

Hanwell Instruments Ltd Instruction Manual

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1. Introduction

This document details how to install, configure and use the MODBUS version of the Radiolog CR2. This is a version which can also be interrogated via the standard MODBUS communications protocol. The CR2 is configured with the sensors to be monitored by an operating PC via USB communications. It is then connected to the MODBUS and passes the received radio information to a 3rd party software system.

1.1. Prerequisites

The CR2 unit must be fitted with firmware **Mod1USB**. The start up screen will show MBUS- Read1 Vx.x

Operation

The sent ModBus ID is interpreted as a sensor number and the data from this sensor only is transferred. If the data is not available for any reason then the CR2 will not answer.

There is no point in polling at a rate faster than the incoming radio data, **the BMS should limit the polling rate to allow the CR2 to operate correctly**

This version of the firmware does **NOT** log data internally

2. Installation

This section details the installation of the hardware and software.

2.1. Software

The supplied software should be installed on a Windows machine. This software will be used for configuring the CR2 with the sensors, checking radio reception, configuring the CR2s MODBUS properties and checking the CR2 MODBUS functionality is working.

1. Install Radiolog from the supplied W400 CD. (V8.5 or later)
2. The MODBUS Utilities will be found in the ..\resources\tools folder.

2.2. Hardware

1. Connect the 12V power to the 12V power socket.
2. Connect the Receiver.
3. Connect the appropriate comms leads

- USB A to MiniB
- Y516: for RS485 MODBUS communications. Fitted to the MS socket.

This is supplied as an 4-way mini-DIN lead with a free end. The free end should be wired into the MODBUS as follows:

TX+ Red
 TX- Yellow
 GND White

The Black core is normally unused. **It has +12V on it and should be isolated.**

NOTE THE UNIT WILL NOT RESPOND TO MODBUS REQUESTS WHEN THE USB CABLE IS CONNECTED

4. Switch on the CR2 using the ON/OFF switch.
5. For alternative hardware setup see section 5.0

3. Configuring the CR2 via the PC

This section details how to configure the CR2 using the supplied PC software and the RS232 communications. There are two sections, both of which must be completed to enable the CR-2 for MODBUS use.

3.1. Configuring the System

This configures the CR2 with the layout (the sensors to be monitored). Full details of how to create a layout are in Radiolog8 online help

1. Run **RlogCR2** on the operating PC.
2. Create a layout file containing the Sensors to be monitored. Remember to set the filter limits as appropriate
3. Set a password (**Mode – Set Password**). This will be required if the software is used again so should be 8 characters and memorable.
4. Enable the comms (**System – Configure PC**).
5. Restart the software after it automatically closes. The CR2 should be automatically configured.

3.2. Configuring the CR2 MODBUS ID

The units always run at 9600 Baud, No Parity, 2 stop bits.

1. Close **RlogCR2** if open.
2. Connect the CR2 via USB
3. Run the utility **CR2ModbusSetup.exe**.
4. **Set the Device ID to 1 (as a placeholder only)**
5. Select whether legacy (pre 4000/5000) series status messages are expected or not.
6. Click on **To CR2**
7. The tool will confirm when the CR2 has been programmed.

Testing the MODBUS Communications via the PC

This section details how to (optionally) test the MODBUS commands and responses are being correctly handled by the CR2. *You will need an **automatic** 232/485 adaptor to use this tool (not supplied)*

1. Switch off the CR2 power.
2. Connect the ModBus cable between the CR2 and the operating PC.
3. Switch on the CR2.
4. Run the utility **crmodbustest.exe** and select
 - Mode of operation (read-one)
 - Comms port
 - Sensor number
5. Click on **Get Values** to test the reading of the input registers.
The memo field will display:
 - the command request for the values in hex.
 - the response from the CR2 in hex.
 - the interpretation of the response as Sensor IDs and the live values.
6. Click on **Get Status** to test the reading of the holding registers.
The memo field will display:
 - the command request for the values in hex.
 - the response from the CR2 in hex.
 - the status code of the Sensor (see Section 4.5 for the meaning of the status codes)
7. If a test over time is required then click on **Start Test** and choose a file to save the data to. This will be a plain text file suitable for import into a spreadsheet. The caption will change to **Stop Test**, click on this to halt data acquisition
8. Close the utility.

