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**Serial Output Option for MAGNA  
& Intuitive Series:  
RS232 & RS485 / RS422**

**Includes Settings for Real Time Clock Option: **RTC****

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# Warranty

We warrant this product against defects in materials or workmanship for a period of one year 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.

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Connections and installing into a display: See main display manual.	

\* Need a manual urgently? 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	50 m (165 ft)	1200 m (4000 ft)
9600	20 m (65 ft)	150 m (500 ft)
19200	10 m (33 ft)	75 m (250 ft)
38400	5 m (16 ft)	30 m (100 ft)
115200	2 m (6 ft)	10 m (33 ft)

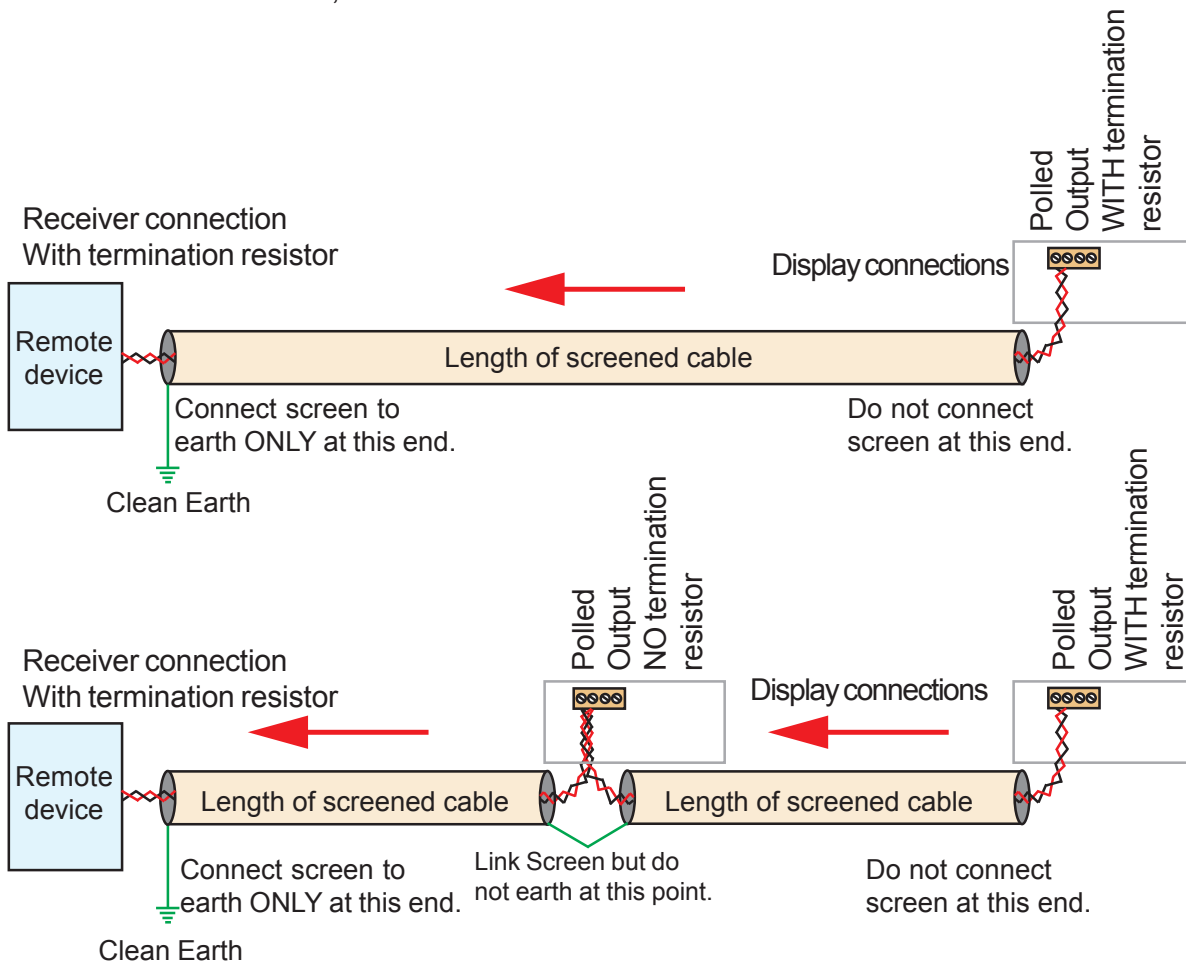
The serial output is derived from the displayed value, so if you adjust filtering for the display, the serial output will also be filtered and will respond to any input changes at the same speed as the display.

