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1. Introduction

This manual is for users who have purchased an Eltek GenII system comprising Eltek standard transmitters, standard repeater(s) and an RC250 receiver together with the RxConfig or software.
It assumes that the application is satisfied using this standard equipment and that a survey has been conducted to ensure that the radio range covers the site in question within the required margin of safety of performance.
It assumes that the RxConfig software will be used to configure the RC250 and transmitters and that the RepConf software will be used to set up repeaters if required.

Quick survey methodology is included.

Eltek has made all user instructions, manuals, data sheets and technical notes available on their website at www.eltekdataloggers.co.uk/support.html. Details of specific links are provided where applicable and any relevant information is also reprinted in this manual to assist the user.

A section is included for standard accessories, identifications and use. A limited number of standard readily available probes and sensors are covered.

07-06-16

2. System principles of operation

2.1 Appropriate applications

The Eltek GenII wireless telemetry system is ideal for a wide variety of applications that involve the accurate monitoring of data in conditions where events are slow moving.
Therefore, the system works well in applications such as measuring the environment in a building or following a process. However, the system cannot accurately record values that change very quickly. (<500mS)

2.2 Transmitter interval

The GenII system is a one way telemetry system. There is no need for a receiving or polling device at the transmitter unit, meaning battery endurance can be several years using off the shelf batteries.
Transmitters send the sensor value(s) or averaged (transmitter dependant) sensor values at a random point in time within the configurable **transmitter interval**.
The receiver is continuously active. The random transmissions from the various transmitters are held in a **pending value register** that is successively updated as newer, valid transmissions are received.

3. RC250 Receiver

3.1 Packed items

- RC250 receiver with serial and Modbus output (RS232)
- 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
- Optional RS485 adapter (must be ordered with RC250 – see accessories.)

3.2 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

3.3 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 "No Data interval" on page 8 (Section 11).
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.

3.4 Power Requirements

The RC250 requires permanent AC mains connection. Use only the AC power supply type MP12U provided. 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.

3.5 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 IQ3 (using Modbus)

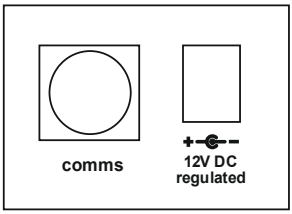
3.6 LED Indicator

A red LED on the top of the RC250 Indicates the receiver has successfully received a valid data packet. (In addition to this, the RC250 display will show the serial number of the transmitter received and the RSSI will show the signal strength.)

3.7 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 search box to open this, and look for Ports. USB to serial converters supplied by Eltek are listed as Prolific USB-to-serial.

3.8 Top panel connections



Comms (6 way mini Din)

12VDC (inner is -ve)

3.9 Specification

Maximum no. Channels	160
AC supply	100 to 250V AC (Use only Eltek power supply type MP12U)
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.
Controls	Concealed button (power off)
Freq. UHF (Europe)	Default is 434.225Mhz (the label on the base will give the exact frequency)
Rx sensitivity	-117dbm (typical)
Antenna connection	SMA socket
Antenna – standard type (supplied)	¼ wave whip (shipped with product) – Eltek 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	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

4. Care and disposal of product

Care

Please treat all components with care.
Do not expose the transmitter to any harsh environment where extremes of temperature, humidity or dust can be experienced.
The transmitter must not be used in any hazardous rated environment.
Do not disassemble the transmitter for any other reason than configuration or battery replacement. Some transmitter types do have a replaceable fuse should the battery be reverse connected.
Do not expose the transmitter to water, rain or spillage. It is not waterproof. For operation in these environments a secondary water/weatherproof enclosure is required and can be supplied by Eltek
Do not abuse the transmitter by dropping, knocking or violent shaking. Rough handling could damage the transmitter.
Do not operate the transmitter close to a receiving device – ensure there is a separation of 20cm.
The transmitter power output is below the directive for devices used in a medical or hospital environment. For further details contact Eltek.

Disposing of the product

This electronic product is subject to the EU directive 2002/96/EC for Waste Electrical and Electronic Equipment (WEEE). As such it must not be disposed at a municipal waste collection point. Please refer to your local regulations for direction on how to dispose of this product in an environmentally responsible manner

5. Maintenance and calibration

5.1 Maintenance

There is no specific maintenance or adjustment required other inspection of the battery compartment to ensure no corrosion due to battery leakage is present and battery replacement when necessary.

Batteries

Most transmitters are supplied with a pack of 4 or 6 low cost AA LR6 primary cells – that is non rechargeable. These should be replaced when the LCD battery gauge (if fitted) is flashing. The battery voltage can be interrogated using RxConfig software but is not available on the ModBus output. Failure to replace exhausted cells can lead to leakage and corrosion which can damage the transmitter circuity and enclosure.
Always replace with high quality LR6 batteries e.g. GP®Super. It is good practice to replace the battery cassette or holder, this is available at low cost from Eltek direct or an authorised distributor.

Mandatory battery change at the time of calibration can be cost effective.

The battery chemistry for devices that are AC powered with built in back-up batteries (e.g. RX250AL, GD47, GW47 and RP250GD) is NiMh and should be reliable for many years. It is suggested that they are replaced after 5 years.

5.2 Calibration

Calibration of your wireless telemetric system is essential to maintain accurate and reliable readings. We recommend annual on-site calibration of RH, temperature, Lux, and UV. Equipment can be returned to an accredited Eltek distributor or direct to Eltek for transmitters with built in CO2 sensors.

Transmitters that include RH and temperature are best calibrated using the sensor exchange procedure. Calibrated digital RH and temp sensors are plug-in. The original sensor should then be disposed of responsibly or returned to UK for safe disposal. Alternatively Eltek can test the returned sensor and issue a report for your audit purposes. This service is chargeable.

Transmitters with Lux or Lux and UV sensors are digital devices and can be checked against a known light source and calibrated meter. Alternatively they can be returned to Eltek for calibration. There is a charge for this service.

