

Wireless security system RAS-002
Repeater RR-VHF

Full user guide

Safety requirements

Before using RR-VHF repeater familiarize you and follow the safety regulations!

The RR-VHF repeater is a technical part of the communications of security system, operating in continuous mode. The power supply source for the repeater is the AC network. To avoid injuries (arising from the effect of heat or electricity voltage) as well as willing to ensure reliable and long-lasting performance of the repeater it is necessary to follow these safety regulations.

The repeater should be located only in uninhabited and isolated places of limited and complicated access.



Only trained personnel, being aware of the operation principles of such kind of devices, propagation of radio waves and safety requirements, may perform mounting of the repeater and constant maintenance.

Any other operators cannot come into contact or other way affect the operation of the equipment.

The power to the repeater is supplied from the AC network with the (50 ± 1) Hz frequency and 220V nominal voltage and from back-up battery of 12V/7Ah capacitance. Permissible range of alteration of alternating voltage is 10%. The current supplied from the network does not exceed 0,15 A.

Safety fuse eliminates details, which may be under high voltage. However, only built-in safety fuse is not trusted enough. It is reasonable to install additional high-speed security in both phase wire and neutral wire. All connections should be performed "below the screw".

Connecting the battery, changing the polarity of connective wires is impermissible. The battery used to replace an old one should be of the same type and conform to the requirements, indicated in the user guide.



Having opened the door of the repeater, the places under high voltage exist inside

The repeater has no special devices for disconnection from the AC network. It is disconnected only employing bipolar switches, installed in wiring system of the building. Dividing space of the contacts of disconnection device should be not less than 3mm and both poles are disconnected simultaneously.

The repeater performs its functions being in a vertical state. The repeater is reliably fixed to the vertical wall using not less than three screws. Power supply cable must be fixed reliably.



The repeater must be carefully grounded!

Lightning protector must be fixed to the antenna connector!

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Repeater RR-VHF

The repeater RR-VHF is a microprocessor device of wireless communication, designed to operate as a component of wireless security system RAS-002. The RR-VHF receives, recognizes and transfers encoded information about troubles of object security. Information is transferred via wireless communication channel. The repeater is used in order to expand the range of operation of wireless security system or to increase the reliability of the signal being received within appropriate territory.

The repeater RR-VHF operates in VHF frequency band. The central receivers RI-4010V, RI-5000 or another kind of the repeater receive messages from the RR-VHF. Communication with object being protected is ensured at a distance of 5÷7 km, with another repeater or central receiver at the distance of 10÷30km, depending on layout of geographical objects, type of antennas and height of their mounting. Single-directional communication is applied.

RR-VHF is mounted in a metal housing together with all other wireless communication devices, power supply circuits and back-up battery. Sabotage buttons built inside the housing protect the equipment from unauthorized break-in and by necessity send instantaneous message about intervention. The repeater is located in closed uninhabited places with external antenna and power supply network having been connected.

