RANGEFUL

WILL GET IT THROUGH

Repeater

Lance 200 PRO, Lance 400 PRO,
Lance 200 V4G, Lance 500 V4G, Lance 800 V4G,
Lance 200 V3G, Lance 500 V3G, Lance 800 V3G,
Lance 200 V4G-L, Lance 500 V4G-L, Lance 800 V4G-L,
Lance 200 V4G-H, Lance 500 V4G-H, Lance 800 V4G-H,
Lance 200 V3G-L, Lance 500 V3G-L, Lance 800 V3G-L,
Lance 800 V-L, Lance 800 3G, Lance 800 4G-800

Installation Manual

Content

1. Product Features

RANGEFUL Lance is an advanced repeater created for boosting up to 5 different types of a mobile signal at the same time and works for all mobile operators in Europe. This repeater is a perfect option if you use several mobile operators or need to improve all types of connection. RANGEFUL Lance is a newly designed signal repeater with smart functions.

Coverage area

RANGEFUL Lance is the perfect solution for improving the mobile signal at home, office, restaurant, hotel, apartment, building, warehouse or supermarket, in the quickest time possible. One repeater covers up to 200, 400, 500 or 800m2 (depends on a repeater modification).

	Lance 200 PRO Lance 200 V4G Lance 200 V3G Lance 200 V4G-L Lance 200 V4G-H Lance 200 V3G-L	Lance 400 PRO	Lance 500 V4G Lance 500 V3G Lance500 V4G-L Lance 500 V4G-H Lance 500 V3G-L	Lance 800 V4G Lance 800 V3G Lance 800 V4G-L Lance 800 V4G-H Lance 800 V3G-L Lance 800 V-L Lance 800 3G Lance 800 4G-800
Coverage area	Up to 200m^2	Up to 400m^2	Up to 500m^2	Up to 800m^2
Internal antennas	1-2	Up to 4	Up to 5	Up to 7

Supported signals

RANGEFUL Lance is compatible with all mobile devices and supports all services (voice, Internet, SMS, MMS, etc.) provided by the mobile operators and presented on the site. RANGEFUL Lance supports all mobile networks in Europe and most countries of the world.

Model	GSM calls 900Mhz	GSM calls 1800Mhz	3G internet 900Mhz	3G internet 2100Mhz	4G LTE internet 800Mhz	4G LTE internet 1800Mhz	4G LTE internet 2600Mhz
Lance 200 PRO Lance 400 PRO	•	•	•	•	•	•	•
Lance 200 V4G Lance 500 V4G Lance 800 V4G	•	•	•		•	•	
Lance 200 V3G Lance 500 V3G Lance 800 V3G	•	•	•	•		•	
Lance 200 V4G-L Lance 500 V4G-L Lance 800 V4G-L	•		•		•		
Lance 200 V4G-H Lance 500 V4G-H Lance 800 V4G-H	•	•				•	
Lance 200 V3G-L Lance 500 V3G-L Lance 800 V3G-L	•		•	•			
Lance 800 V-L	•		•				
Lance 800 3G				•			
Lance 800 4G-800					•		

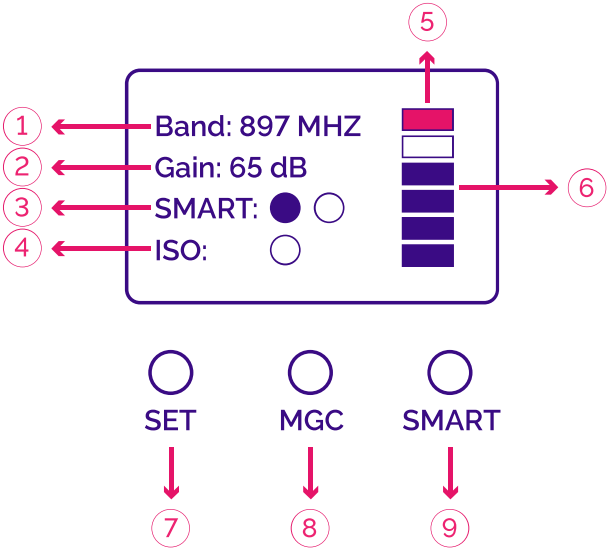
ATTENTION! Repeater's signal performance and coverage area directly depends on the signal performance of the mobile operator's base station. Correct installation of the repeater, antennas and cables is crucial. It is important to understand that abnormal use of the repeater will lead to its malfunction, performance deterioration, as well as malfunctions in mobile operator's base station. The user is responsible for all possible problems caused by abnormal use.

