

Eltek TU1004 - User Instructions for RC250 receiver

Packed items

- RC250 receiver with serial and Modbus output
- Antenna (basic whip) – Eltek type UHFFlexi/SMA
- MP12U power supply with regional adaptor
- LC68 – RC250 to PC serial lead
- USB to serial converter lead
- LCTX3 – Transmitter to PC serial lead
- RxConfig software

RxConfig software

RxConfig can also be downloaded from: www.eltekdataloggers.co.uk
When installed, RxConfig creates a folder “Eltek”. In this folder are the RC250 documents for details of Modbus over serial, etc. for Modbus limitations.

The program allows the user to:-

- Read transmitter settings
- Set the transmitter interval
- Associate an RC250 Channel with a specific transmitter channel
- Meter configured RC250 channels

Operation

The RC250 works by first receiving a data 'packet' from a transmitter, verifying it, then storing it to be read by the external device or PC. It is verified by means of a checksum contained in the message and the associated transmitter number.

If the RC250 does not receive a message from a transmitter within a configured time, the stored value will be set to “no data”. For more detail see P6 “No Data interval”.

Example application: Typically data from the RC250 to the PC is updated every 30 minutes, so the transmitter interval is set to 5 minutes (that this PC update period ÷ 6) and the “No Data” interval to 2 hours. (that is PC update period x 4). If the transmitter stops transmitting for any reason the PC should register this fact after 2 hours.

Power Requirements

The RC250 requires permanent AC mains connection. Use only the AC power supply type MP12U. Built-in Ni-Mh batteries provide up to 3 days standby in the event of power failure. A fully discharged battery is charged in 72 hours. Once the batteries become low the RC250 will switch itself into a low power mode and turn off the receiver. **OFF** will appear in the display.

Note: the RC250 is despatched in the **OFF** mode.

The RC250 will power up (turn on) next time external power is applied. The display will then switch to working mode. The RC250 can be turned off by removing the external power and then clicking **Tools > Turn Receiver Off** or briefly pressing the concealed switch accessed through the case rear.



Application

For users who wish to use the Eltek GenII series of transmitters with third party or proprietary software. The RC250 can also be used to interface GenII transmitters to:

- Existing data acquisition systems such as the Datataker DT80 (using Modbus)
- BMS (e.g. Trend) via a Synapsis interface or Trend IO3 (using Modbus)

Locating the RC250

The RC250 and antenna should be located in a position clear of interference, in particular that generated by computers and monitors, and away from surfaces that can compromise RF performance e.g. steel or damp or reinforced walls. Use of the optional dipole antenna will maximise coverage.

LED Indicator

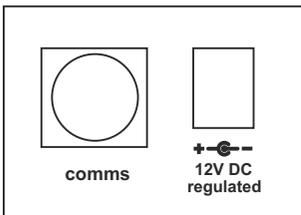
A red LED on the top of the RC250 Indicates the receiver has successfully received a valid data packet.

RC250 programming leads

- LC68 – used to program the RC250 from the PC serial port or via the USB adaptor if no serial port is available
- LCTX3 – used to program the Transmitter from the PC serial port or via the USB adaptor if no serial port is available

A single serial port on the PC can be used but this will mean having to change over the LCTX3 lead and LC68 as required. Note, in **File > Properties** the PC com port can be nominated. You can use the **Device Manager** in Windows to list the COM ports available on your computer. Type **Device Manager** in the Windows 7 search box to open this, and look for **Ports**. USB to serial converters supplied by Eltek are listed as **Prolific USB-to-serial**.

Top panel connections



Comms
(6 way mini Din)

12VDC
(inner is -ve)

Using Receiver Config - From V1.1

Load the program on your PC – it will try to find an existing Eltek folder. To program the RC250 use the LC68 lead. Connect one end to the serial port of the PC and the other to the mini DIN socket situated on the top panel of the RC250. Set the Com port using **File** >

Properties.

Menu:

File	Load Receiver	Upload an existing RC250 configuration
File	Save Receiver	Save the current RC250 configuration
File	Properties	Select PC serial port for communications with RC250 and Transmitter
Tools	Turn Receiver off	Turns receiver off (display indicated OFF)
Tools	ModBus Setup	Sets device (node) address and register addresses for ModBus communications. See ModBus Configuration section.

Buttons: in the TX configuration table

Get TX		Get the current configuration from the Transmitter
Set Interval		Set TX Interval (use the drop down menu)
Set Sensor On Time		Applicable only to transmitter where the external sensor needs power before a reading can be taken. E.g. GS42/GS44 and GD43

Buttons: in the RX configuration table

Get RX		Get the current configuration from the RC250
Set RX		Set the configuration in the RC250
Start Meter / Stop Meter		Load table with received data
Edit Chan		Click over a channel, click Edit Channel to edit. (Use to accept a transmitter not available for direct connection.)
Clear Chan data		Click over a channel, click Clear Channel data
Set Nbr Chans		Enter Number of channels to display (160 maximum) and click Set Nbr Chans to confirm (this reduces unnecessary on screen information and speeds up the interface).