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 preferably 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.

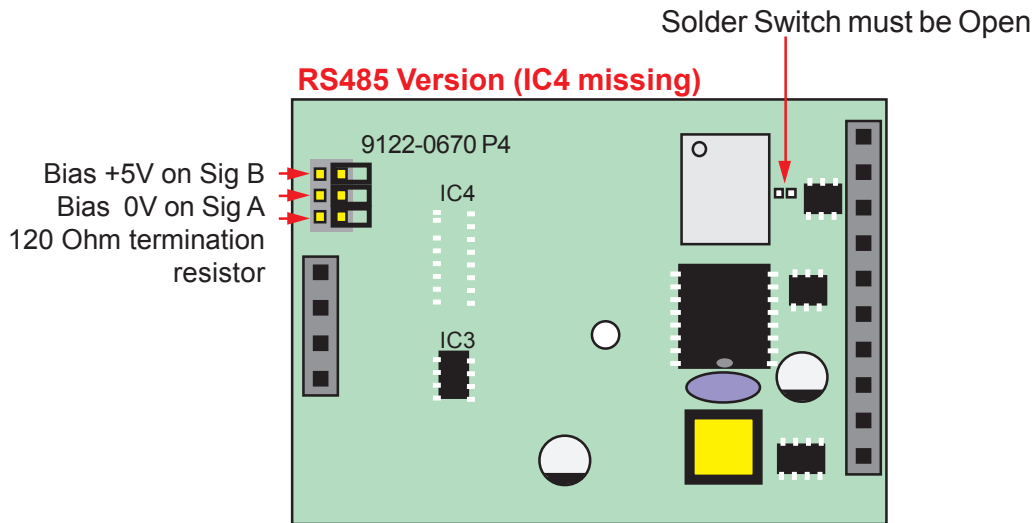


# Serial Output Board Configuring - ASCII Output

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.

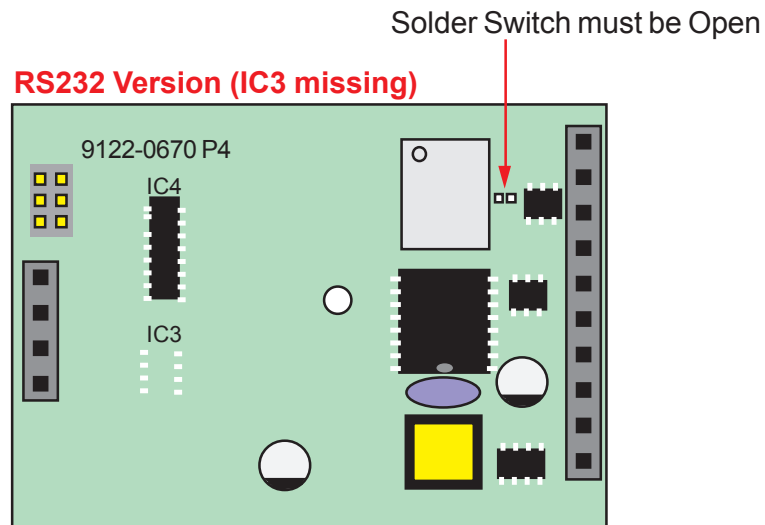
If the display is at the end of the data cable, you will need to fit the 120 Ohm termination jumper.

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.



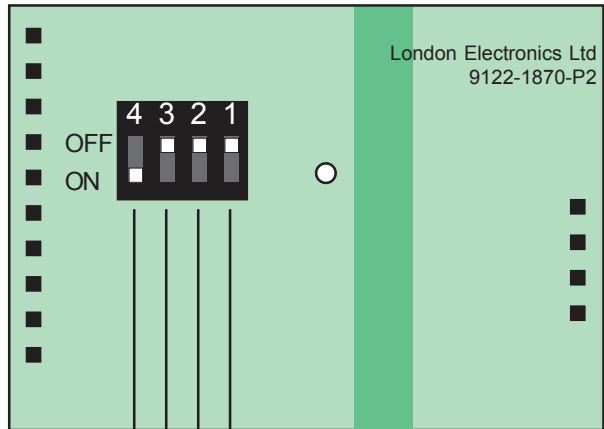
The RS232 board looks similar to the RS485 board, but requires no jumpers to be fitted at any time. The input/output solder switch must be open - this configures the board as an output driver.

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



# Serial Output Board Configuring - Modbus RTU

## RS485 Modbus RTU Version



	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 London Electronics Ltd QuickSet utility or RealTerm.