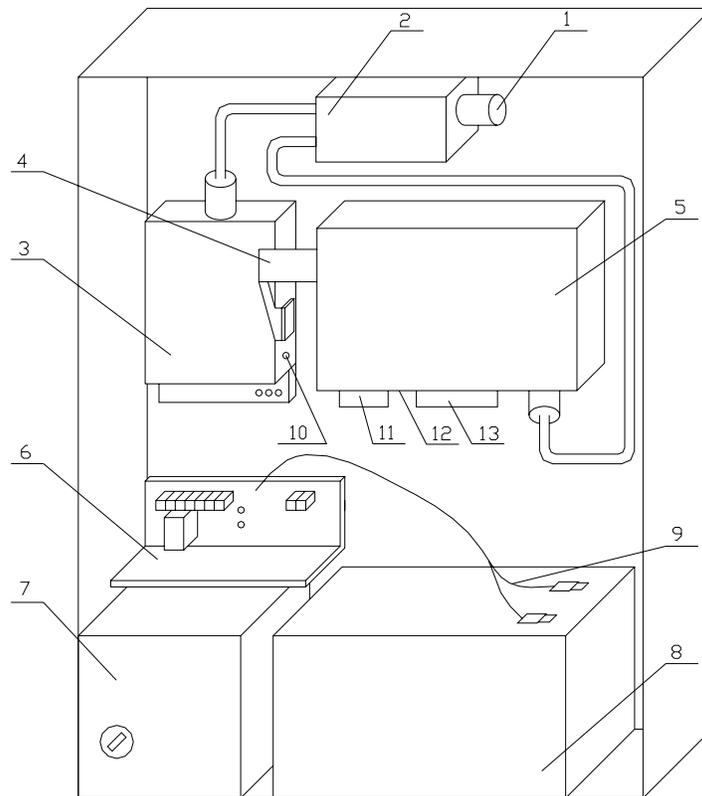


Fig.No1. General view of the RR-VHF repeater

1. Antenna connector;
2. Antenna commutator;
3. Transmitter T7;
4. Connective cable;
5. Receiver IVHF
6. Power supply unit;
7. Transformer;

8. Battery
9. Terminals for battery connection;
10. RESET button of transmitter;
11. RS232 connect of receiver;
12. RESET button of receiver;
13. Printer connection.

Functions, performed by each repeater and operation modes are set during the configuration of the repeater, considering the requirements of the user, specialty of the site and relief as well as algorithm for the functioning of the network being organized. Configurations are set by manufacturer or by its authorized person.

Application

The RR-VHF repeater is applied for:

- wireless communication in security systems;
- alarm signal transmission to the centralized monitoring station;
- remote control systems;

Components

The RR-VHF repeater consists of metal box, containing antenna commutator, of power supply unit and back-up battery as well as sabotage buttons, receiver and transmitter. To ensure communication, modules of wireless communication system RAS-002, i.e. IVHF receiver and SVHF transmitter, are used.

The complete set of the repeater:

- Repeater RR-VHF- 1 unit.;
- Full user guide - 1 exemplar;

Transport and storage of the repeater

The RR-VHF repeater should be transported by ground, using manufacturer's packing.

It should be stored being in a manufacturer's packing as well, protecting it from the direct climate influence. It is recommended to hold the device horizontally when transporting or storing. Its position in operation should be vertical. The device should be protected from mechanical injuries, vibration as well as from direct climate influence.

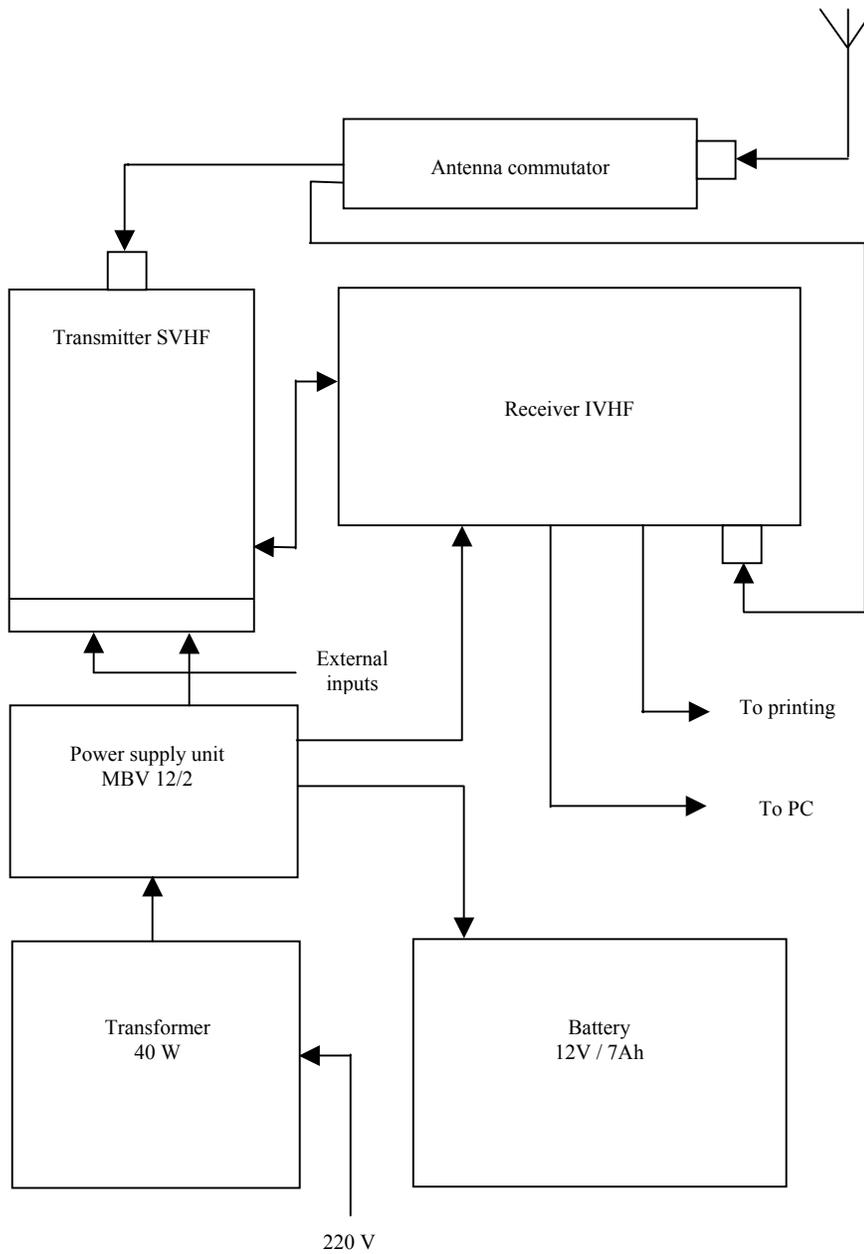
Main features and description of the operation principles