6. Note about RF performance

6.1.1 Improving Reception

Radio waves travel best in open unobstructed spaces. Aerials work best high up in open spaces. Unfortunately, it is rarely possible to have both of these criteria met! However these two statements should be kept in mind when installing the radio system. This will lead to the best performance of the system that can be obtained in a given situation. Note that metal objects, thick and damp walls significantly attenuate radio signals. Reinforced concrete is a real signal killer as it can act like a metal screen.
If a nearby source of interference contains frequency components in the band of the system, then the receiver will be desensitised. This is especially true if the interference is stronger than the signal from a distant transmitter. Typical sources of interference are mobile phones, walkie-talkie type radios, Tetra police communication systems, computer equipment (especially older equipment) and anything with a radio transmitter in it, e.g. the components of a wireless security system.

6.1.2 Locating the Transmitters

Try to place the transmitter as high up as possible, but not too close to ceilings. Keep away from damp or metal clad walls, metal objects, cabling, pipes, etc. Also bear in mind that the fewer obstacles in the path to the receiver will give the greater range and reliability of the system.

6.1.3 Locating the RC250

The RC250 is a single unit that acts as a data receiver. Locate the RC250 central to the transmitters and clear of sources of radio interference.
Where range is not a problem the built in antenna supplied should be used and provides a very compact installation. Range can be very significantly improved using the optional LW-ANT/sma dipole or UHFFlexi/Mag/SMA antenna. This should be mounted as high as possible and away from sources of interference.

7. Accessories

7.1 Probes and sensors

Eltek RH and T detachable probe with 3m lead. (For longer lead refer to Eltek)	RHT10E
Leak sensing cable with 15m inactive section and 4m active section (other combinations POA) for GC60F	LC-Leak15/4

7.2 Antenna

Lightweight indoor/outdoor dipole antenna with 5m lead, SMA plug and mounting hardware	LW-ANT/SMA
5m coaxial antenna extension lead SMA to SMA	ANT-EXT/SMA5m
¼ antenna on magnetic base with 1.8m lead	UHFFlexi/Mag/SMA

7.3 Wall bracket

Tamper-resistant wall bracket for all GenII product (except TMET)	WBG

7.4 Leads

Serial to USB convertor lead	RS232/USB
2M LC68 lead extender	RS232/2M

7.5 Connectors

Mini thermocouple connector type T (brown)	MiniT
Mini thermocouple connector type K (green)	MiniK

7.6 Weatherproof enclosure

Rugged outdoor (IP65) enclosure with built-in cradle for most transmitter types. *specify transmitter type and accessories required with order - if in doubt contact Eltek*	OD1 series

7.7 AC Transducer

AC100/240 transducer - provides an isolated contact closure when powered. Detects presence of an AC supply (can be used to assert alarms). Use with GD24 or GD34	EL-CC

7.8 Power supply

100-250VAC to 12VDC 7.2W power supply. Specify mains plug type with order (UK/Euro/US)	MP12U

100-250VAC to 9VDC approx.10W supply. Specify mains plug type with order (UK/Euro)	MP9U
DIN rail mounting AC to 12VDC power supply for GD90A	DRA18-12
Wire-in 24/12V to 9V regulator	24REG9

7.9 Communications module

RS485 interface (for RC250 units after serial no. 25194)	SQ/RS485

"Wired socket" is the mini Phoenix with cage screw terminals or equivalent with strain relief

8. Replacement accessories

8.1 Antenna

Stubby antenna for transmitters 434.225Mhz L=66mm	UHFStub/SMA
Flexi antenna for receiver, repeater or transmitters 434.225Mhz L= 165mm	UHFFlexi/SMA
Flexi antenna on magnetic base with 2M lead with sma connector	UHFFlexi/Mag/SMA

8.2 Battery

Battery carrier (4 x AA cells not included)	BATCARR4
Battery carrier (6 x AA cells not included)	BATCARR6
Plug-in rechargeable 7.2V MiMh pack for RP250GD, RC250 or GD47	EL7.2NIMH
6 x 1.8Ah batteries for RC250, RC250D or WSR	EL6XMIMH

8.3 Connectors

2 way transmitter connector - screw down - green with strain relief	MINIPL2
4 way transmitter connector - screw down - green with strain relief	MINIPL4
5 way transmitter connector - screw down - green	MINIPL5
6 way transmitter connector - screw down - green	MINIPL6
8 way transmitter connector - screw down - green	MINIPL8
TiniQG - for GD11 temperature probe	QGMX-1320

8.4 Leads

TX set up from PC lead	LCTX3
Receiver to PC serial lead (1.0m) or replacement lead assembly for MoxaD-311	LC68

8.5 TMET

IP65 outdoor enclosure with pole mount bracket for use with TMET only	WBT
Pole mounting bracket Skye or Kipp and Zonen pyranometers	PyrBkt

8.6 Power supply

AC to 12VDC power supply (For GD40A)	MP12U/GD40A

9. Supported third party sensor products

Type	Manufacturer	Product name	Eltek Product
AC current transducer (AC output)	Northern Design	SCL / SCT	GD90A, GD900A, 651 Squirrel
AC current transducer (DC output)	Northern Design	SXD	GD40A
Energy meter	Northern Design	NDRail310, NDRail350	GD90A, GD900A, 651 Squirrel
Energy monitor with pulse output	Rayleigh	PRO1D	GC62, GD67 and GD68
Energy monitor with pulse output	Rayleigh	PRO75D	GC62, GD67 and GD68
Energy monitor with pulse output	Elster	A100C	GC62, GD67 and GD68
Heat meter	Landis & Gyr	T230	GD93A
Heat meter	Sontex	SuperCal 539	GC62, GD67 and GD68
Heat meter	Sontex	SuperStatic 440	GC62, GD67 and GD68
Heat flux sensor	Hukseflux	HFP01	GS44H, 451L
Sunshine pyranometer	Kipp and Zonen	CMP3	GS41Acf, TMET
Sunshine pyranometer	Skye Instruments	SKS 1110	GS41Acf, TMET
Water flow meter	Flownetix	Flownetix 315	GC62, GD67 and GD68
Water flow meter	Flownetix	Flownetix 325	GC62, GD67 and GD68
Air velocity	E plus E	EE576/EE660	GS41AV
Carbon dioxide sensor (0-5/10/20%)	Vaisala	GMT221	GD43E
Weather sensor	Vaisala	WXT520	TMET Weather
Wind sensor	Vaisala	WMT52	TMET Weather
People counter			

10. Repeater notes

The RP250GD repeater is a self-contained mains operated data packet (GenII protocol only) repeater.
The RP250GDS repeater additionally includes a built-in switchable loudspeaker for survey applications.