2. Safety Information

- Only qualified personnel are allowed to install the repeater, cables and antennas.
- The antennas and the cables must be connected only when the repeater power is off to avoid damage to the repeater.
- Connection to different power source than those specified may result in equipment malfunction and damage. If the restrictions are not followed, fire hazard is possible.
- Do not disassemble the repeater, install or remove accessories by yourself. This may result in equipment malfunction or electric shock.
- Do not install the repeater near the heating equipment to avoid heating the operating repeater.
- Do not cover the repeater, as this may affect the heat dissipation process.

3. Functional elements

3.1. LED Display



1 – BAND - shows current frequency.
2 – GAIN - shows the gain for current frequency.
3 – SMART – shows if the Smart function is enabled. The repeater sets the gain automatically to prevent the Alarm.
4 – Antenna Isolation Detection. When first power on the repeater, it automatically detects the oscillation between the outdoor antenna and indoor antenna.
5 – ALC Alarm indicator.
6 – Five bars of the output signal strength indication. It shows the maximum output power of the repeater.
7 – Enter for selection or confirm the settings.
8 – Increase/decrease the gain or upward/downward adjusting the central frequency. Decrease the gain or downward adjusting the central frequency.
9 – Smart key. Press the key enter into Smart function.

LCD screen shows 1 working frequency at a time and it will change automatically each 5 seconds from low to high.

The repeater has a Manual Gain Control (MGC) feature that allows engineers to reduce the gain of the repeater manually via screen if oscillation is detected. Users could use the "Smart" function as well, which will help to set to the suitable gain automatically without any interference to the mobile network. To maintain safe and specific output signal levels, this repeater has a built-in signal oscillation detection circuit to adjust the gain automatically to avoid interference to the cellular network, also it gets color changing LED's indicating its environmental status: the Alarm LED's located on the front of the unit changes color from green to orange or red, (depending on the input power level) when the system detects signal oscillation in the working band or the input signal is beyond a safe limit. The repeater also features a Network Safe / MUTE feature that automatically shuts off the repeater to protect the cellular network. Users shall make sure the LED remains green at all times for the best system performance.

3.2. Alarm LED

Colour	Description
Green	The repeater works normally.
Red	The repeater works with medium oscillation. We recommend checking the correct installation of the outdoor antenna (see Sec 4. Installation). **Attention!** It is crucial to adjust the gain or ensure sufficient shielding between the antennas (see Sec 4. Installation). The Alarm LED will turn green again otherwise normal operation of the repeater is not possible.
Red (Flickering)	The repeater can turn off at any time! There is a strong excess of the total "signal level from the outdoor antenna + repeater gain" over the maximum output power of the repeater. **Attention!** It is crucial to adjust the gain or ensure sufficient shielding between the antennas (see Sec 4. Installation). The Alarm LED will turn green again otherwise normal operation of the repeater is not possible.

3.3. Manual Gain Control (MGC)

Press "**SET**", wait till you reach to the uplink gain (the uplink gain figure is flickering), then press "**MGC**" to decrease /increase the gain as per the request, Please do remember to press "**SET**" again to confirm the right settings.

Repeat the steps for setting the downlink gain.

3.4. Smart function

The Smart function means that the repeater could set the gain automatically. Press "**SMART**" to turn enable this function.

ATTENTION! When the smart function is enabled, users can't set the gain manually. Disable the smart function if you need to set the gain manually, and follow the instruction of MGC setting.

4. Installation

4.1. General conditions

First, assemble the mobile signal amplification system. Use the following additional equipment:

- An outdoor antenna that will provide communication between the repeater and base stations of mobile operator.
- An indoor antenna or several antennas that will provide communication between the repeater and mobile devices.
- Coaxial cable (50 Ohm) and connectors (N-type or SMA according to the antennas used) for connecting antennas to the repeater.

