

**THE GNSS REPEATER TECHNOLOGY EXPERT**



**ROGER™ GPSR-1-EU/-UK/-US**

**ROGER™ GNSS-L1G1GA-EU/-UK/-US**

**Repeater**

**User Manual**

**Time2Act™**

*Thank you for choosing this product/these products from Roger-GPS Ltd. We appreciate your support and hope that our product serves you well. This product is designed to provide many years of reliable service provided it is used as intended and taken care of. This user manual will assist you in assembly and general operation of this product.*

*It is not our intent to teach you about GNSS satellite navigation. It is assumed that you are an experienced user of satellite navigation products and services with the basic skills and experience necessary to use this product safely. If after reading the following instructions, if you are unsure or uncomfortable about safely using this product we urge you to seek additional information through our local partner or widely available GNSS and GPS information sources. Some of the information sources are listed at the end of this manual.*

### **IMPORTANT!**

Read carefully the contents of this manual before assembly or operation of this product.

**Please check, apply and fulfil the radio licensing regulations and directives of the use of GNSS repeaters in your country from your regulator.**

### **ROGER™ GPS Repeater key features**

1. ROGER™ GPS Repeater products are designed and manufactured in Finland.
2. ROGER™ GPS Repeater products are carefully tested and have full two years warranty.
3. ROGER™ GPS Repeater products are CE-certified and approved worldwide by the communications authorities e.g. in EEA countries for use as radio-licensed devices.
4. ROGER™ GPS repeater has a proprietary gain control system that provides up to 15dB more signal than other systems in the market.
5. ROGER™ GPS active gain control provides up to 10 times more gain signal while adhering to the ETSI EN 302 645 standard.
6. ROGER™ GPS intelligent repeater provides more gain in difficult conditions and an oscillation protection to protect your GPS signals.
7. SUMMARY
  - Automatic gain limitation
  - Oscillation prevention with indicator
  - Maximal coverage for CE approved repeater
  - Instant GPS-lock when moving outdoors
  - Full product family with repeaters, amplifiers and splitters



### **Roger-GPS Ltd. – the Company**

The increasing popularity of **GNSS – Global Navigation Satellite System** (GPS, Glonass, Galileo, Compass, ...) terminals, systems and services has generated new applications and given rise to expectations that these devices would be able to operate indoors as well.

Roger-GPS Ltd. is a company specialized in GNSS (GPS) repeating technology. Our customers include a wide range of users who need GNSS signal reception indoors. Users who benefit from the use of indoor GNSS signal are among others: public safety, defence, public transport, airlines, logistics and companies manufacturing, selling and servicing GPS terminals, systems and services.

Roger-GPS Ltd.'s business concept permits the use of GNSS repeater devices and services in places where it was previously impossible.

The company was established as spin-off in February 2009 to carry on the development, manufacturing and marketing of GPS products started by Sparklike Ltd. September 2008 Sparklike Ltd. launched the first CE-certified GPS repeater product family approved by the communications authorities in Finland and Sweden for use as radio-licensed device.

The private company owners of Roger-GPS Ltd. are Maktub Consulting Ltd., and Naxim Ltd.

### **CE CERTIFICATE, radio licensing**

The Roger-GPS L1 GPS repeater has recertified the repeater product in January 2012 according to the renewed ETSI EN 302 645 V1.1.1 (2010-03) Harmonized European Standard. The equipment conforms to the essential requirements of Directive 2014/53/EU (hereafter "the Radio Equipment Directive") and EN 301 489-1 (V1.8.1), EN 301 489-3 (V1.4.1), EN 302 645 (V1.1.1).

Roger-GPS GPSR-BP products have been classified in NATO N-S-N code 5825580004234 and NATO NCAGE code: A557G.

***This product can be put on service including European Economic Area. Study this documentation of use and installation from this manual/in your local country sales company/Roger-GPS LTD. The user must have the necessary frequency licence for operation.***



## DECLARATION OF CONFORMITY

We

Roger-GPS Ltd.  
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FI-02270 Espoo, Finland  
Email: [roger@gps-repeating.com](mailto:roger@gps-repeating.com)  
[www.gps-repeating.com](http://www.gps-repeating.com)

Declare under our own responsibility that the products

**GPSR-1, GPSR-L2, GNSS-L1G1GA, GNSS-L1G1GA-IP67, GNSS-L1L2-67D1,  
GNSS-L1L2G1GA-67, GNSS-L1G1GA-CHAIN, GNSS-L1G1GA-CHAIN-Y**

Commercial name: ROGER™ - GPS or ROGER™ - GNSS Repeater.