RP250GD Repeater features:

- An LCD to view activity and status of transmitters in operation
- Received Signal Strength Indication (RSSi) of incoming transmitter data (chevron bar)

Using the RepConf, Repeater Configuration software you can:

- Authorise transmitters you want to be repeated
- Compensate for systems requiring multiple repeaters
- Conduct a radio survey

10.1 Power requirements

The repeater requires permanent AC mains connection. Use only the AC power supply provided. When powered the red LED on the top of the unit will flash. Built-in Ni-Mh batteries provide up to 3 days standby in the event of power failure. A fully discharged battery is normally charged in 72 hours.

- When you first receive the RP250GD the display will read *OFF*
- The display will switch to working mode when the MP12U power supply is connected or by activating the concealed switch if the batteries are suitably charged.
- If you remove the MP12U power supply the unit will stay in working mode until the internal rechargeable batteries are exhausted. The display will then read *OFF*.

The repeater can be turned off by removing the MP12U power supply and activating the concealed switch under the small hole on the back of the unit using an unfurled paper clip or narrow screwdriver. The red LED will stop flashing and the display will read *OFF*.

10.2 Product Specification

AC supply:	100 to 250V AC (Use only Eltek power supply type MP12U)
DC input:	12.5VDC Maximum current <70mA
Battery endurance:	typically 72 hours
Freq. UHF (Europe):	default is 434.225Mhz (other frequencies available –

	refer to Eltek)
Freq. US:	default is 914.5Mhz (other frequencies available – refer to Eltek)
Rx sensitivity:	-117dbm (one chevron on signal strength bar)
Tx RF power:	10mW
Antenna connection:	SMA socket
Antenna - standard:	¼ wave whip (shipped with product)
Antenna - alternative:	Indoor/outdoor dipole, lead length 5M standard, accessory from Eltek Ltd type LW-ANT/sma. The maximum recommended lead length is 10M.
Transmitter spec:	to European spec EN300-200
Temperature Range:	-10 to +55°C
Humidity:	95% non-condensing
Environment:	Indoor use only IP40. A secondary enclosure must be used for outdoor use
Backup batteries type:	Ni MH pack
Backup battery life:	Typically 24 to 48 hours dependant on activity
Dimensions:	D 41mm x W 80mm x H 125mm
Weight:	500g inc. batteries
Receiver/Transmitter:	Crystal controlled

Connectors

DC supply: 2.1mm concentric jack (male)

Comms (serial):

3.5mm stereo jack (applicable up to serial number 8480) – use with lead type LCTX3

6 pin mini din (applicable to serial number 8481 to current) – use with lead type LC68

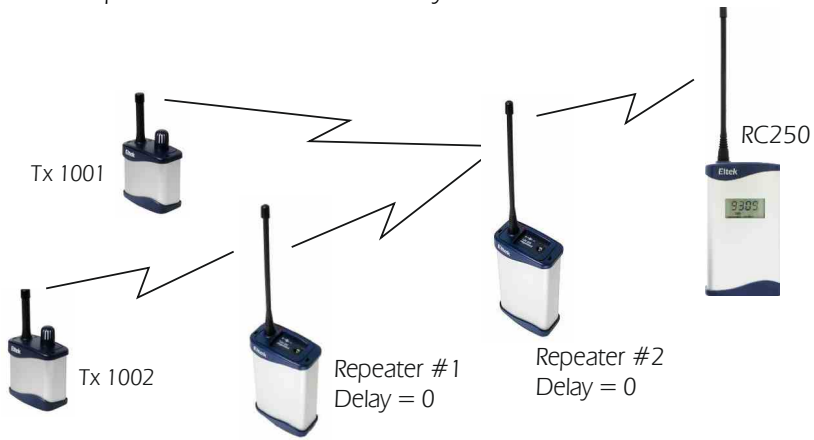
For the latest detailed RP250GD information see the document TU1007 – RP250GD user instructions (available online).

10.2.1 Basic system where there is one RP250GD only

Do not repeat transmitters unnecessarily!

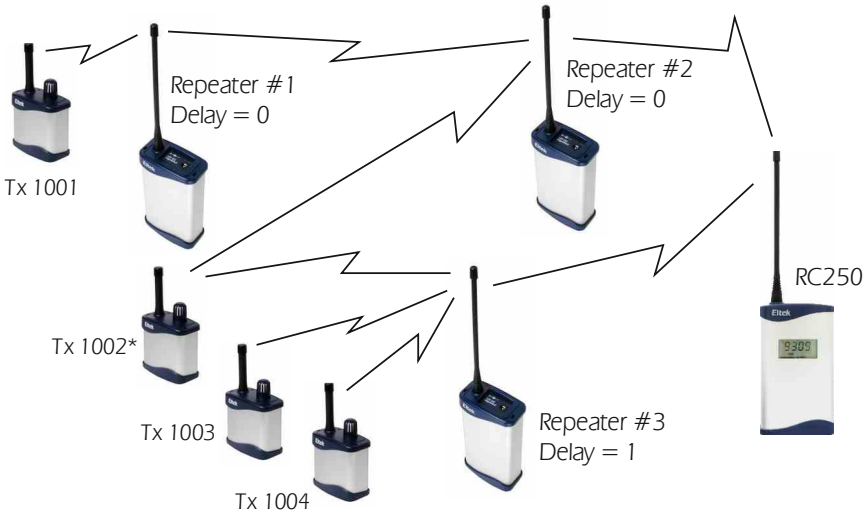
10.2.2 A system where are there are two or more RP250GD

Do not repeat transmitters unnecessarily!