In addition, splitters, couplers, antenna amplifiers and boosters may be needed to create a mobile signal amplification system. All the additional equipment is available on our website www.rangeful.com

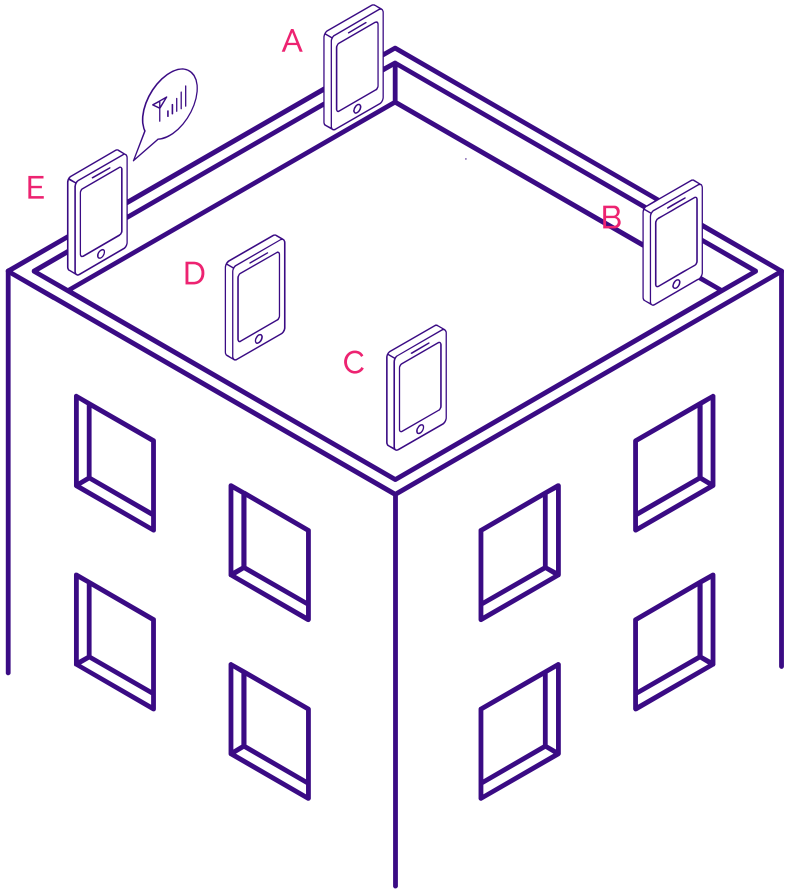
4.2. Outdoor antenna installation

It is recommended to install the outdoor antenna free from visible obstacles to signal transmission. The optimal antenna performance can be achieved by attaching it to a mast or bracket and pointing it towards the operator base station.

The repeater is a highly sensitive bi-directional amplifier of a mobile signal, therefore it is necessary that the outdoor and indoor antennas are well isolated from each other to avoid self-oscillation of the repeater. The minimum distance between the outdoor and indoor antenna is 10m. If isolation can't be achieved due to limited distance, the roof of the building, concrete or brick walls or any other barriers can be used between antennas to increase isolation. There is also highly recommend 3-4m vertical distance between antennas.

To understand the self-oscillation process you can take a microphone and a loudspeaker and bring them close to each other. You will hear a very loud noise.

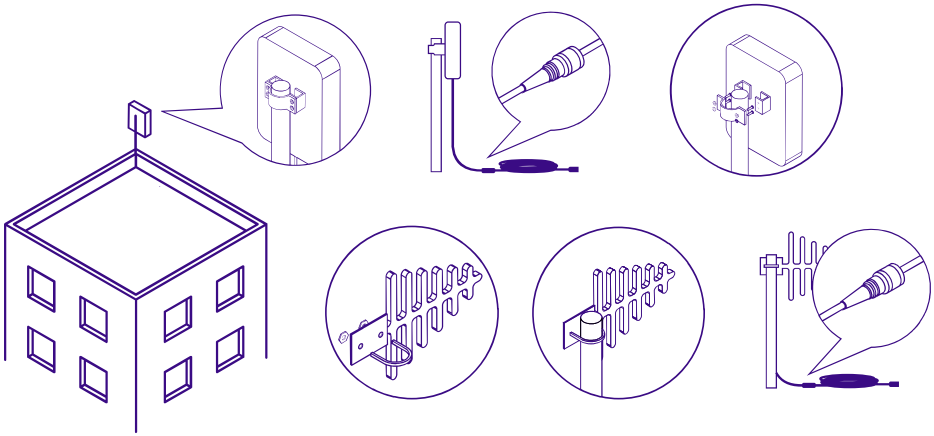
The signal strength from the outdoor antenna directly affects the efficiency of the indoor coverage. That's why it is very important to choose the good outdoor antenna location in order to get the best signal.



