



ROGERTM

GPS repeater

Installation instructions



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FAST installation instructions



1. Installation, tools required

When installing the GPS repeater, you should have:

- A suitable tools to tighten the SMA connector
- Handheld GPS receiver (*)
- Multimeter
- Suitable fixing tools and accessories



2. Receiving antenna installation

The receiving antenna should be placed in a place where it can 'see' as much of the sky as possible.



3. GPS repeater installation

Install the GPS repeater transmitter by fixing it to the ceiling, wall or a suitable mount.



4. Power supply

After having installed the outside antenna, cable and repeater, plug in the wall adapter cable and plug the adapter to a power outlet.



5. Ready to adjustments

After having installed the power supply, the LED of the repeater should flash a few times at startup and then turn constant red, green or yellow.

See adjustment instructions on page 9.

ROGER™ GPS repeater installation instructions

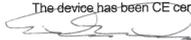
Product description

ROGER™ GPS repeater is a device that is used to relay GPS signals to places where they cannot normally be. The GPS repeater operates by receiving GPS satellite signals with an antenna located outside of the building and re-radiating them to the indoor or covered space. The GPS received can then 'see' the satellites indoors. The use of re-radiated signals mean that the GPS receiver is tracking the current GPS status. This means that when the receiver is moved from the indoors to outside, the GPS receiver is instantly tracking the location, instead of time consuming acquisition of current GPS state.

Please note that ROGER GPS repeater can be used for indoor navigation but you have to take into consideration that the receiver will always give the position of the outdoor antenna instead of the real position

Operating license note

Note: GPS repeaters may require a license or they may not be used in your country. Check licensing conditions with the local (radio)authorities before operating the GPS repeater product. In some countries the ROGER™ package contains instructions.

DECLARATION OF CONFORMITY	
We hereby declare that the electrical device manufactured by Sparklike Ltd. complies with essential requirements of R&TTE Directive (1999/5/EC).	
Manufacturer:	Sparklike, Ltd.
Contact information:	Särkiniementie 5 C 6, FI-00210, Helsinki, Finland tel. +358 10 387 7701, fax +358 10 387 7707 email: sparklike@sparklike.com
Product:	Radio frequency signal repeater for retransmitting received GPS navigation signals to indoor spaces. Available accessories include outdoor receiving antenna, RF cabling and CE certified power supply.
Commercial name of the device:	Roger GPS Repeater
Type number:	GPSR-1
The structure of this device complies with the following universal standards:	
ROGER™ GPS repeater complies with the essential requirements of R&TTE Directive (1999/5/EC) Following standards and requirements have been used for the assessment:	
Art. 3.2, Radio spectrum:	Requirements set by Notified Body #0523 according to Annex III+IV route (Partly based on EN 300 440-1&2)
Art. 3.1 b, EMC:	EN 301 489-1
Art. 3.1 a, electrical safety:	EN 60950-1
The technical construction file has been approved and the device has been inspected by accredited testing and certification company Intertek Oy in its reports T08-600A-EMC and T08-600A-ELSA.	
The device has been CE certified in 2008.	
	
Helsinki, on the 3rd of June, 2008, Sparklike Oy, Ermo Launo, Managing Director	



Components

The ROGER™ GPS repeater system consists of the following components:

1. **GPS Repeater**
2. **Outside antenna for receiving GPS signals**
3. **Power supply**
4. **RF Cable**

1. GPS Repeater

The GPS repeater works by receiving GPS signals from satellites with an outdoor antenna. The signals are then transported to indoors via cable and re-radiated by the GPS repeater. The GPS Repeater is powered from mains by the power supply.

In addition, it is possible to use custom length cables and line amplifiers to extend the cable length and signal splitters with additional transmitters to extend the coverage area.

Since the GPS signals are very low level, the repeater incorporates special circuitry to limit the output level to a maximum value within the requirements to conform with the CE requirements.

2. Outside antenna

The outside antenna is used to receive GPS satellite signals. The antenna has a female TNC connector and requires +5VDC power through the center pin. The power is usually supplied by the repeater, but if there is a DC block in the cable used, the power must be supplied from an another source.

Please note that a good quality antenna and a good location are essential for effective operation of the GPS repeater system. The standard antenna supplied in the kit has +35dB gain and <2dB noise figure

In some cases a small patch antenna may be used. Typically this kind of solution is used in research labs where the receive antenna can be easily installed so that it gets the line of site from outside GPS satellites. The indoor coverage is typically greatly reduced in this case and feedback may present a problem (indicated by RED led indication), but is typically sufficient to bench test handheld GPS equipment

Hint: the location of the outside antenna can be easily located by using a GPS receiver to read the coordinates through the repeater.