10.2.3 For a system where multiple (tandem and radial pattern) RP250GD used:

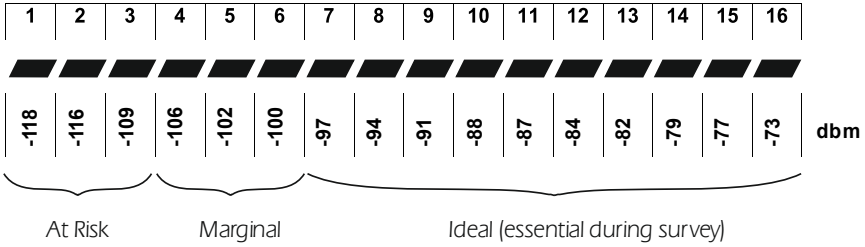
Do not repeat transmitters unnecessarily!



- Tip: Make a proposed system schematic as this will assist set up for the various repeaters in the system.
- *TX1002 could be roving (mobile) around an area of coverage e.g monitoring a pallet on a fork lift truck, such that Repeater 2 or Repeater 3 would repeat its transmission.

10.3 RSSI indicator (calibrated from serial number 7925 to current)

The 16 chevrons indicate the following Received Signal Strength Indication:



At Risk: Insufficient margin of safety to guarantee year-on-year performance

Marginal: Depending on environmental factors, performance may be inhibited or inconsistent.

Ideal: Signal should be ideal at all times. (Recommended for high system reliability)

10.4 Radio coverage survey

Eltek have provided an online tutorial which illustrates how to perform a radio coverage survey. Please visit www.eltekdatareceivers.co.uk/surveytutorial.

Overview

Typically a system will consist of transmitters distributed across various floors and rooms of a building reporting to an RC250 receiver. Range can be extended by means of repeaters that provide both tandem and/or radial coverage patterns.

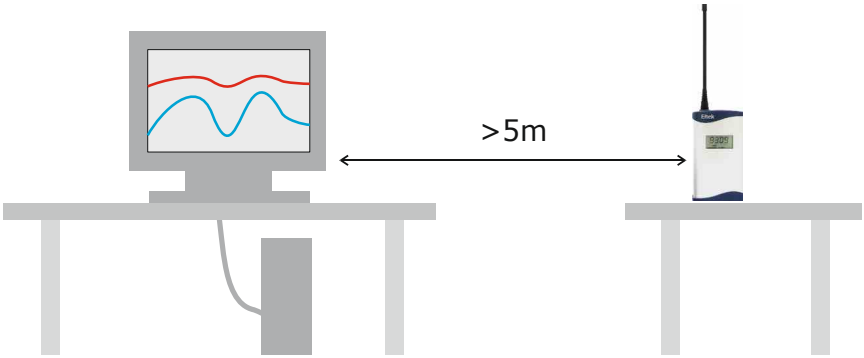
Systems can be linked by repeater links, enabling communications across roadways or car parks.

Use of an external antenna on the receiver, repeater or individual transmitters can be used to optimise range.

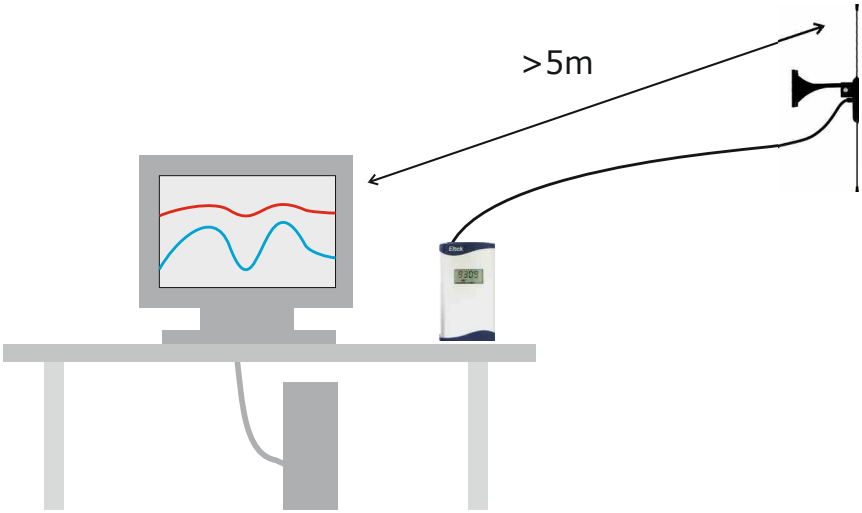
Locating the Receiver

Before the location of the transmitters and repeaters can be considered, it is very important to find a suitable location for the RC250 Receiver in the site. Care should be exercised in positioning the RC250 Receiver.

Try to site the Receiver at least 5 metres away from the PC so that interference is minimised:



If the Receiver is connected directly to the PC, an RS232 extension lead may be required (RS232/5M for 5m). Alternatively, use an external antenna on the Receiver if installation permits:



The Receiver should also be located clear of all other sources of radio interference.
The following locations/materials will inhibit the performance of the system:

- Reinforced concrete
- Metal cladding
- Rooms that are constructed as Faraday cages
- Moving machinery that changes position e.g. fork lift trucks, cranes

10.4.1 Using an RP250GD/RP250GDS to detect interference

Disconnect the antenna, and if no interference is present the RSSI bar on the unit's display should show 2 chevrons or less:

RP250GDS Only: Switch the audio toggle switch on (located on the top of the unit). You should hear white noise only.

Connect the antenna, and if no interference is present the RSSI bar should display at most 6 chevrons:

RP250GDS Only: The audio should remain as white noise.

If the signal is higher, this indicates that interference may be present. Interference can be generated by nearby electronic equipment. If the interference is from a nearby telemetry system then an alternative frequency for the final installation may be necessary.

Should interference be detected and the origin cannot be found then advanced interference detection equipment will have to be used, e.g a radio frequency spectrum analyser. Refer to Eltek.

Before installation a survey should be conducted.

10.5 Preparing the transmitter and repeater for the survey

10.5.1 Prepare the transmitter

Set the transmitter's transmit interval to 1 second:

- Connect the survey transmitter to the PC with the cable supplied.
- In RxConfig, open Transmitter Setup
- Enter the correct COM port and click OK / Connect.
- Enter 1 second as the Tx Interval and click Set Tx Interval.