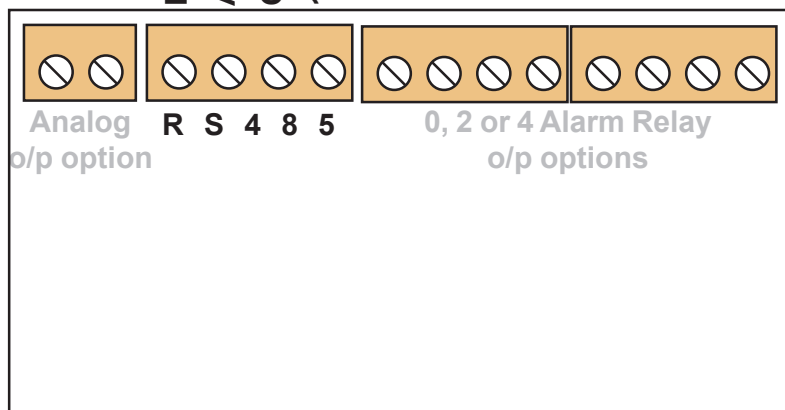
Connect 120 Ohm terminal to terminal A for line termination



With this module, you must set the internal comms parameters on Page 8 as follows:-

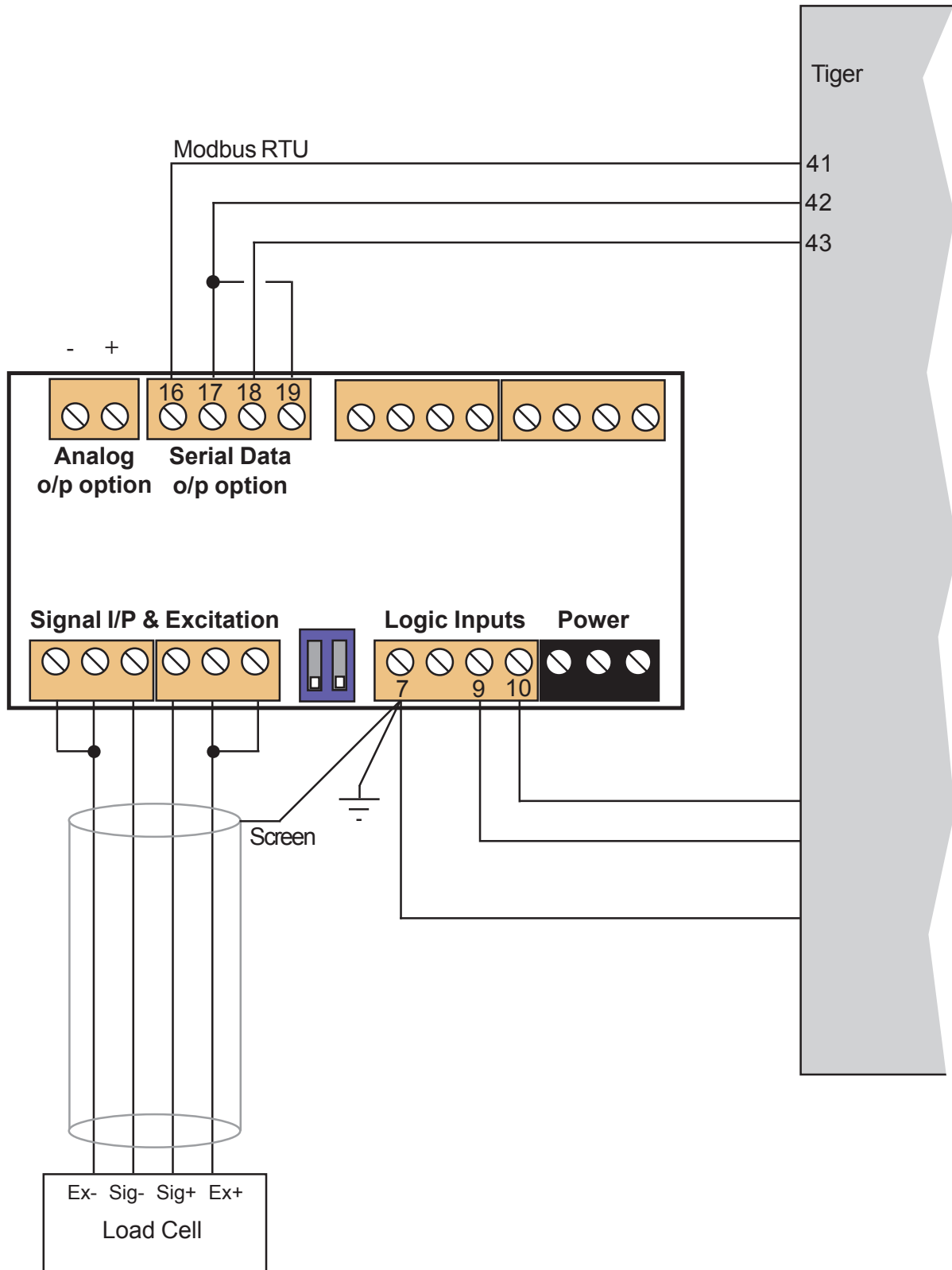
These are **not** the Modbus RTU comms parameters, which are set only by the 4 switches shown above.