3. Power supply

The GPS Repeater system is powered by a AC wall adapter supplied in the installation kit.

4. Cable

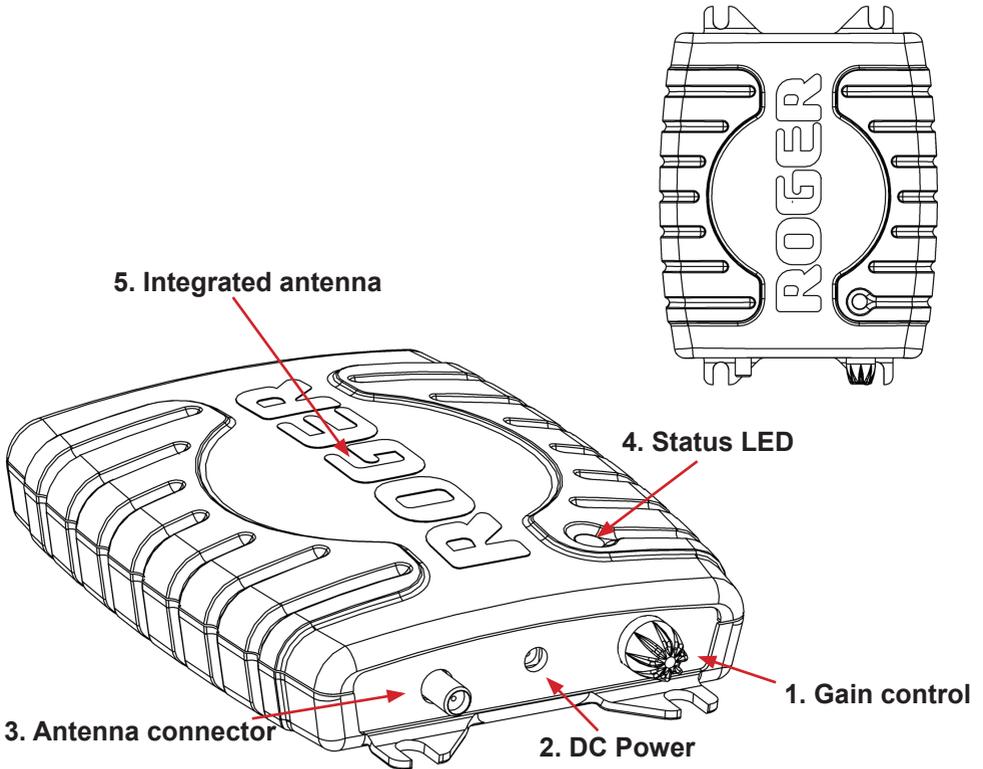
The standard cable supplied with the repeater is of RG58 type, which can be used for cable runs of up to 20 meters. Cable runs up to 40 meters can be realized with RG214 and up to 90m with ECOFLEX. Longer cable runs may require a separate line amplifierto compensate the power loss in the cable.



ROGER™ GPS Repeater Package (GPSR-BP) includes:

1. ROGER™ GPS repeater unit
2. Outdoor antenna for receiving GPS signals
3. Power supply
4. RF antenna cable, 19,5 m
5. Installation manual

Figure 1: Repeater controls and connectors



GPS Repeater transmitter

The GPS Repeater transmitter is the main component of the system. The GPS Repeater transmitter contains filtering, amplifiers and power control circuits. The GPS Repeater also supplies power (+5VDC, max 100mA) to the outdoor antenna through the antenna cable.

Description of GPS Repeater controls and connectors :

- 1. Gain control knob**
The gain control knob is used to control the output power of the GPS repeater.
- 2. DC power connector**
The repeater power is supplied through the DC input connector. The connection is reverse polarity protected. (+12VDC 300mA in)

3. **Receiving antenna connector**

Receiving antenna should be connected to the SMA input connector with the RG58 cable supplied. Alternatively, a custom cable can be used. (SMA female, +5VDC 100mA output for active antenna)

4. **Status LED**

5. **Integrated antenna inside the case**



Installation, tools required

When installing the GPS repeater, you should have:

- a suitable tools to tighten the SMA connector
- handheld GPS receiver (*)
- Multimeter
- Suitable fixing tools and accessories

(*The GPS receiver must be able to show the satellite signal levels.)

Receiving antenna installation

The receiving antenna should be placed in a place where it can 'see' as much of the sky as possible. It should be also located as far as possible from any RF interference sources, like any transmitting antennas. Before fixing the antenna, check that the cable is long enough and it can be run from the antenna to the required indoor location.