10.5.2 Prepare the repeater

- Ensure the battery in the RP250GD/RP250GDS is fully charged. From fully drained, the battery takes 3-4 days to charge.
- Power on the repeater by briefly connecting the mains supply or by using the concealed button on the back.
- When a valid transmitter signal is received by the RP250GD/RP250GDS repeater, the transmitter serial number and RSSI (signal strength) will be displayed on the repeater's LCD display.
- If using an RP250GDS, the loudspeaker audio will be change from white noise to a short bark or croak. If the signal is strong the bark is clean and as the signal weakens the bark will become dominated by the white noise.

10.6 Carrying out the survey

- Create an initial site map/plan with the prospective transmitter

positions located on it.

- Position the transmitter at the proposed Receiver location.
- Take the RP250GD/RP250GDS to the first proposed transmitter location.
- View the transmitter's serial number on the RP250GD/RP250GDS display.
- Check the signal strength is greater than 6 chevrons.
- If the strength is good, mark the survey map with a tick.
- Continue checking, ticking transmitters when the signal is good.
- Where the strength is not good, a repeater may be needed.
- Find an appropriate location for a repeater, both in terms of signal transmission and daily operation.
- Move the survey transmitter to the proposed repeater location.
- Check the remaining transmitter locations with the RP250GD/RP250GDS.
- Mark the location of the repeater and tick off transmitter locations when surveyed.

At the end of the survey you should have sufficient information to update the plan. There may be an opportunity to rationalise the plan (and perhaps reduce the number of repeaters) by possibly relocating repeaters. If this is the case the survey must be repeated to assure performance.

What can you expect in terms of range?

Our experience indicates communication across two floors (wood or reinforced concrete – and vertically inline separated) will be reliable.

On the same floor expect more than 100m if simple prefabricated walling is used, more if the floor is open, and considerably less if steel or panelling of mesh lined chambers is present.

Expect 500m for a repeater located in a window which is revealed to another repeater in a similar location.

Always configure the repeater to pass the transmitter signal of those required and inhibit those not required. This reduces on-air activity leading to best system reliability.

11. Using the RxConfig software

11.1 RxConfig System Requirements

- PC running Windows Vista/7/8/10
- CDROM drive (for installation)
- 16Mb RAM
- 8Mb free hard disk space for program
- Additional hard disk space for data
- VGA (or better) display
- One unused serial port (or USB slot if used with a USB to Serial Converter)
- LC68 cable
- Eltek RC250

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).

11.2 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).
- [1]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. To set up another TX, go back to the [1]Now connect… step.

- 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.

11.3 Columns in the RX Configuration panel table:

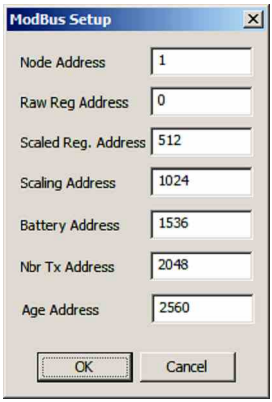
Chan	RC250 channel (maximum 160 channels)
Tx Serial	Tx serial number
Tx Chan	TX channel (alpha character A to H)
Tx Range	TX channel range e.g. Humidity SHT if the B channel of a GD10 (see Page 9 for an example of the Edit Rx Channel pane)
Value	Tx value of the last valid data received expressed in units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

11.3.1 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.

11.4 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.



	Description
Node Address	ModBus slave device ID
Raw Reg Address	Base address of holding registers for the raw values
Scaled Reg. Address	Base address of holding registers for the range-scaled values
Scaling Address	Base address of holding registers for the scaling factors
Battery Address	Base address of holding registers for the transmitter battery levels
Nbr Tx Address	Base address of holding registers containing the transmitter counter
Age Address	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.

11.4.1 Communications

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 (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

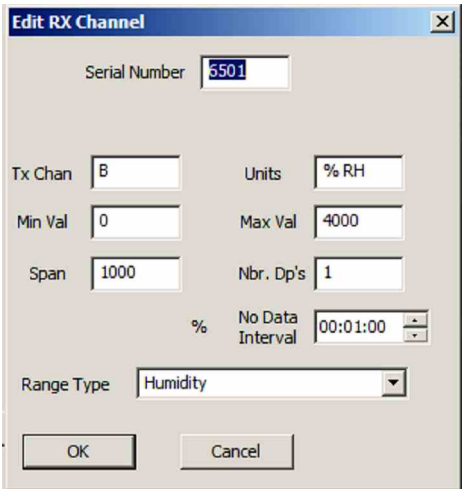
11.4.2 Extra information on RC250 ModBus setup

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:
Scaled value = (Raw * Span / Max Val + Min)*10^Dp
Scaling factor = 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:



11.4.3 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

11.4.4 Calibrating transmitter channels using RxConfig

Documentation detailing how to calibrate a transmitter from within RxConfig can be found in RxConfig's online help. Launch RxConfig, click **Help** > **Contents** and choose **Reference** > **Transmitter Setup** > **Calibrating Transmitter channels**.

11.5 Help file issues

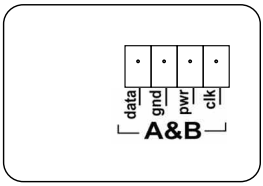
Microsoft do not include the Windows help system with Windows Vista/7/8 /10by default. RxConfig and RpConfig currently use this form of help. You can install the help system via Microsoft from the following location(s):
Windows Vista/7/8:
`https://support.microsoft.com/en-us/kb/917607`
There is currently no way of viewing Windows help files (.hlp) within Windows 10.