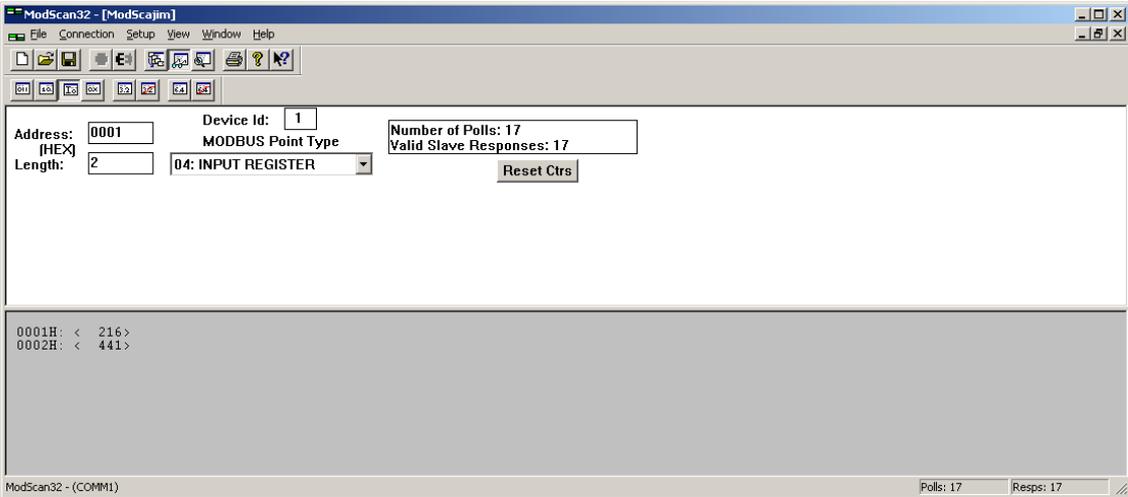
You can also use 'ModScan32' a utility available at <http://www.win-tech.com/html/modscan32.htm>

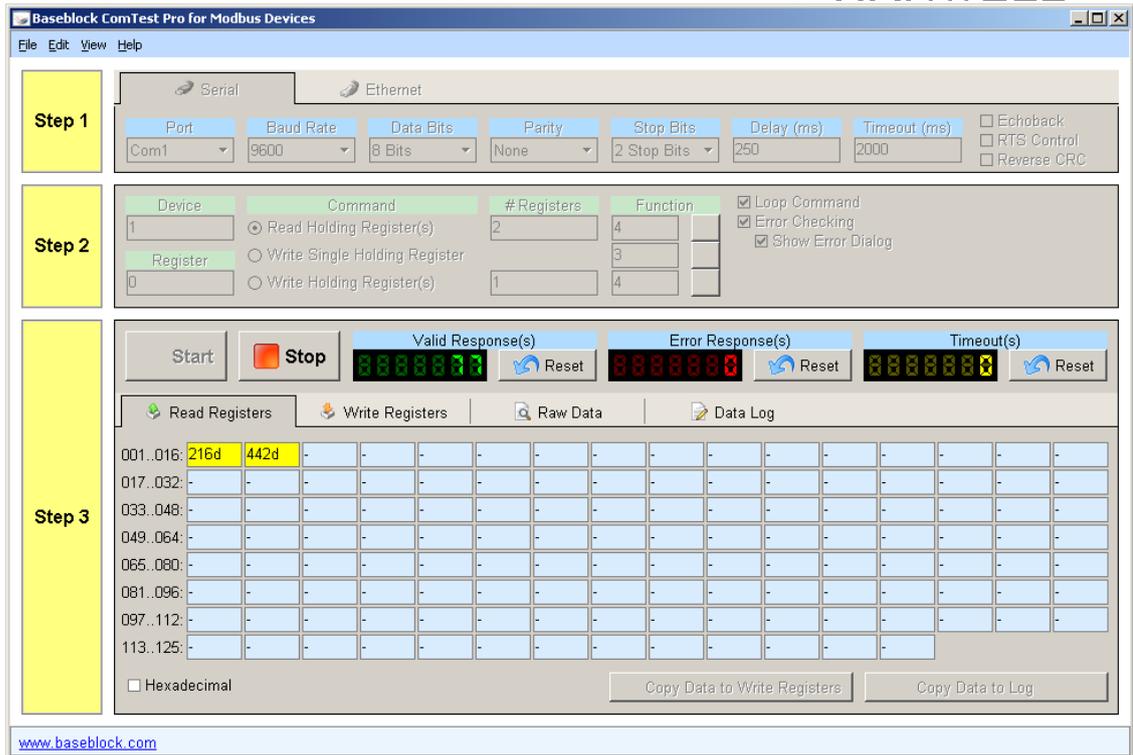
Or Baseblock available at <http://www.baseblock.com/PRODUCTS/demosoftware.htm>

The settings you need for these applications are shown below..

CR2Modbus setting

Application	Modbus Device ID	Function Command	Start address	No. of registers to read
Baseblock Comtest Pro	Sensor ID	4	0	2
Modscan32	Sensor ID	4	1	2





4. Interrogating the CR2 via MODBUS

This section details how to call for both data and sensor status via the MODBUS communication protocol.

NOTE THE UNIT WILL NOT RESPOND TO MODBUS REQUESTS WHEN THE USB CABLE IS CONNECTED

4.1. MODBUS Communications Parameters

The following specifications apply

- Baud rate : 9600
- Parity: none
- Stop bits: 2
- Response time: ≤ 1.5 seconds.

The response from the CR2 is limited to 256 bytes: if this is less than the amount of data required, the CR2 should be interrogated in sets of sensors.

4.2. Connecting to a BMS

The Black core of the connecting cable is unused in this application and MUST normally be isolated before connecting as it will then have +12V on it. If this is shorted then it will blow an internal fuse

1. Switch off the CR2 's power.

2. Connect the Y516 RS485 MODBUS communications cable between the CR2 and the BMS interface module.

This is supplied as an 4-way mini-DIN lead with a free end. The free end should be wired into the MODBUS as follows:

TX+	Red
TX-	Yellow
GND	White

It is generally not appropriate to through-connect the GND as this may cause earth loops.