Channel Set-up Procedure

Transmitter present:

- Start up the Configuration program. (If this is the first time it has run you will need to configure the serial port(s) using **File > Properties.**)
- Connect the PC to the RC250 using the LC68 programming lead (and USB converter if required)
- Get the current or start a new RC250 Configuration using the **Get RX** button (you should see the details appear in the right hand list box).
- ▶ • Now connect each transmitter to the PC using an LC-TX3* programming lead.
- Use **File > Properties** to set the TX serial port.
- Get the transmitter details using the Get TX button (the TX serial number will appear)
- Set the transmitter interval. This should be about one sixth of the update interval required in the PC (or connected monitoring device)
- Click on a channel, click **Select Range**, and choose input type from drop down. Click **OK** to confirm.
- Repeat for channels applicable to connected TX
- Repeat if a number of transmitters are being added to the RC250
- Connect the PC to the RC250 using the LC68 programming lead
- Select the destination RC250 channel (by single clicking and highlighting it)
- Select the required transmitter channel (by single clicking and highlighting it).
- Copy the channel details to the RC250 configuration using the **>>** button. Note RXconfig will assume the next TX channel and next RX channel are to be linked. Click the **>>** button to confirm or set up as required.
- Copy the configuration to the RC250 using the **Set RX** Button.

* To gain access to the transmitter programming socket the bottom cover must be removed (2 x pozi-drive screws). Carefully remove the battery pack but do not disconnect it. The programming socket is a 3mm stereo jack socket that will now be accessible.

Using pulse count transmitters

Pulse count transmitters use an internal counter which counts from 0 to 65535 and is incremented each time a pulse is measured. The counter rolls over when it reaches 65535. Transmitters will send the current value of their internal counter each time they transmit. It is therefore necessary to perform a calculation in the receiving software / device which subtracts the previously received pulse counter value from the current one, giving the number of pulses counted.

Columns in the RX Configuration panel table:

Chan	RC250 channel (maximum 160 channels)
Tx Serial	Tx serial number
Tx Chan	TX channel (alpha character A to H)
Tx Range	TX channel range e.g. Humidity SHT if the B channel of a GD10 (see Page 9 for an example of the Edit Rx Channel pane)
Value	Tx value of the last valid data received expressed in units allocated to the range. These can be default or configured as engineering units.
Batt	Tx battery condition expressed in %
Age	Time, in seconds, since the last valid reading received. Age will not be normally greater than 2 times the transmission interval. If it is, there may be permanent or temporary loss of communications and should be investigated.
Nbr TX	Number of successful transmissions received, indicates the reliability of performance and is for comparison purposes only.

No Data Interval

Within the **Edit RX Channel** window is the feature **No data Interval**.

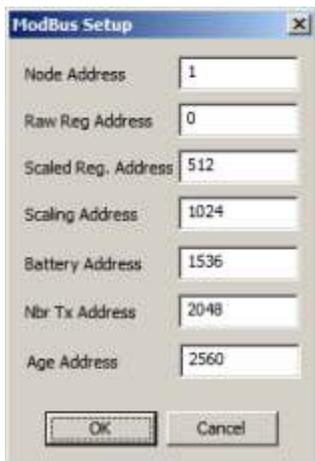
The RC250 expects new channel information from the transmitter on a frequent basis to refresh the last valid value held in a buffer. If data is not received within a configurable period, e.g. due to transmitter failure, the value is reported as **No Data**. This in turn can be processed as appropriate to the application by the connected software.

The No data Interval will default to the TX interval x 6 and can be set (as hh.mm.ss) for special applications on a per channel basis.

Modbus configuration

The ModBus Setup menu (**Tools - Modbus setup**) allows the user to configure the ModBus device address and the holding register addresses for the various parameters.

Node Address should be set to the required slave device ident. The following six boxes are for specifying the start address of holding registers for reporting the transmitter information. The value in each of these boxes must be greater than that in the previous box. The difference must be greater than the number of channels configured in the RC250.



Field	Value
Node Address	1
Raw Reg Address	0
Scaled Reg. Address	512
Scaling Address	1024
Battery Address	1536
Nbr Tx Address	2048
Age Address	2560

Description

- ModBus slave device ID
- Base address of holding registers for the raw values
- Base address of holding registers for the range-scaled values
- Base address of holding registers for the scaling factors
- Base address of holding registers for the transmitter battery levels
- Base address of holding registers containing the transmitter counter
- Base address of holding registers containing the ages of each value.

When reading the values from the RC250, the only Function Code that can be used is 'Read Holding Registers' (0x03). It is possible to read several registers at a time using the Quantity of Registers field, but note that RC250 is limited to 50 registers at a time.