12. Transmitter connections

The following transmitter type suffixes are used to indicate:

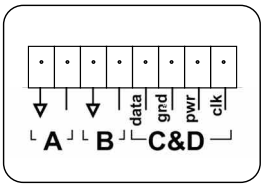
- **E** – Eltek RHT10E RH/temperature probe (digital interface) (except GS42/44)

12.1 GS/GD13E



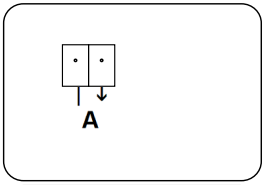
1 x External RH / temperature digital interface
E for RHT10D
J for E plus E EE08

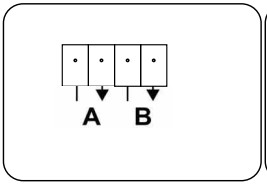
12.2 GS/GD14E

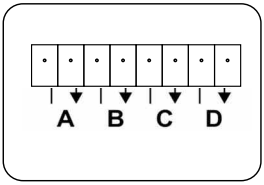


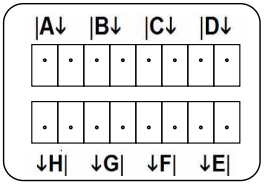
As GS/GD13 but with 2 x external thermistor temperature inputs

12.3 GS/GD 31/2/4/4R/8



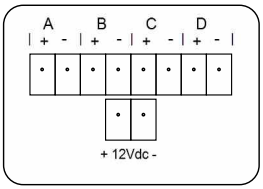






All inputs for thermistor temperature probes

12.4 GD40A



Inputs A - D: Observe sensor polarity. Each input is relay isolated. CTs share a common ground.
12VDC: Connect MP12U5WA external supply if required.

12.5 GS41A

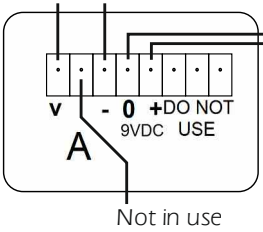
Use with a pyranometer:

SKS1110

Connect green wire to "v", connect red and blue wires to "-"

CMP3

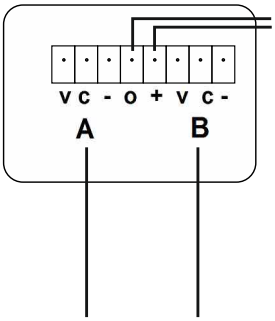
Connect red wire to "v", connect black(screen) and blue wires to "-"



Not in use

The GS-41A can be powered from an external 9VDC (+/- 0.1V) supply or supplementary battery pack (type SP1118) and / or internal batteries. External power is connected to "+" and "0".

12.6 GS42/42E



The **GS-42** provides a 5V or 12V sensor supply (the selected sensor voltage is present only during transmission or if the sensor supply is enabled in TxSetup).

0 is sensor supply output -ve

+ is sensor supply output +ve.

The **GS-42E** has the option to be powered from an external 9VDC regulated supply.

0 is external supply -ve

+ is external supply +ve.

Both transmitters provide two voltage/current inputs, A and B.

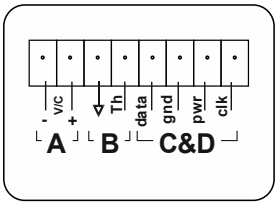
v is a voltage input. (0-100mV / 1V / 10V plus EU scaling configured using Darca software)

c is a current input. (0-20mA or 4-20mA plus EU scaling configured using Darca software)

If current is used link **v** to **c**. **-** is the -ve voltage or current input.

12.7 GD43E

GD-43E/J/JA

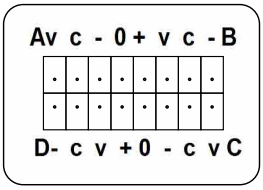


Channel A
Version E
Ranges are 0-100mV / 1V / 10V / 0-20mA / 4-20mA
Version JA
Range -15mV to +15mV with scaling.
Use with Kipp and Zonen NRLite Net radiometer.
NRLite connections:
Connect red wire to "+"
Connect black(screen) and blue wires to "-"

Channel B
Thermistor temperature input with range
-50 to +150 °C.

Channels C, D
These channels are the digital signal and power for the RH and temperature probe:
Channel C is presented to the logger as the temperature.
Channel D is presented to the logger as the RH.

12.8 GS44/GS44E/GS44H



Connector
1
2

The **GS-44/44E** provide four inputs, A B C and D. Each is a voltage or current input (v c -).
v is voltage input, **c** is current input. If current is used, link **v** to **c** . **-** is the -ve voltage or current input.

GS-44

There is a **sensor supply output** on Connector 1 and a sensor supply output or FET switch on Connector 2.
Connector 1: **0** is sensor supply output -ve, **+** is sensor supply output +ve
Connector 2: **0** is sensor supply output -ve or FET switch, **+** is sensor supply output +ve or FET switch

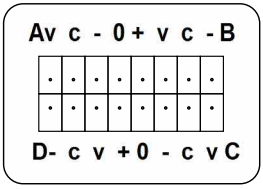
GS-44E

There is an **external 9VDC supply input** on Connector 1 and a sensor supply output or FET switch on Connector 2.
Connector 1: **0** is external 9VDC -ve, **+** is external 9VDC +ve
Connector 2: **0** is sensor supply output -ve or FET switch, **+** is sensor supply output +ve or FET switch

GS-44H[suffix letter]

The **GS-44H** provides four **bipolar single range** voltage inputs, A B C and D. There is also an external 9VDC supply input on Connector 1 and a sensor supply output or FET switch on Connector 2.
Connector 1: **0** is external 9VDC -ve, **+** is external 9VDC +ve
Connector 2: **0** is sensor supply -ve or FET switch, **+** is sensor supply +ve or FET switch

12.9 GS44AVE

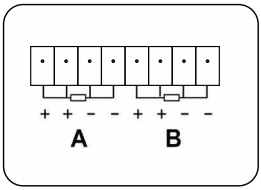


1
2

AVE indicates an averaged value is used at the point of transmission.
Connector 1
0 is external 9VDC -ve (e.g MP9U),
+ is external 9VDC +ve
Connector 2
(**0** is No connection, **+** is No connection)

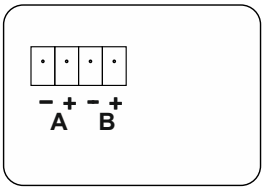
v is a voltage input
c is a current input (with V to C for current range)
- is the -ve voltage

12.10 GS/GD52



For 2 x 4 wire PT100

12.11 GS60

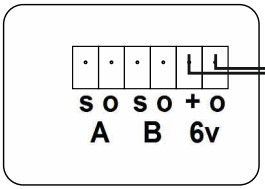


2 x state inputs are provided: A and B.

An open input is transmitted as a "1"
A closed input is transmitted as a "0"

Note: + is common. V open circuit is nominally V batt
Input impedance is approximately 10Kohm.