Which are manufactured in Finland and to which this declaration refers conforms with the relevant standards or other standardising documents:

- **EMC:** EN 302 645 (V1.1.1), EN 301 489-1 (V1.8.1), EN 301 489-3 (V1.4.1)
- **RF:** EN 302 645 (V1.1.1)
- Intertek ETL Semko Oy (FINAS T199) product compliance test reports 200630A-EMC and 200630C-RF.

According to regulations in Radio Equipment Directive 2014/53/EU.

The product carries the CE mark:



*This declaration of conformity is valid from 01st of December 2017*

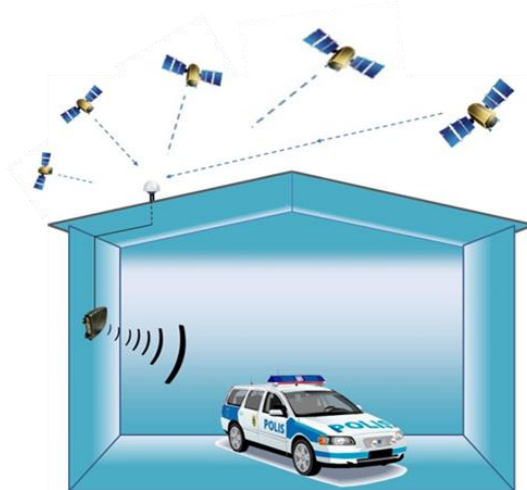
**Authorised Signatory:**

A handwritten signature in blue ink, appearing to be "S. Ruoko", written over a horizontal line.

Simo Ruoko, CEO, Roger-GPS Oy (Ltd.)

## What is ROGER™ GNSS Repeater?

ROGER™ GNSS repeater operates by receiving GNSS satellite signals with an antenna located outdoor and re-radiating the signals to the indoor area or covered space.



To use GNSS satellite devices inside your building you will need a repeater system to transfer the outdoor signals to inside. A repeater is a device that relays GNSS signals to any indoor location that isn't normally reachable. The repeater receives GNSS satellite signals via an antenna located outside the building and re-radiates them to the indoor or covered space.

The GNSS receiver is tracking the GNSS signal by using the re-radiated signal from the ROGER™ GNSS repeater. When the GNSS receiver is moved from repeater covered area to outdoors, the receiver will instantly track the location instead of the time consuming acquisition of GNSS almanac data.

### Notes:

1. ROGER™ GNSS repeater can be used for indoor navigation taking into consideration that the receiver gives the position of the outdoor antenna.
2. ROGER™ GNSS repeater as said earlier fulfils the EN 302 645 V1.1.1 (2010-03) specification requirements-so it can be put on sales in all over the world including EEA countries.
3. The use (taking into use) of GNSS repeaters (such as ROGER™ GNSS Repeaters) in many markets requires a radio license to allow to power it on. The GNSS repeaters are meant to be used by professional business users: companies and institutes. Check the license regulations, conditions and how to apply for a license from your local regulator authority before operation.
4. If the user of the GNSS repeater is an individual person, a radio license must be applied before the GNSS repeater is taken into use from the local regulator authority.

**Description of GNSS Repeater controls and connectors (applies to repeater versions GPSR-1 and GNSS-L1G1GA):**

1. Gain control knob: The gain control knob is used to control the output signal level (gain variation when turning the knob is 0 ...-40dB) of the GPS repeater.
2. DC power connector: The repeater power is supplied through the DC input connector. The connection is reverse polarity protected. The repeater uses 300 mA/+12V DC.
3. Receiving antenna connector: from the outdoor antenna is connected to the SMA input in the repeater front panel with the cable.
  - a. ROGER™-GPS has product packages that include cable.
  - b. Alternatively a 50Ω custom cable can be used. At the repeater end the connector is SMA female so the cable end should be SMA male.
  - c. The repeater feeds +5VDC 100mA for active outdoor antenna.
  - d. The cable connector is TNC male for the outdoor antenna.
4. Status LED indicator
5. Integrated transmitter (TX) antenna inside the case.