<b>Baud</b>	115200
<b>Protocol</b>	P2
<b>Address</b>	01 to F7
<b>t.reP</b>	0
<b>t.Chr</b>	0



See following page for an example of a connection to a Tiger load alarm system via RS485 modbus...

# Tiger Module Connection Example






# 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

This feature is available in Easy and Advanced Modes


1




Set1  
Digit



Set2  
Max/Min




Output  
Reset



Alarms  
OK

Press briefly together


**Lockout Switch must be OFF**




OFF

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. 8n 1	Data format 8 data bits, no parity, 1 stop
Prot.C 1	Protocol. C1 = continuous, P1 = 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.


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.
Linearization	The analog output is derived from the displayed value, so if your display has a nonlinear response, and you are using the display's linearizer 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.

# Modbus ASCII

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.

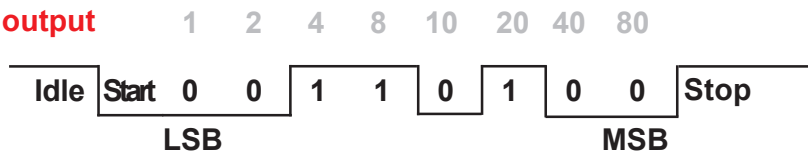
Some examples:-

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

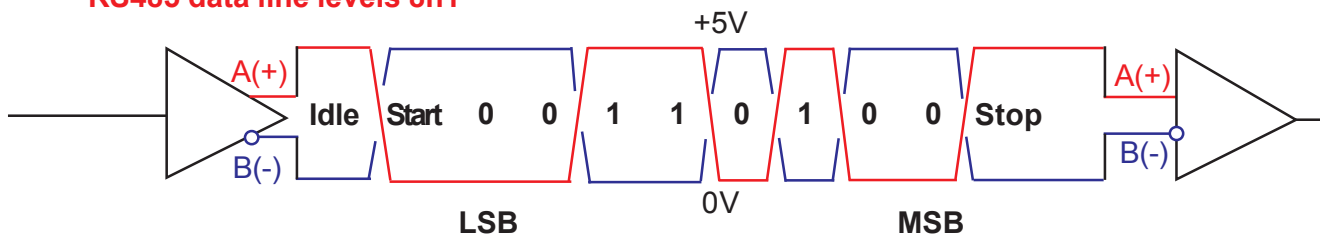
# Signal Levels

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.

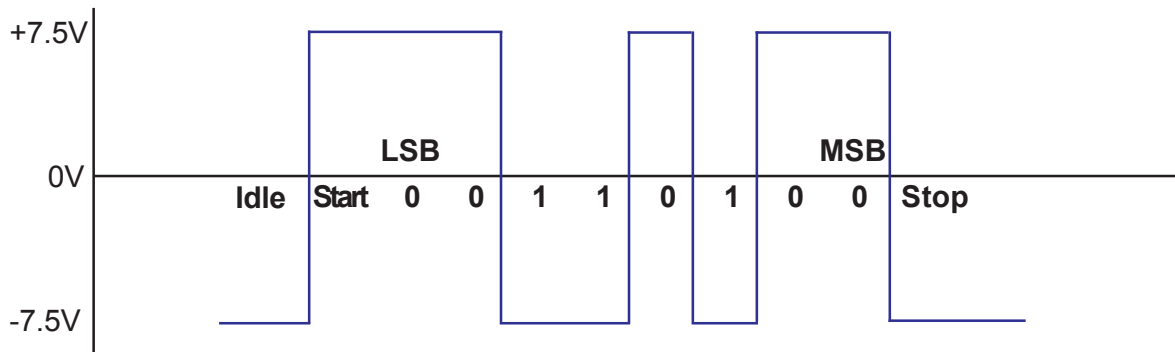
## Typical UART output



## RS485 data line levels 8n1



## RS232 data line levels 8n1



# Fault Finding

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.

