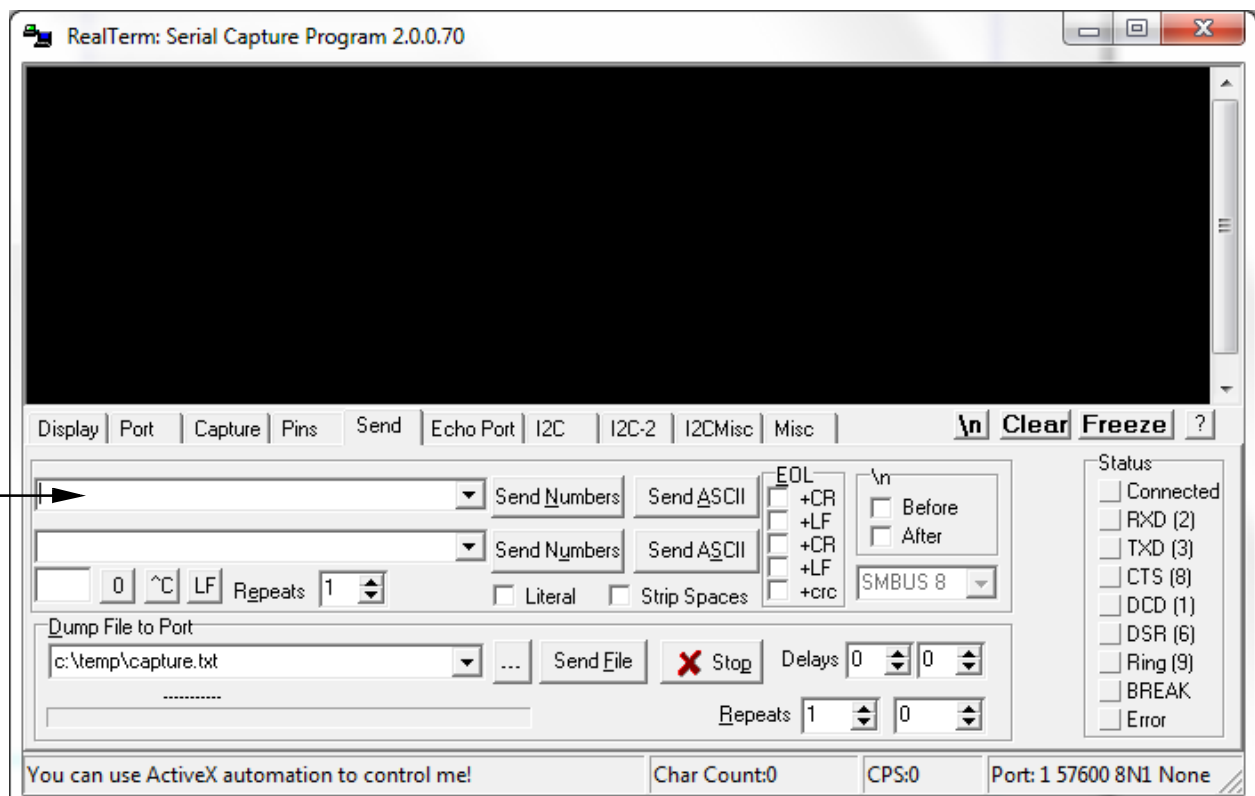
3. To view incoming data, click on the 'Display' tab, and select either ...

    a. ASCII - if you want to see the textual value of the data

    b. Hex - if you want to view the full Hex contents of the transmission (Ideal if you want to send us your data for diagnostics). Hex gives us the fullest detail of all data in your transmission, and includes non-printing characters and control codes.
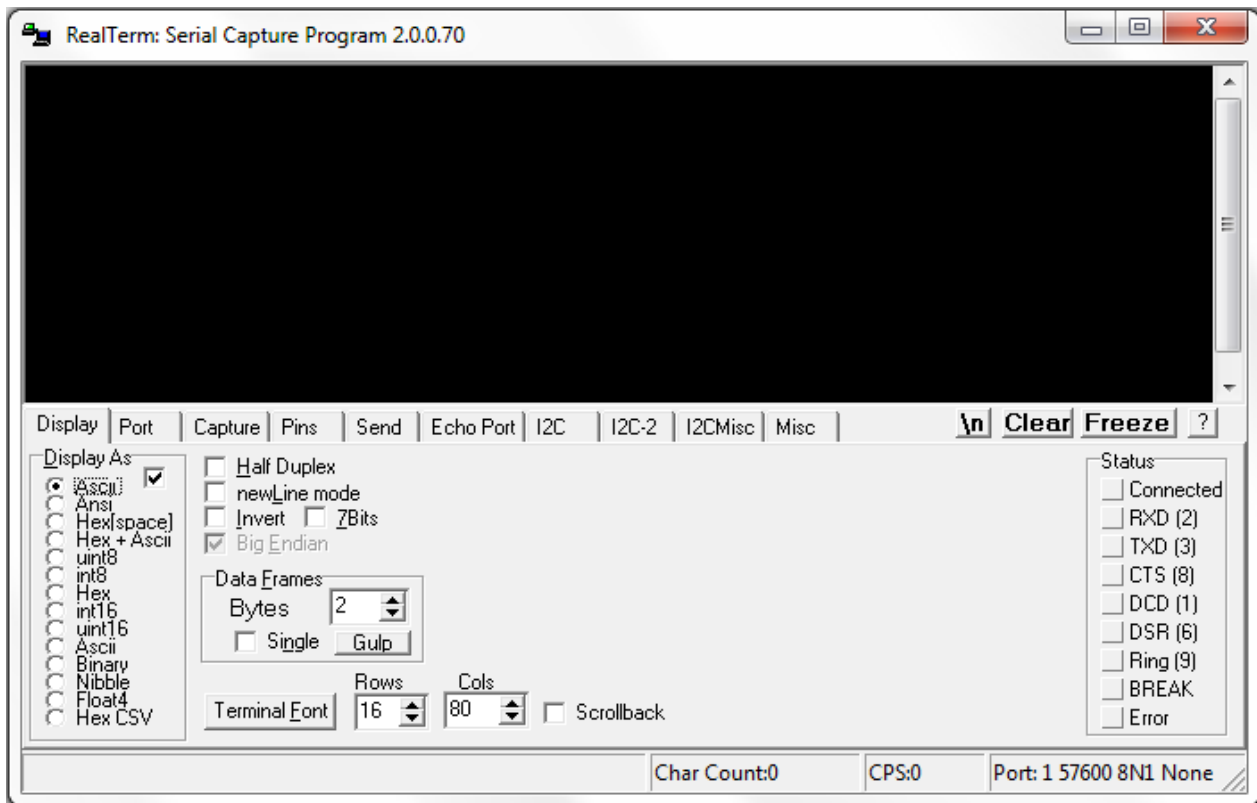
Record of Revisions

20 August 2010   Revision 0 version of manual released.
2 November 2010   Rev. 1 Added <LF> to C1 mode data output stream
26 November 2010 Rev. 2 Software updated to F00.20
2 February 2011   Rev. 3 Software updated to F00.21
28 February 2011   Warranty increased to 3 years and terms added
30 July 2013   Added RealTerm examples and Modbus RTU section
5 November 2013   Added Tiger module connection page