**ROGER™-GPS Repeater (GPSR-1 or GNSS-L1G1GA)**

A single ROGER™ GNSS Repeater is enough to provide a GNSS indoor coverage area about 1 to 1600 square meters. The modern receivers can detect the signal at the level which less than -160dBm, such like TETRA radios and smart phones using A-GPS (Assisted GPS), so the distance can reach up to 50 meters from the repeater's centre.

Several ROGER™ GNSS Repeaters can be installed in the same building. Alternatively, the signal coverage provided by a single package can be extended with ROGER™ GNSS additional products such as line amplifiers and signal splitters.

**WHAT IS GPSR-1 or GNSS-L1G1GA (-EU/-UK/-US) PRODUCT**

- 1x ROGER™ GNSS Repeater unit (GPSR-1 or GNSS-L1G1GA)
- 1x Power supply with EU or UK or US plug respectively
- 1x User Manual in English (this one)

**ROGER™ GNSS repeater installation (applies to GPSR-1 and GNSS-L1G1GA)**

Install the GNSS repeater transmitter by fixing it to the ceiling, wall or a suitable mount. The repeater has an integrated transmitter TX antenna, which is located in the middle of the unit, same side as the status LED. The transmitter antenna radiates mostly towards to the same direction as the LED. Ideally the transmitter should be located so that any desired GNSS receiving location (like an antenna on top of a van in a garage) has a direct line-of-sight to the repeater antenna.

Also note the length of the power adapter cable when planning the installation location.

After the outside antenna, cable and repeater has been installed. Make sure the antenna connector is properly fastened to the repeater, plug in the power adapter.

Power on and the green indicator LED blinks for about two three seconds during the startup phase.

Turn the control knob in order to set the gain. Higher gain increases the coverage of the GNSS reception.

Constant green light indicates proper gain setting. Turning the knob too far clockwise will result in the red LED to light up indicating too large gain setting. Turning the knob too far counter clockwise will result in the green LED to blink indicating too low gain setting.

**The indications of the status LEDs are:**

- Constant **GREEN**: Transmitter is operating normally
- **Constant RED/GREEN**: Transmitter is operating normally; output power has been limited to maximum allowed value.
- **RED**: Transmitter has detected an error or interfering signal. Typical reason is that the input antenna is located so that it can pick up the signal from the transmitter and a feedback oscillation occurs. Other common reason is that there is an interference source close to the receiving antenna.

**Troubleshoot:**

Problem: Red light is on.

Solution: The gain setting is too high. Turn the control knob counter clockwise to decrease the gain.

Problem: Green light blinks (about 5 Hz), red light is off.

Solution: Transmitted signal level is too low. Turn the control knob clockwise to increase the gain.

In normal operation only the green indicator LED is steady on. In all other cases please check the antenna connector before making any gain adjustments.



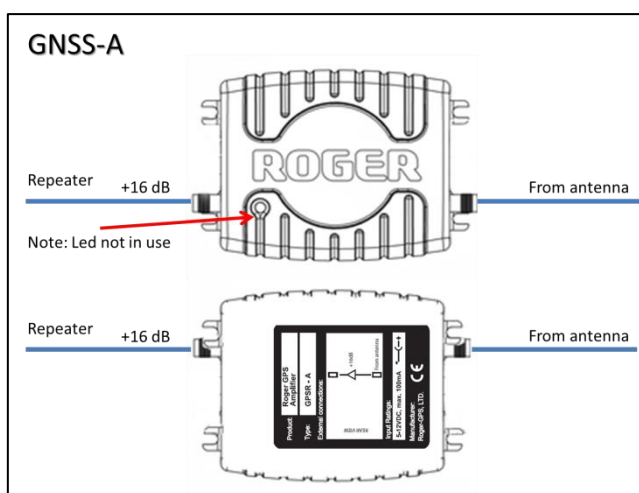


## Extending the ROGER™ repeater's distance from the outdoor antenna.

### ROGER™ GPS Amplifier (GNSS-A)

ROGER™ GPS Line Amplifier is used to allow longer cable runs and/or signal splitting to several GPS Repeaters.

It has a gain of +16dB and it includes a filter to remove unwanted signals that may have entered the cable at some point. Amplifier is powered through the output signal cable by the ROGER™ GPS Repeater and it passes on DC power for the



GPS receiving antenna or another GPS line amplifier.