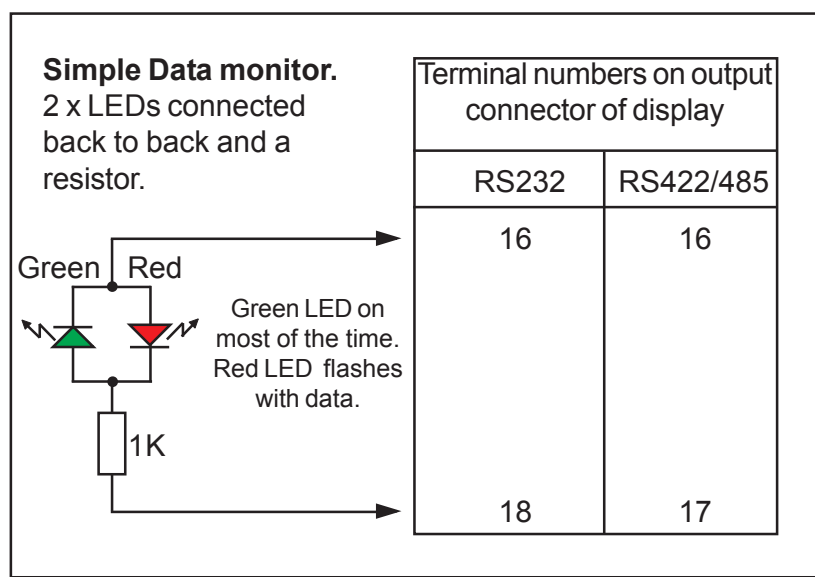
You can check to see whether a serial output board has been installed in the display - press the outer 2 buttons for around 3 seconds and the display will give a summary of installed software and options.