It is also recommended that the system is first tested by running the cable through a convenient route to the indoor installation place and checking that the indoor GPS coverage is suited to the use.

GPS repeater installation

Install the GPS repeater transmitter by fixing it to ceiling, wall or a suitable mount. The repeater has an integrated antenna, which is located next to the status LED. The transmitter radiates mostly towards the same direction as the LED. Ideally the transmitter should be located so that any desired GPS 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 AC/DC adapter's cable length when planning the installation location.

The cables should be installed so that there is no constant strong force to any direction at the connector.

After having installed the outside antenna, cable and repeater, plug in the AC/DC adapter cable and plug the adapter to a power outlet. The LED of the repeater should flash a few times at startup and then turn constant red or green

The indications of the status LED are:

-  **GREEN:** Transmitter operating normally
-  **YELLOW or constant RED/GREEN:** Transmitter 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.

Adjusting and testing

To adjust the repeater for optimal coverage and minimal interference, perform the following tests and adjustments:

- Go next to the outside antenna and use the GPS receiver to record the antenna location.
- Keep the GPS receiver on and go to the GPS Repeater
- Turn the gain setting fully counter clockwise for minimum gain.
- Turn the gain setting knob clockwise until the GPS receiver shows that it can receive satellite signals.
- By adjusting the gain knob and measuring from different places with the GPS receiver, find out the minimum gain setting that reliably allows for GPS reception in the area planned. Turn the knob carefully, it is very sensitive in some positions.
- When the LED indicator turns GREEN/RED or YELLOW, you have reached the maximum gain setting and no more gain can be added by turning the knob.

Troubleshooting

GPS receiver cannot receive signals next to the repeater.

- Check that +5VDC is present in the antenna end of the cable and in the antenna connector of the repeater. Broken or short-circuited cable?
- Check that repeater power is on and LED is on.

No LED indication on GPS Repeater

- Check that +12VDC is present in the DC power cable connector
- Check that AC power is available at the power cord where the AC/DC adapter is connected.

LED turns RED and GPS coverage is lost.

- Check that outdoor receiving antenna is in a location where it cannot receive signals from the repeater
- Try turning down the gain setting
- Check that there are no interference signals close to the receiving antenna. The system is very sensitive to interference at the GPS L1 frequencies (1575.42 \pm 20 MHz)

Small indoor coverage radius

- Check that outside antenna is correctly positioned
- Check that there are no interference sources close to the receiving antenna
- Check gain setting
- Check the repeater positioning
- Are there obstacles that could limit signal coverage?
- Shorter cable run or a line amplifier can improve signal level slightly
- Signal splitter and additional repeater units may be required to cover a larger or obstructed areas

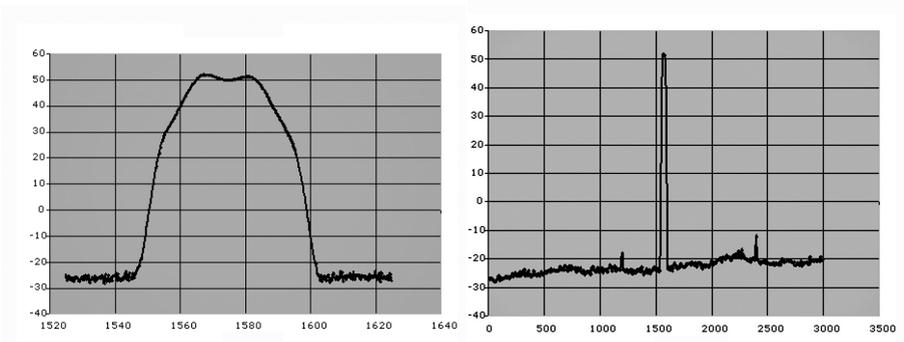


Figure 2: Wideband gain. NOTE: Attenuation outside the 1.575GHz passband is typically better than -60 dB. Graph indicates lower attenuation due to measurement setup (spectrum analyzer noise floor).

Technical information

Size	110*143*28 mm
Weight	165 g
Overall Gain	> 40dB
Noise Figure	< 2dB
Variable attenuation	0-40dB
Impedance	50Ω
Input connector	SMA-female
Operating temperature	-35 - +60°C
Power supply	+12VDC, 300mA Power supply included
Indoor coverage radius	10-18m
Antenna power output	+5VDC, 100mA
TX antenna gain	max +4dBd, RHCP polarization

Other features

Automatic gain control	Status/power LED
Feedback oscillation suppression	Internal transmit antenna
Manual gain control	
Output power limit -60dBm, 0,000001mW	

CE-certified 0523

Contact information

ROGER is a registered trademark of:

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