

# Eltek TU1114 – 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  
LCTX3 – Transmitter to PC serial lead  
USB to serial converter lead

## RxConfiguration software

RxConfig can also be downloaded from [www.eltekdataloggers.co.uk](http://www.eltekdataloggers.co.uk). When installed, RxConfiguration 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 then storing the data to be read by the external device or PC. Data 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 page 5 “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 is PC update period ÷ 6) and the “No Data” interval to 2 hours. (i.e. 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 from the RxConfiguration menu select **Tools >Turn Receiver Off**. Alternatively, briefly press the concealed switch accessed through the rear of the case.

## 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 a BMS or existing data acquisition systems 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. Use Windows Device Manager to list the COM ports available on your computer. Type Device Manager in the Windows search box to open this and look for the section “Ports (COM & LPT)”. USB to serial converters supplied by Eltek are listed as **Prolific USB-to-Serial Comm Port**.

## Using RxConfiguration Software

Load the program on your PC – it will try to find an existing “Eltek” program folder. To configure 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 the menu option **File > Properties**. The full menu options are described below;

### 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 <b>Set Nbr Chans</b> to confirm (this reduces unnecessary on screen information and speeds up the interface).

## Channel Set-up Procedure

### Transmitter present:

1. Start up the RxConfiguration program. (If this is the first time it has run you will need to configure the serial port(s) using **File > Properties**.)
2. Connect the PC to the RC250 using the LC68 programming lead (and USB converter if required)
3. 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).
4. Now connect each transmitter to the PC using an LC-TX3\* programming lead.
5. Use **File > Properties** to set the TX serial port.
6. Get the transmitter details using the **Get TX** button (the TX serial number will appear)
7. Set the transmitter interval. This should be about one sixth of the update interval required in the PC (or connected monitoring device)
8. Click on a channel, click **Select Range**, and choose input type from drop down. Click **OK** to confirm.
9. Repeat for channels applicable to connected TX
10. Return to step 4 to add additional transmitters
11. Connect the PC to the RC250 using the LC68 programming lead
12. Select the destination RC250 channel (by single clicking and highlighting it)
13. Select the required transmitter channel (by single clicking and highlighting it).
14. 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.
15. 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 3.5mm 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:

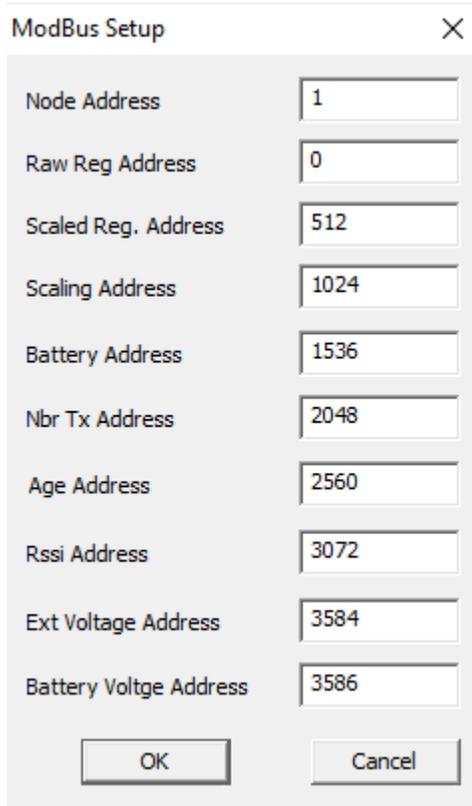
Chan	RC250 channel (maximum 160 channels)
Tx Serial	Tx serial number
Tx Chan	TX channel (alpha character A to H)
Tx Range	TX channel range e.g. Humidity SHT if the B channel of a GD10 (see Page 9 for an example of the Edit Rx Channel pane)
Value	Tx value of the last valid data received expressed in units 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 device identifier. The following ten boxes are for specifying the device identifier and 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.



The image shows a 'ModBus Setup' dialog box with a close button (X) in the top right corner. It contains ten input fields for Modbus addresses, each with a label on the left and a text box on the right. At the bottom, there are 'OK' and 'Cancel' buttons.

Label	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
Rssi Address	3072
Ext Voltage Address	3584
Battery Voltage Address	3586

**N.B.** serial numbers below 43282 (showing in RxConfig as Version 2.7 or below) will not display or contain valid data for the last 3 registers: RSSI Address, Ext Voltage Address or Battery Voltage Address. These values are only available in RC250 firmware version 2.8 and greater.

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.

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 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:

Node 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:

Node 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:

Node 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:

Node 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 (0xFFFB) - No Data
- 65532 (0xFFFC) - 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 a dialog box titled "Edit RX Channel" with a close button (X) in the top right corner. The dialog contains the following fields and controls:

- Serial Number: 0
- 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 (dropdown menu)
- OK button
- Cancel button

## 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	100 to 250V AC (Use only Eltek power supply type)
Power supply type	MP12U note inner -ve and outer +ve
DC input	12VDC Maximum current <150mA
Battery endurance	Up to 72 hours
Battery charge time	Trickle - allow 72 hours to fully charge an exhausted battery pack
Controls	Concealed button (power off)
Freq. UHF (Europe)	Default is 434.225Mhz (refer to label on base)
Rx sensitivity	-117dbm (typical)
Antenna connection	SMA socket
Antenna – standard	¼ wave whip (standard) – Eltek type UHFFlexi/SMA
Antenna – lightweight (optional)	dipole Indoor/outdoor dipole, lead length 5m standard, accessory type LW-ANT/SMA. The maximum recommended lead length is 10m.
Antenna – compact (optional)	Yagi 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	Indoor use only IP40 A secondary enclosure must be employed for outdoor use.
Transmitter types	Compatible with all transmitters in GenII range from serial number 7000
Transmitter Interval	1 second to 4 hours