12.12 GC62

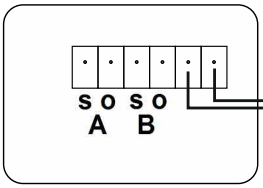


2 x pulse input transmitter.

External power in
Range 6V to 9V DC (regulated).
Power supply is MP9U from Eltek.
When external power is applied (and if greater than the internal battery voltage), the external power is used. If external power fails the internal batteries will power the transmitter.

Input A: **s**: Signal **o**: -ve
Input B: **s**: Signal **o**: -ve

12.13 GC62EX

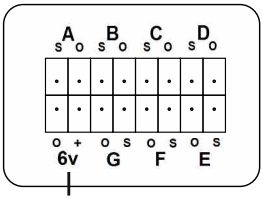


2 x pulse input transmitter for compliance to IGEN (gas connection) requirements

Not used

Input A: **s**: Signal **o**: -ve
Input B: **s**: Signal **o**: -ve

12.14 GD67



For 7 x pulse inputs with external power. Suitable power supply is MP9U5W.

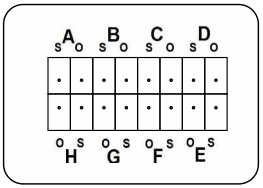
Inputs

s Signal

o -ve

External supply input (4-9V, nominally 6V).
(Diode ORed with internal battery.)

12.15 GD68



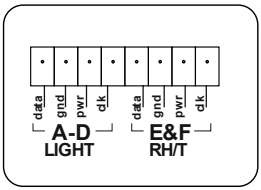
For 8 x pulse inputs.

Inputs

s Signal

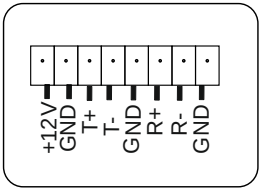
o -ve

12.16 GD72E



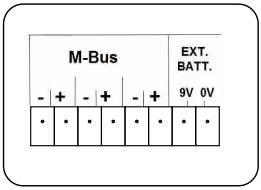
For use with LS50 lux sensor or LS70 lux / UV sensor and RHT10D RH / temperature probe.

12.17 GD90A/900A



GD90A: For use with 1 x ND350 3 phase energy meter.
GD900A: For use with up to 6 x ND350 3 phase energy meters.
Modbus comms.

12.18 GD93A



For use with Landis & Gyr T230 heatmeters. For other MBus applications refer to Eltek.

13. Specifications

13.1 Common transmitter specification

RF specification	EN300-220
RF power	10mW
Environment specification:	
Compliant to EN300-220	-10 to +55ºC
Actual	-30 to +65ºC
Humidity	100% non condensing
Environmental rating	IP40
Dimensions (footprint)	78 x 41mm
Battery endurance	up to 5 years (interval set to 5 minutes)
Transmission interval range	(less for GL-70 and GS40 series) 1 sec to 4 hours
Indicator (red LED)	transmit active/on/off
Control switch (concealed)	test mode / hibernate
Antenna socket	SMA

13.2 Individual transmitter specifications

Models	Sensors	Range	Resolution	Accuracy
GC04/GD 04	1 x external thermistor temperature	-40 to +70ºC	0.1ºC	±0.2ºC (-15 to +40ºC)
			0.2ºC	±0.4ºC (-29 to +65ºC)
			0.3ºC	±0.6ºC (-36 to +70ºC)
			0.4ºC	±0.8ºC (-40 to -36ºC)
GC06/GD 06	built-in thermistor temperature	As GC04		
GC10/GD 10	built-in temperature (digital sensor)	-30 to 65ºC	0.1ºC	±0.4ºC (+5 to +40ºC) ±1.0ºC (-20 to +65ºC) ±1.5ºC (-30ºC)
	built-in RH	0-100%	0.1%	±2% (10 to 90%RH) ±4% (0 to 100%RH)
GD11	built-in temperature and RH	As GC10		
	external thermistor temperature	As GC04		
GD13E	external RH (RHT10E)	0-100%	0.1%	±2% (10 to 90%RH)

	external temperature (RHT10E)	-40 to +120ºC	0.1ºC	±4% (0 to 100%RH) ±0.4ºC (+5 to +40ºC) ±1.0ºC (-20 to +80ºC)
GD14E	external RH (RHT10E) external temperature (RHT10E) 2 x external thermistor temperature	As GS13E As GS13E As GC04		
GS21/GD21 GS24/GD24 GD21AL/GD24AL GD24HV	1 x external T or K type thermocouple temperature 4 x external T or K type thermocouple temperature / state inputs As GD21/GD24 with audible and visual alarm. 4 x external T or K type thermocouple temperature	-200 to 200ºC	0.1ºC / 0.2ºC	±0.3ºC
GD24H	4 x external K type thermocouple temperature	-200 to 1200ºC	0.5ºC	±2.0ºC
GD24R	4 x external R type thermocouple temperature	-200 to 2000ºC		
GS31/GD31 GS32/GD32 GS34/GD34 GS38/GD38 GD32AL/GD34AL	1 x external thermistor temperature 2 x external thermistor temperature 4 x external thermistor temperature / state inputs 8 x external thermistor temperature / state inputs As GD32 and GD34 with audible and visual alert	-50 to 150ºC	0.05ºC (-5 to +75ºC) 0.1ºC (-25 to +100ºC) 0.2ºC (-40 to +125ºC)	±0.1ºC (-5 to +75ºC) ±0.2ºC (-25 to +100ºC) ±0.4ºC (-40 to +125ºC)
GS34R	4 x resistance	0-1K 0-10K 0-100K		±4R ±10R (1 to 10K) ±1K (10 to 50K) ±4K (50 to100K)
GS34R100	4 x resistance	0-100R		
GD40A	4 x voltage inputs with averaging for NDMeter SXD CTs	0-6VDC only		
GS41Acf	1 x external pyranometer (e.g. Skye SKS1110 / Kipp & Zonen CMP3) 1 x calculated average value 1 x calculated cumulative (Integrated) value	0-1500W/m2 0-1500W/m2 0-65,000 Wh	3.75µV	
GS41AV	1 x external air velocity (EplusE EE66/576) rolling average value 1 x calculated minimum 1 x calculated maximum 1 x instantaneous value (last value measured)			