If you don't know the exact location of your operator's base station, go through the antenna aiming process for getting the best result. To aim the antenna correctly, follow the steps below:

1. As shown from the picture above, testing the mobile operator signal quality from point A to E, and select the best place that displays maximum bar signals.
2. Install the outdoor antenna on the point with best signal, install the cables, repeater, indoor antenna and switch on the system.

3. A person on the roof aims the antenna in a certain direction. The other person inside waits for 1 minute and checks the signal level on the phone.
4. Slightly rotate the antenna for 30-45 degrees. The other person inside waits one more minute and checks signal level again.
5. Repeat the process until the best antenna position is found. The lower dB parameter gives better system performance results.
6. Fix the antenna in the position with the best signal result.



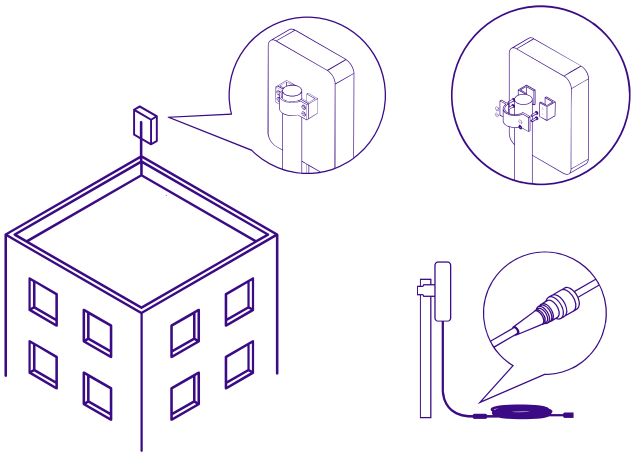
When installing an outdoor antenna, the following guidelines should be observed:

- Do not install it in rain or thunderstorm.
- Follow the antenna assembly and installation instructions carefully.
- Protect all connectors from water and moisture.
- Install it as far as possible from metal structures, high voltage cables and transformers to avoid radio interference.
- If possible, direct the antenna into an open area and avoid directing it towards nearby obstacles (forest, building, hills, etc.).
- Avoid installing an outdoor antenna near the mobile operator's base station.

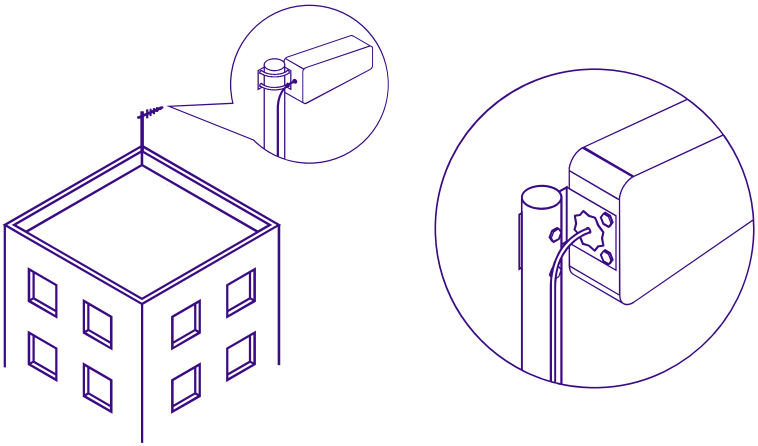
ATTENTION!

- After installing the outdoor antenna, it is necessary to carefully check the cables connection, since is affects the signal quality.
- Avoid sharp bends and deformations.
- Give waterproof treatment to outdoor connection parts.