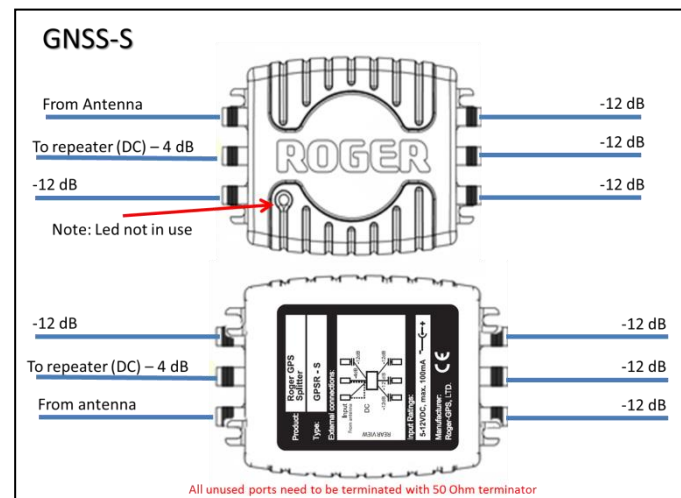
## Extending the number of repeaters by adding a Splitter or Splitter Amplifier.

### ROGER™ GPS Splitter 1 to 5 (GNSS-S)

With the ROGER™ GPS Signal Splitter, the signal from one external antenna can be redistributed to up to five repeater units.

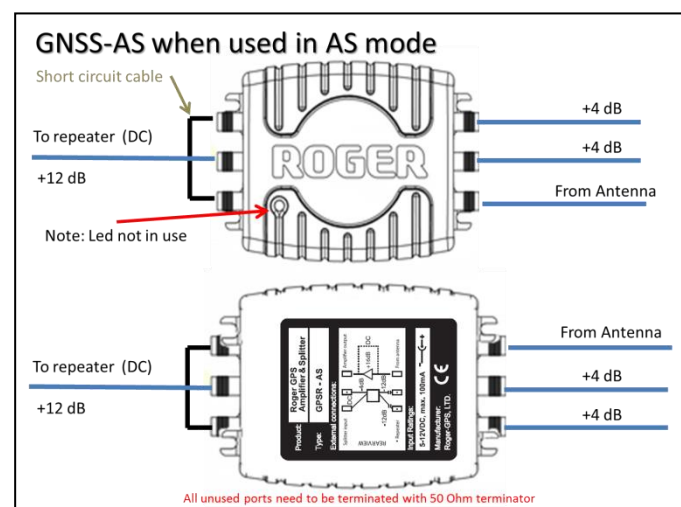
It is advisable to use a separate amplifier with the signal splitter in order to ensure adequate transmission power to all the five repeaters. If the signal is to be transmitted to fewer than five repeaters, the unused ports must be terminated. Splitter is powered through the output signal

cable by the ROGER™ GPS Repeater and it passes on DC power for the GPS receiving antenna or GPS line amplifier.



### ROGER™ GPS Amplifier & Splitter (GNSS-AS)

ROGER™ GPS Amplifier & Splitter is a combined signal splitter and line amplifier with an output of +12dB (1 port) and +4 dB (2 ports) that can transmit to up to three separate repeater units. In order to get the amplification, the ports shown in the picture must be connected. The unused ports must be terminated if less than 3 repeaters are connected to GNSS-AS.



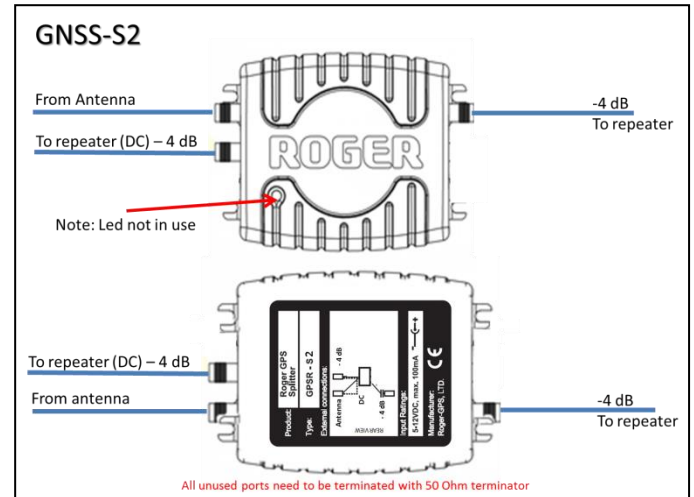


**ROGER™ GPS Splitter 1 to 2 (GNSS-S2)**

With the ROGER™ GPS Signal Splitter 1 to 2, the signal from one external antenna can be redistributed to up to two repeater units.