NB. The address values used in the RC250 protocol are the actual addresses encoded in the Modbus message. Some host communication software requires ModBus Holding Registers in the form 4xxxx or 3xxxx. With this scheme, what is referred to as 'Holding Register 40001' is actually addressed within the message protocol as register address 0000 (not 0001 or 40001). It is very important to ascertain exactly what convention the host software uses.

Example request to retrieve holding register 100 (set up to contain the raw value from channel 1) from node address 6:

Slave Address	06
Function	03
Starting Address Hi	00
Starting Address Lo	64
No. of Registers Hi	00
No. of Registers Lo	01
CRC Hi	c4
CRC Lo	62

Response from RC250:

Slave Address	06
Function	03
Byte count	02
Raw Value Hi	06
Raw Value Lo	2b (in decimal, 1579)
CRC Hi	4e
CRC Lo	3b

Example request to retrieve holding register 200-201 (set up to contain the scaled values from channels 1 and 2) from node address 6:

Slave Address	06
Function	03
Starting Address Hi	00
Starting Address Lo	c8
No. of Registers Hi	00
No. of Registers Lo	02

Response from RC250:

Slave Address	06
Function	03
Byte count	04 (2 readings, so 4 bytes)
Raw Value Hi	00
Raw Value Lo	e6 (in decimal, 230 - meaning 23.0 degrees)
Raw Value Hi	01
Raw Value Lo	ed (in decimal, 493 - meaning 49.3 %RH)
CRC Hi	ac
CRC Lo	d9

Raw Reg holding registers, other than pulse counts, contain values less than 65000. Numbers starting from 65441 (0xFFA1) are used to represent out of range or fault conditions. These numbers are:

- 65441 (0xFFA1) - Raw value is above maximum value of range
- 65442 (0xFFA2) - Raw value is below minimum value of range
- 65444 (0xFFA4) - Sensor is open circuit
- 65531 (0xFFFFB) - No Data
- 65532 (0xFFFFC) - Dummy

Scaling Reg holding registers use the scaling factor to represent these same conditions. The scaling factor would normally contain a value of 0 to 4. Values from 240 (0xF0) upwards contain the following error conditions:

- 240 (0xF0) - Scaled value is above the maximum value of range
- 241 (0xF1) - Scaled value is below the minimum value of range
- 242 (0xF2) - Sensor is open circuit
- 243 (0xF3) - No Data
- 244 (0xF4) - Dummy

Extra information on RC250 ModBus setup

The following parameters can be read from the RC250 for each channel:

Raw value	unsigned integer	data received by the RC250 from the transmitter
Scaled value	signed integer	scaled value from the sensor
Scaling factor	unsigned integer	number of decimal points in the Scaled value
Battery value	unsigned integer	percentage transmitter battery level (0-100%)
Nbr Tx	unsigned integer	Tx count

Conversion from the Raw value to the scaled value uses the following formula:

$$\text{Scaled value} = (\text{Raw} * \text{Span} / \text{Max Val} + \text{Min}) * 10^{\text{Dp}}$$

$$\text{Scaling factor} = \text{Dp}$$

The Min, Span, Max Val and Dp can be found by selecting the appropriate channel in the Rx Configuration table and selecting **Edit Channel**.

The **Edit RX Channel** window is shown below:

The screenshot shows the 'Edit RX Channel' dialog box with the following settings:

- (TX) Serial Number: 5501
- Tx Chan: B
- Units: % RH
- Min Val: 0
- Max Val: 4000
- Span: 1000
- Nbr. Dp's: 1
- % No Data Interval: 00:01:00
- Range Type: Humidity

Serial Data

Both ModBus and RC250 Serial Interface protocols are implemented on an RS232 interface. The interface requires no configuration and will automatically respond appropriately to either protocol. It is preset to these settings:

Baud Rate	19200
Data Bits	8
Stop Bits	1
Parity	None

Product Specification

Maximum no. Channels	160
AC supply MP12U	100 to 250V AC (Use only Eltek power supply type)
DC input	12VDC Maximum current < 150mA
Battery endurance	Up to 72 hours
Battery charge time battery.	Trickle - allow 72 hours to fully charge an exhausted battery.
Controls	Concealed button (power off)
Freq. UHF (Europe) the exact frequency)	Default is 434.225Mhz (the label on the base will give the exact frequency)
Freq. US	Default is 914.5Mhz
Rx sensitivity	-117dbm (typical)
Antenna connection	SMA socket
Antenna – standard (supplied)_	¼ wave whip (shipped with product) – Eltek type UHFFlexi/SMA
Antenna – lightweight dipole (optional)	Indoor/outdoor dipole, lead length 5m standard, accessory type LW-ANT/SMA. The maximum recommended lead length is 10m.
Antenna – compact Yagi (optional)	Lightweight 3 element Yagi, providing up to 6db gain supplied with 5m lead and plug.
Temperature Range	-10 to +55°C
Humidity	95% non condensing
Environment used for outdoor use	Indoor use only IP40. A secondary enclosure must be used for outdoor use
Transmitter types	All in GenII range from serial number 7000
Transmitter Interval	1 second to 4 hours