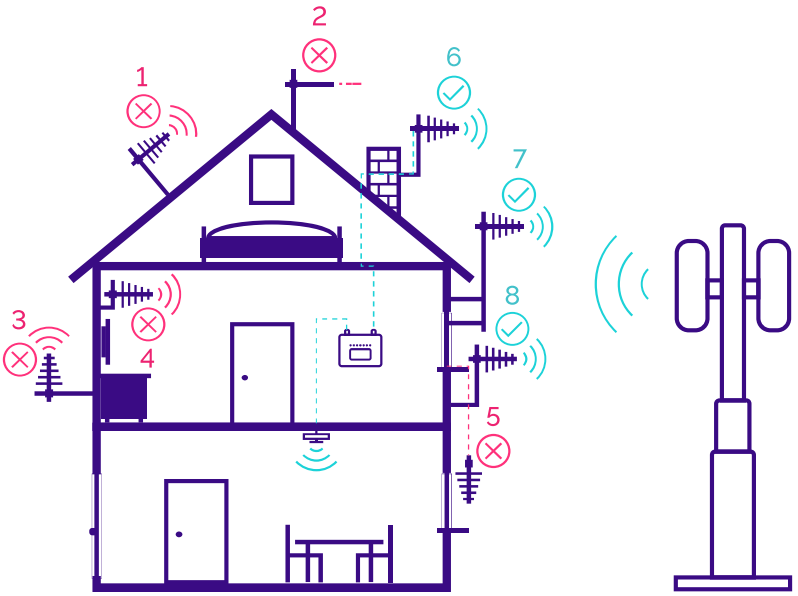
The outdoor panel antenna installation example



Example of an outdoor Yagi antenna installation



Correct and incorrect installation of an outdoor antenna



1. Do not install the antenna on the roof slope.
2. Wrong antenna direction. The antenna must be positioned so that its lateral side is oriented vertically.
3. Do not point the all-weather antenna into the sky. The mobile signal comes from base stations located on the ground.
4. Installing an outdoor antenna inside will significantly reduce signal performance.
5. The outdoor and indoor antennas must be installed correctly for the repeater to work.

6. The outdoor antenna is installed on the chimney. This allows you to optimally tune it to the base stations. If the roof is made of still, it creates an additional shield between the outdoor and indoor antenna.
7. The antenna is installed on the mast. This allows to raise the antenna higher and get a better input signal.
8. The antenna is installed on the wall of the building. This is the quickest and easiest way to install the antenna.

4.3. Indoor antenna installation

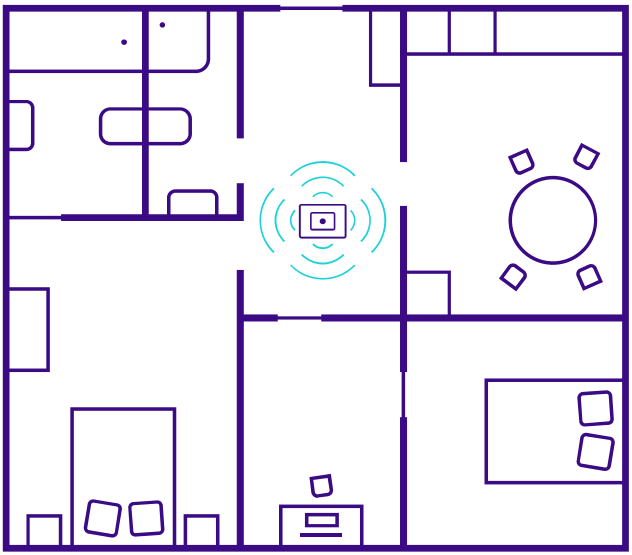
Select indoor antennas according to the site conditions.
Indoor antennas are needed for the repeater to interact with mobile devices inside the premises. Indoor antennas allow the repeater to create a local area for mobile communication.

Single indoor antenna is used in simple installations. It is connected directly to the repeater. This antenna distributes all the energy of the mobile signal that comes to it from the repeater.

Omni or Directional antennas can be used:

- Omni antenna (Indoor omni ceiling antenna or whip antenna), is suitable to be installed in the center and radiate all directions.