It is advisable to use a separate amplifier with the signal splitter in order to ensure adequate transmission power to all the two repeaters. If the signal is to be transmitted to only one repeater, the unused port must be terminated. Splitter is powered through the output signal cable by the ROGER™ GPS Repeater and it passes on DC power for the GPS receiving antenna or

GPS line amplifier.



**ROGER™ GNSS repeater technical information:**

<b>Size:</b>	110*143*28 mm
<b>Frequencies:</b>	GPSR-1: 1.57542 GHz GNSS-L1G1GA: GALILEO 1.57542 GHz GPS L1 1.57542 GHz GLONASS L1 1.602 GHz
<b>Weight:</b>	165 g
<b>Overall Gain:</b>	> 40dB
<b>Noise Figure:</b>	< 2dB
<b>Variable attenuation:</b>	0-40dB
<b>Impedance:</b>	50Ω
<b>RF Input connector:</b>	SMA-female
<b>Power consumption:</b>	max 300 mA
<b>Operating temperature:</b>	-25 ... +55°C
<b>Power supply:</b>	110-230VAC/+12VDC, 1600mA Power supply included
<b>Antenna power output:</b>	+5VDC, 100mA
<b>TX antenna gain:</b>	max +4dBd, RHCP polarization
<b>Indoor coverage radius:</b>	1-50m (depends of the sensitivity of the receiver) and the gain position
<b>Other features:</b>	Automatic gain control
	Feedback oscillation suppression Status/power LED
	Output power limit –60dBm, 0,000001mW
	Manual gain control
	Internal transmit antenna
<b>CE-certified</b>	Yes

More information about GNSS specification, look at:

- <http://www.gps-repeating.com/>
- [http://www.etsi.org/deliver/etsi\\_en/302600\\_302699/302645/01.01.01\\_60/en\\_302645v010101p.pdf](http://www.etsi.org/deliver/etsi_en/302600_302699/302645/01.01.01_60/en_302645v010101p.pdf)

## GNSS Technology Expert

## ROGER™-GPS

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### WARRANTY

Roger-GPS Ltd agrees that any hardware supplied under these Conditions shall be free from defects in materials and workmanship for a period of 24 months from the date of the delivery "(the Warranty Period)" covering material and workmanship. The 24 months period is calculated from the date, the products are shipped from the Byer's warehouse in the case that the Byer has an accounting system that keeps track on the shipment dates. Nevertheless, the warranty period cannot exceed in any circumstances 26 months from the date of delivery from Roger-GPS Ltd warehouse.

Roger-GPS Ltd undertakes to remedy all defects in the Products notified to it by the Buyer during the Warranty Period by either repairing or replacing or refunding at Roger-GPS Ltd.'s option the defective Product or defective part at Roger-GPS Ltd.'s cost.

Goods returned under this guarantee shall be delivered to Roger-GPS Ltd at the Buyer's expense.

Warranty will be void in respect of goods which in Roger-GPS Ltd.'s reasonable opinion, have been subjected to unauthorised modification or repair, improper installation, neglect, misuse or operation in environmental conditions outside of specified safe operating extremes. The warranty applicable to non-Roger-GPS Ltd product supplied by Roger-GPS Ltd shall be limited to the warranty offered by the manufacturer of the product.

Roger-GPS Ltd shall not be liable to the Buyer for any consequential loss.

No warranties, expressed or implied, including but not limited to, any implied warranty of merchantability of fitness for any purpose, are made or deemed to have been made by the Roger-GPS.

Roger-GPS Ltd shall not be responsible to the Buyer or any other party in respect of any claims arising out of the sale of the products.

Roger-GPS Ltd does not warrant the software delivered under these conditions per se but agrees to maintain the software for a period of 90 days from the date of delivery of the relevant software.

The Buyer shall indemnify Roger-GPS Ltd against all proceedings, claims or demands in any way connected with the Conditions brought or threatened against Roger-GPS Ltd by a third party except to the extent that Roger-GPS Ltd is liable to the Buyer under the Conditions.



Supplier reserves all rights for product changes and upgrades.  
Pictures and texts are indicative