## 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.

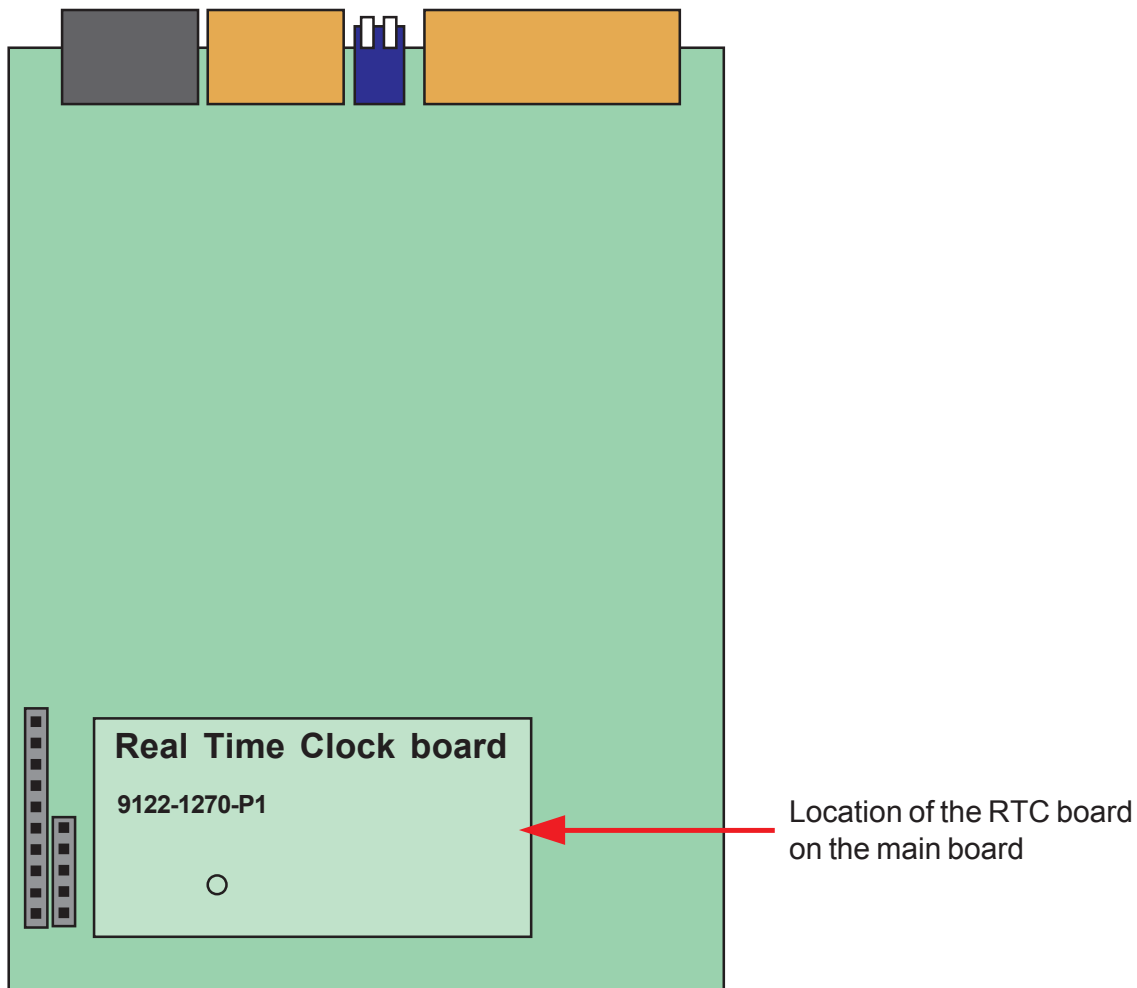


## -RTC Real Time Clock Option

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.



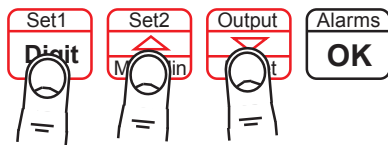
In some systems, the board can also be corrected automatically by our ASR-GPS atomic time receiver.

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.

# RTC Setup Method

This feature is available in Easy and Advanced Modes

1



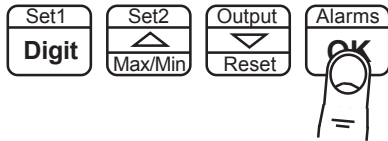
Press together for 3 seconds

Lockout Switch must be OFF




Circuit board ON

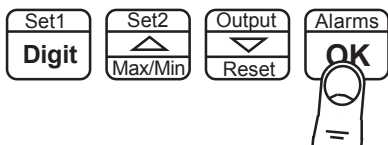
2



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

Yr. 11	Set the last 2 digits of the year
m 03	Set the month. 1=Jan, 12 = Dec
dt.24	Set the date 1=1st , 31=31st
14:59	Set the hour
14:59	Set the minutes
14:59 	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



Press to accept



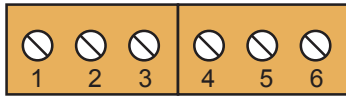
# Application Note

## Connecting master and slave displays over RS232 or RS485

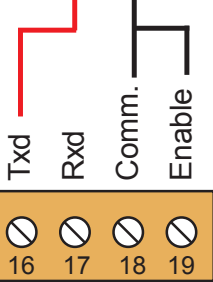
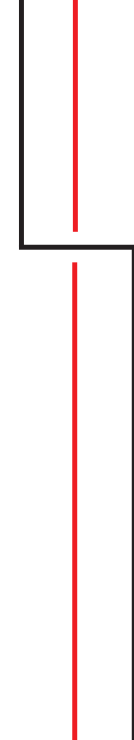
RS232 should be used over short distances only, preferably under 10 metres of cable length

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

### RS232 Slave



Demand  
Comm  
Rxd  
Txd  
nil  
nil



Txd  
Rxd  
Comm.  
Enable

### RS232 Master

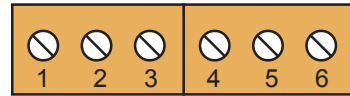
#### Input settings on slave

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

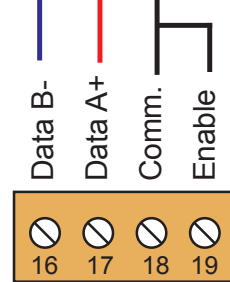
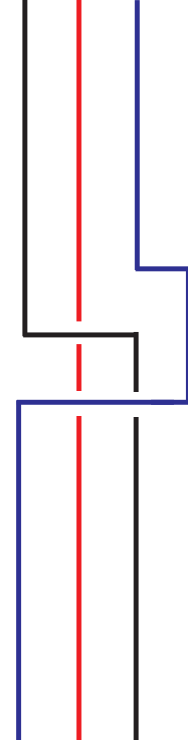
#### Output settings on master