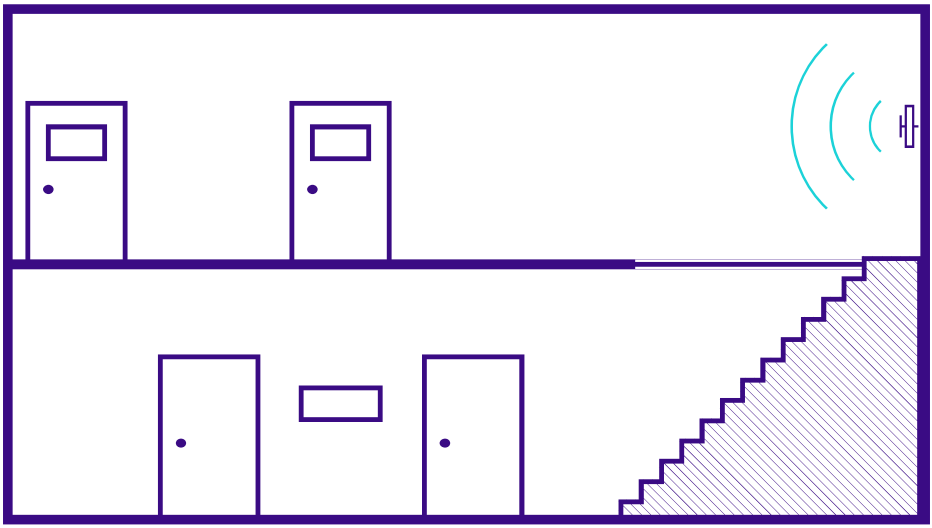
- It is recommended to use a directional panel antenna when the coverage shape is long and narrow (corridors, long row of houses in two sides, tunnels or elevators or rural open space).



The indoor antenna's coverage area and the range are determined by many factors.

The most significant are:
- The actual output power of the repeater at the frequencies of the operator to be amplified.
- Antenna radiation pattern.
- Construction materials of the building and / or other objects in the repeater coverage area.
- Antenna location.

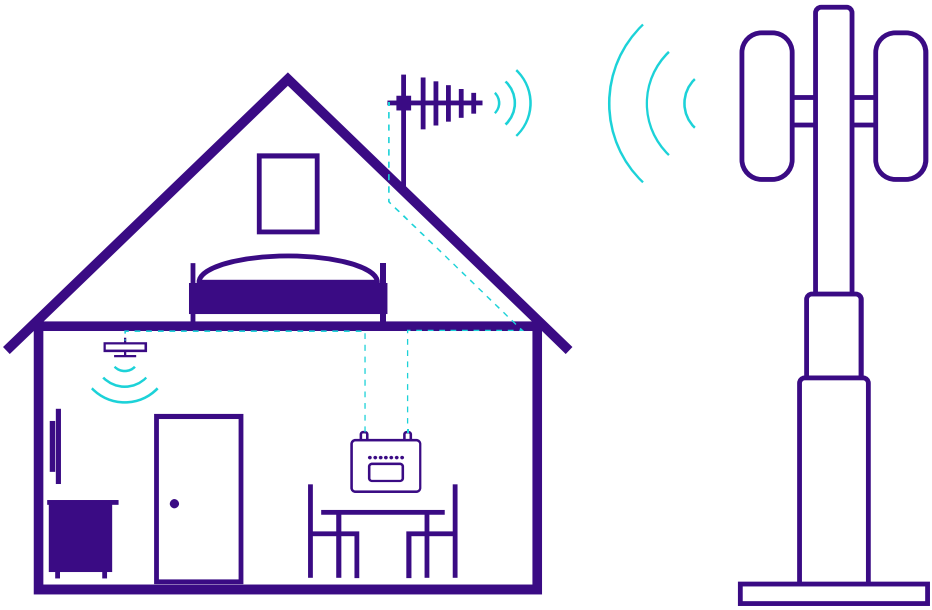
Repeaters can use more than one indoor antenna especially repeaters equal to or over 20dBm. A 20dBm repeater can be connected with up to 6-8 antennas to equally send the signals to larger areas. Please consult professional engineers about the solution if you want to connect more than one antenna.



4.4. Repeater installation

The Lance repeater shall be installed indoors in well-ventilated premises to ensure heat dissipation.

Installation scheme



Installation steps

- Connect the power supply and the cables properly to the correct ports.
- Check again to make sure the repeater is installed firmly and repeater alarm LEDs stay in green.

1. Find an appropriate position for an outdoor antenna. (see the requirements in Sec 4.2).
2. Connect the outdoor antenna to the repeater to the “Outdoor” connector and fasten tightly.

3. Connect the indoor antenna to the repeater from “Indoor” side and fasten tightly.
4. Connect the power supply to the repeater.
5. Switch on the repeater. If the Power LED on the repeater turns on it means the installation has been implemented correctly.