The GND is connected via the CR2 power supply to **PE (Protective Earth)**, normally this should also be true at the BMS end.

Best practise would be to use a twisted pair for Tx+/Tx- in a shielded cable. The shield should be connected to **PE** at **ONE END ONLY**. For short runs this is not necessary but for runs over a metre or so this will be required

3. Switch on the CR2.

4.3. Requesting Data (**Except** pulse counting units)

The calculated data from the sensors is held in the input registers.

To read it, send the command

```
[device id] 4 0 0 0 2
```

where

[device id] is the ID of the sensor to be read

4 is the command calling for the input registers.

[0 0] is in high-low byte order and is the starting register address to be interrogated.

[0 2] is in high-low byte order is the number of registers to read. (Temperature and Humidity)

If the sensor exists on the CR2 layout AND data is available for both channels then the CR2 will respond with the current data from the requested sensor in Hi-Lo byte order.

NB In any other case the CR2 will not reply

For all parameters except Lux and UV the values are returned*10 (1dp) so for example 20.1C would be returned as 201. In the case of Lux and UV the actual value (0dp) is returned.

The CR2 allows 10ms for the BMS to internally change the RS485 communications direction.

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The CR2 may return an error code – see section 4.6 for the definitions.

If there is no reply for a *data* request, possible reasons are:

- The CR2 has just been switched on and no data has been received yet.
- No data has been received for the Elapsed Time Period set (see section 4.3).
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If there is no reply for a *status* request a possible reason is:

- The Sensor is not included in the CR2 configuration (see section 3.1).

4.4. Requesting Pulse Counter Data

The calculated data from the sensors is held in the input registers.

To read it, send the command

```
[device id] 4 0 0 0 2
```

where

[device id] is the ID of the sensor to be read

4 is the command calling for the input registers.

[0 0] is in high-low byte order and is the starting register address to be interrogated.

[0 2] is in high-low byte order is the number of registers to read. (hi word & lo word of the 4 byte (30bit) count)

If the sensor exists on the CR2 layout AND data is available then the CR2 will respond with the current data from the requested sensor in Hi-Lo byte order.

NB In any other case the CR2 will not reply

The first result returned will be the high 14bits of the 30bit longword that is the cumulative count (hi,lo order)

The second result returned will be the low 16bits of the 30bit longword that is the cumulative count (hi,lo order). If you wish it is possible to just use this result and allow the BMS logic to handle the rollover at 65536.

The counts are returned with **NO** offset or gain applied

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The CR2 may return an error code – see section 4.6 for the definitions.

If there is no reply for a *data* request, possible reasons are:

- The CR2 has just been switched on and no data has been received yet.
- No data has been received for the Elapsed Time Period set (see section 4.3).
-
-

If there is no reply for a *status* request a possible reason is:

- The Sensor is not included in the CR2 configuration (see section 3.1).

4.5. Requesting Status

The hardware status of the Sensors is held in the holding registers. This indicates if no signal has been received from the Sensor for a user-defined period of time, or if the Sensor has sent a low battery warning.

To read it, send the command

```
[device id] 3 0 0 0 1
```

where

[device id] is the ID of the sensor to be read

3 is the command calling for the holding registers.

[0 0] is in high-low byte order and is the starting register address to be interrogated.

[0 1] is in high-low byte order and is the number of registers to read

IF the sensor is on the CR2 layout then the CR2 will respond with the current status from the requested holding registers, otherwise there will be no answer. If an answer comes it will be one of the following:

0	Status OK	Data values will also be available
1	Low Battery Alarm	Data values will be available but the sensor's batteries are low. This value will be interleaved with normal data signals.
2	No Valid data	No data is currently available

Transmitters that are set to send Legacy Mode battery alarms do so after every normal signal. When not set to legacy mode they transmit a battery message after every 256th data. The low battery flag will persist only until the next transmission.

4.6. Error Codes

The CR2 may return the following error codes:

1 Unsupported Function

The request from MODBUS is not recognised.

2 Illegitimate Parameters

The request from MODBUS is recognised but the parameters in the request are not correct.

The CR2 will respond with error code 2 if:

- The start address is not an even number. (0 only supported here)
- The number of registers to read is not an even number (2 only supported here)
- The number of registers to read is less than or equal to zero.

5. USB to RS232/422/485 Adapter

Testing of the modbus system was carried out using a Startech.com 2 Port USB to RS 232/422/485 Serial adapter.

<http://uk.startech.com/Cards-Adapters/Serial-Cards-Adapters/2-Port-USB-to-RS232-RS422-RS485-Serial-Adapter~ICUSB2324852>

5.1. Connections to the Startech.com adapter

Y516: for RS485 MODBUS communications. Fitted to the MS socket.

Yellow TxD=(Data+)

Red TxD=(Data-)

White Ground

Black unused do not short to ground

Please note the Data+ and Data- connections may need to be reversed depending on the modbus input device.