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

### RS485 Slave(s)



Demand  
Comm  
Data A+  
Data B-  
nil  
nil



Data B-  
Data A+  
Comm.  
Enable

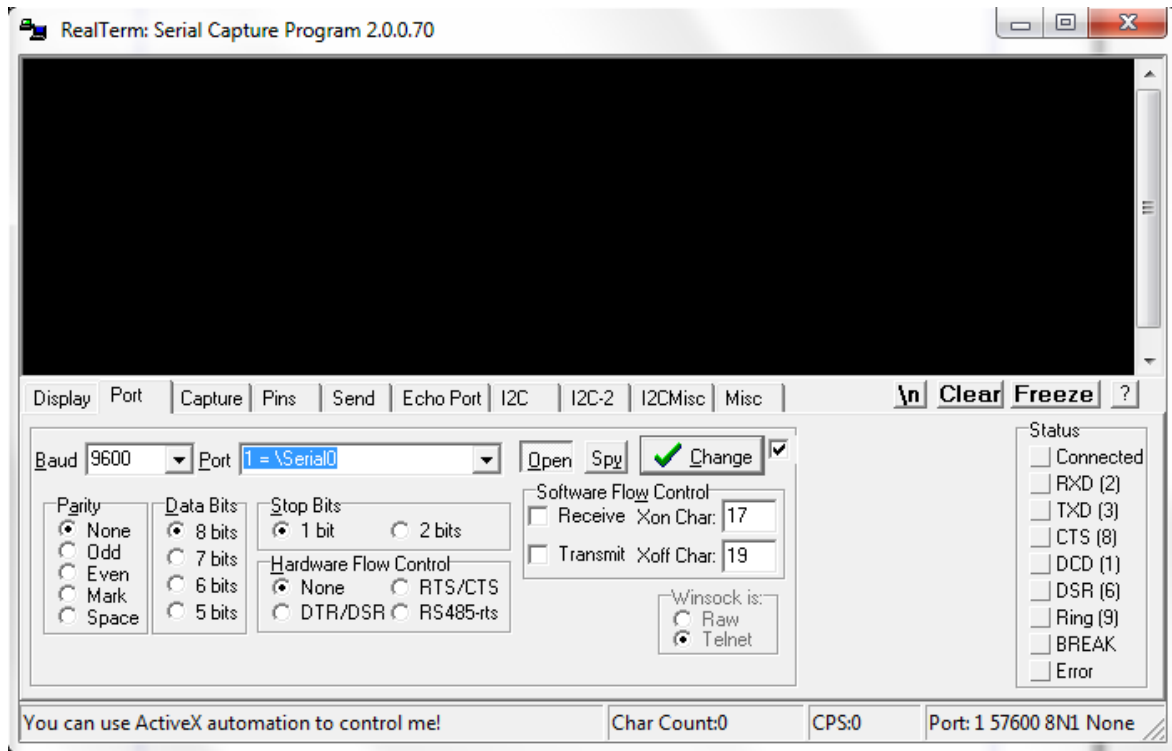
### RS485 Master

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

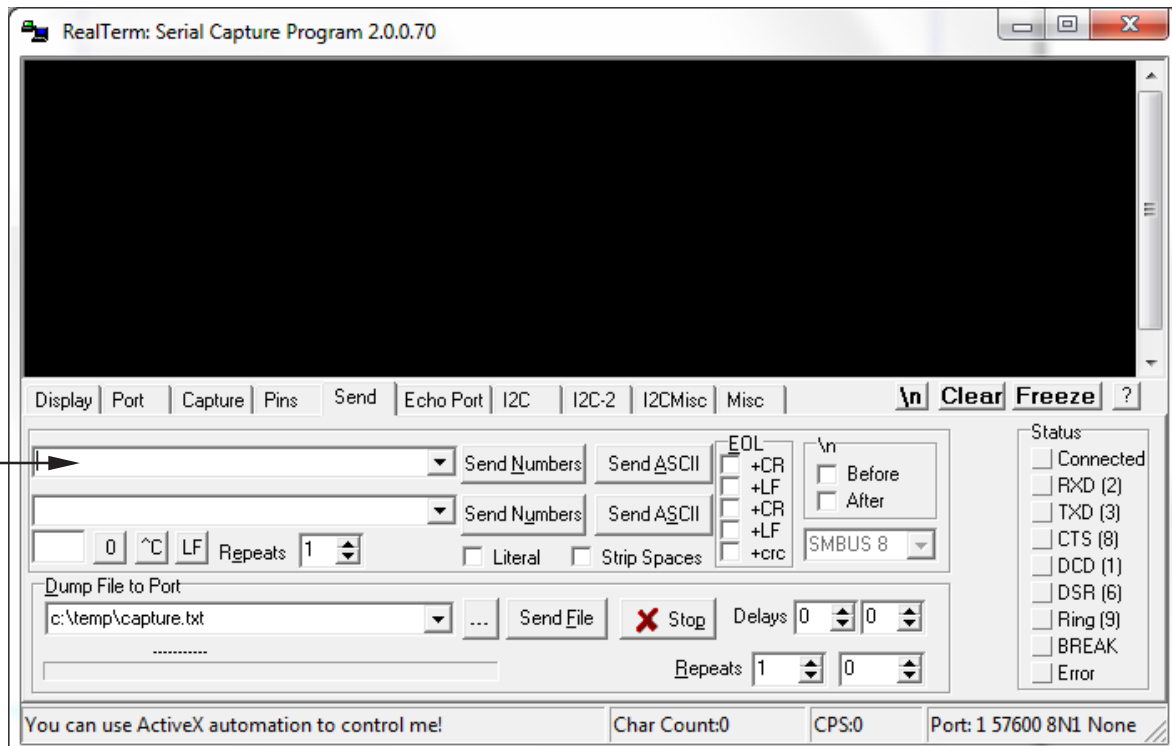


# RealTerm "Getting Started" Guide

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

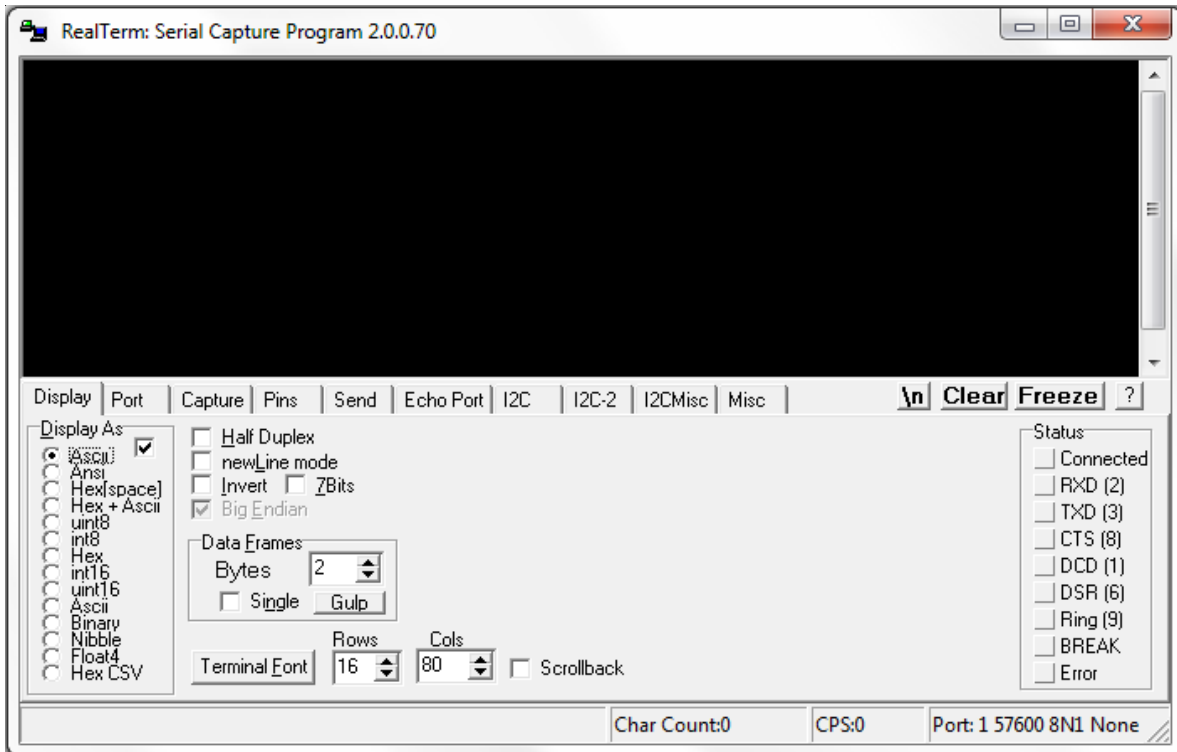


2. Type any data you want to send in the top text box, next to the 'Send Numbers' button. To send hex characters, prefix them with \x . So to send <STX> which is hex 02, you would type \x02. For example, to get data from unit address 07, we need to send <STX>07r<ETX> which is \x0207\x72\x03 (\x72 is 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

**Software version F00.21**

Revision:6 Dated: 5 November 2013