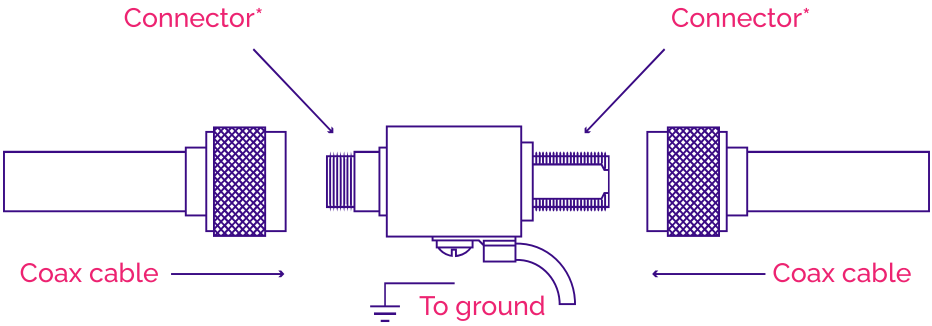
ATTENTION! Turn on the repeater only after you connect outdoor and indoor antennas in the proper way!

6. Test the signal of your mobile telephone – a maximum quantity of bars should be indicated on the display of your phone in each corner of the location within repeater coverage zone. In case the mobile signal is still unstable try to change the position of the outdoor antenna for more proper one.

Important notes for installation:
1. Avoid coiling the cable to avoid additional resistance for signal reception and its transmission.
2. Cables should be shortened to the acceptable maximum so that not to waste or decrease mobile signal coverage range. At www.rangeful.com you can purchase replacement mounting connectors.
3. To prevent water from coming into the repeater through the cable make a loop in it.
4. Keep the outdoor antenna as far as possible from frequency aerials, high voltage cables, metal nets or transformers.
5. Don’t put the antennas (outdoor and indoor) too close to each other. 10m is recommended distance. Be sure to point them in the opposite directions to avoid the risks of malfunctions such as self-oscillation or interference. It’s also recommended that they are not placed in direct vision to each other (use metallic obstacles, concrete wall, ceiling, etc).
Note: It is recommended to plug all AC power supplies for home electronics into a Surge Protector Power Strip.
6. Turn on the repeater only after positioning the antennas correctly according to the instructions above.

4.5. Lightning Surge Protector Installation

The lightning surge protector must be installed between the outdoor antenna and the coax cable connected to the repeater.



*Unit provides protection to both connectors equally.

After connecting the lightning surge protector to the outdoor antenna, connect one end of the coax cable to the repeater and the second - to the surge protector. Since this cable runs inside your home, make sure the lightning surge protector is located outside your home, near the entry to mitigate fire hazards.
To ground the surge protector, we suggest using a copper ground wire no smaller than 2,5mm. If you are using insulated wire, make sure to strip about one inch of the insulation from both ends before installing the wire.
Use a wire that's long enough so it reaches your grounding point, but short enough to avoid creating sharp bends or coiling the wire. Also, avoid using braided copper wire.
Attach the bottom of the grounding wire to your grounding point.

ATTENTION! Not grounding your lightning surge protector will have the same effect as not having a surge protector.

5. Troubleshooting

a. Why is there still no network signal after installing the equipment?

Debugg:

1. Check if the repeater is turned on and its power supply is connected to the mains.
2. Check the connection of the outdoor antenna and repeater.
3. Make sure the outdoor signal is strong.
4. Make sure the outdoor antenna is installed properly.
5. Check the connection between the indoor antenna and the repeater.
6. Make sure the coax cable type meets the system requirements.
7. Make sure that the repeater you are using meets the communication standards used by the mobile operator at the nearest base station.

b. Why is the signal level low in the outermost parts of the room?

Debugg:

1. Make sure the outdoor antenna is facing the right direction.
2. Check how strong the outdoor signal is.
3. Check the quality of connections between all components of the system.
4. Relocate the outdoor/indoor antenna.
5. Make sure the cable type meets the system requirements.
6. Use an additional indoor antenna.
7. Use a more powerful repeater or install an antenna amplifier and / or booster in addition to the repeater.

c. Why does the signal strength on the phone is unstable even after connecting the repeater?

Debugg:

1. The outdoor and indoor antennas may be too close together.
2. Check if the signal strength of the outdoor antenna is stable.
3. Check the quality of the connections made.

d. Why is the repeater power indicator dim?

Debugg:

1. Check if the voltage range indicated on the repeater power supply matches the voltage needed.
2. Make sure the repeater is connected to the power supply correctly and securely.
3. Check if the power supply is damaged. Check if the output voltage is at the level indicated on the power supply.

6. Contact Information

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