GS42	2 x external voltage or current	0-100mV		
GS44	4 x external voltage or current	0-1V DC	0.25mV	±0.5mV
GS44AVE	As GS44 but with averaging function	0-10V DC	2.50mV	±5mV
		0-20mA DC	~5uA	20uA
		4-20mA DC	0.05%	0.1%
GD43E	1 x external RH and temperature (RHT10E)	as GS13E		
	1 x voltage / current	as GS42		
	1 x external thermistor temperature	as GS31		
GD43JScf	1 x external RH and temperature (EplusE EE68)	as GD13J		
	1 x voltage / current for pyranometer	0-30mV	0.1%	±30uV
	1 x external thermistor temperature	as GS31		
GD47/GW 47	1 x built-in RH and temperature	as GD10		
	1 x built-in CO2	0-5000ppm	3%	±50ppm
	1 x built-in 12VDC supply monitor			
GS52/GD 52	2 x 2 or 4 wire Pt100 temperature	-100 to 200ºC	0.1ºC	±0.3ºC
GS52H	2 x 2 or 4 wire Pt100 temperature	0 to 300ºC	0.1ºC	±0.3ºC
GC60	2 x state indications			
GC60F	2 x state indications for flood sensors only			
GC60Y	As GC60 with mark/space ration of event during TX interval			
GC62EX	2 x pulse inputs for connection to domestic gas meter			
GC62/GC 62a	2 x pulse inputs (/a inverted input)			
GD67	7 x pulse inputs			
GD68/GD 68a	8 x pulse inputs (/a inverted input)			
GL-70	1 x built-in temperature and RH	As GC10		
	1 x visible light	0-4,000 Lux	0.1Lux	
		0-200 KLux	0.01KLux	
	1 x UV light	0-5000 mW/m² 0-10,000 µW/Lumen		
GD72E	1 x external temperature and RH	As GD13E		
	1 x external visible light (LS50 or LS70)	As GL-70		
	1 x external ultraviolet (LS70 only)	As GL-70		

GD81	1 x built-in barometric pressure	800-1100mBar	0.0122mBar /bit	+/-1% FSS
GD84	1 x built-in differential air pressure	-250 to +250 Pascal	0.1 Pa	±3Pascal
GD90A	1 x RS485 modbus input for NDRail350V energy meter	Up to 12 values		
GD900A	As GD90A but can connect to up to 6 NDRail350V meters			
GD93A	1 x MBUS input for 3 x landis and gyr T230 heatmeter			
TMET	1 x u type thermistor input	As GD31		
	1 x voltage input for use with external device e.g. solarimeter 1 x serial input for connection to Vaisala WXT520 or WMT50	0-50mV	0.025%	0.1%

14. Transmitter product revisions

GS34 transmitters with a serial number greater than 13316 and GD34 transmitters with a serial number greater than 13773 will have a 'state' range option.
When open circuit the channel will read 1 and for a short circuit it will read zero.

15. Thermocouple isolation and interference issues

To ensure accurate and reliable performance the following points should be understood and taken into consideration:

Galvanic isolation is essential
When using multiple non insulated thermocouple probes it is essential that full galvanic isolation exists between the probes. Failure to do so will create reading errors.

Current loops
When using thermocouple probes connected to a common transmitter which is powered from a source other than internal batteries, potential current loops can exist causing reading errors. If it is essential that the transmitter is powered externally, the AC power supply must be a type which has extremely low AC leakage current (such as medical grade types).
It is preferred that only the Eltek MP12U power supply is used. In case of doubt, contact Eltek.

Induced voltage interference
When using thermocouples with long leads in the presence of electrical interference (e.g. welding equipment or heating control systems, especially oven furnace control systems) voltages can be induced into the thermocouple tip which will lead to reading errors.
Ensure that thermocouples are not located close to electrical interference.

RxConfig will poll the receiver for meter readings at regular intervals (the meter refresh time) when the meter window is displayed and the PC is connected to the receiver.

16. Pulse count and GenII telemetry

The pulse count transmitters GC62 and GD67/GD68 employ the same measuring and transmission techniques.

Transmitter

At the transmitter pulses are counted continuously to a maximum of 65,535. When 65,535 is reached the counter is reset to zero and starts counting again.
At the time of transmission the value in the counter is transmitted.
The transmission interval is normally the logging interval / 6.

Receiver

The last valid value from each transmitter is held by the receiver in a register.
The device connected to the RC250 must calculate the difference between the previous and current values to determine the number of pulses that should be used.

If a no–data condition occurs

Incidence of frequent no-datas (no transmitted data received by the receiver) should always be investigated as a matter of urgency as no-datas could be an indication of radio coverage issues.
The period that the receiver can cope with consecutive no-datas and still record a valid value when a transmission is eventually received is 65,535 pulses. The actual period of time is therefore linked to how frequently pulses are expected from the measuring sensors.
For instance, in the case of The PRO1D electricity meter, the device is rated at 45A max and provides 2000 pulses per KWh.
A kettle rated at 2,500W/2.5kW will consume (assuming AC voltage is 240VAC) 10.41A. So if were left boiling for 12 hours it would consume 2.5kW/12 = 30kWh.
This equates to 30 x 2000 pulse from the PRO1D = 60,000 pulses, indicating that under the conditions of this unlikely example, if a valid transmission were received after 12 continuous hours of no-datas the receiver would self-correct and there would be no inaccurate values in the receiver's data.

Declaration of Conformity

Manufacturer

Eltek Ltd
Haslingfield
Cambridge CB23 1LL
UK

Description of Equipment

RC250 Receiver

I confirm that this instrument conforms to the requirements of the EMC Directive 89/336/EEC (amended 92/31/EEC) and carries a CE mark indicating conformity.

Applied Standards

Harmonised European Standard EN50081 part 1 and EN 50082 part1 for emission and immunity.

Radio products conform to ETSI EN300220 -1

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L.G.H. Hatfield
Managing Director
Eltek Ltd.

Date: 01/12/2014