The repeater receives the message, recognizes it according to five different features, measures the level of message and determines whether retransmit it or not. If the received message should be retransmitted, the repeater, after checking free communication channel and transmission of this message from other repeaters, sends the signal. The serial number of the repeater and level of signal have been received, are added to the new message.

The receiver of the repeater receives encoded signal. Its microprocessor recognizes the received message, checks it in terms of the system regulations, measures the level of the received signal and generates the additional information of the message as well as transfers it to the transmitter. The receiver may be regularized for operation in a single or several message encoding systems: RAS-002, LARS, LARS1 and Milcol-D.

The receiver of the repeater has memory to store 250 latest messages. The memory may be set by PC or printed. By necessity, PC or printer may be connected to the repeater constantly. The transmitter of the repeater receives the information from the receiver via serial port and sends it further through the route of communication. The transfer is performed applying RAS-002 encoding, which ensures full transfer of the documents. Other encoding protocols do not ensure full transfer of the necessary information.

Fig. No2 Structural scheme of the RR-VHF repeater



Exploitation parameters and functions of the receiver are set during the configuration of the repeater. These parameters are set: encoding system, time of insensibility to the same message, retransmission mode and format of data output to PC or printer.

The transmitter has seven external inputs with resistance at the end of the line and controller of power supply voltage. They are constantly interrogated by the microprocessor as well as their state is determined. If changes of the state are detected, microprocessor generates and sends the message. Security circuits to protect the repeater are connected to the inputs of the transmitter. Having received the message via serial port from the receiver, the transmitter sends it without changing the contents of the message. When sending the message, the antenna is disconnected from the input of the receiver and connected to the output of the transmitter. Operating with two different antennas, operation mode without commutation of the antenna is possible.

Exploitation parameters and functions of the transmitter are set during the configuration of the repeater. Input alarm and restore codes, account number, periodicities of communication test are set as well as other parameters.

The Power supply unit ensures continuous power supply to the repeater either from the AC network or from the back-up battery, if the AC networks failure occurs. The power supply unit ensures suitable charging for the back-up battery and after it is fully charged automatically disconnects it from the charging circuit. The repeater constantly controls the power supply voltages and if they are out of the range or if voltage loss occurs, the appropriate message is sent.

The repeater sends the message of communication channel test (i.e. "the repeater is capable") in appropriate periods of time.

Retransmission network may be organized thus that all repeaters would work in parallel, transferring information directly to the station, or in series, transferring information to each other. It is possible to combine both positions also. Each repeater has different broadcasting listen time that enable to avoid operation of several repeaters simultaneously.

Specifications

1. Certificated basic modules of wireless communication i.e. SVHF transmitter and IVHF repeater are utilized in the RR-VHF repeater. Communication modules are fully compliant with the regulations of European Telecommunications standard ETS 300 113. Their specifications are indicated in user manuals.
2. Nominal carrier-frequency power of the transmitter, which is placed in the housing of RR-VHF repeater, is 5W, frequency range from 146 to 174 Hz and from 410. The frequency is set and maintained stable by phase frequency stabilization system. Operating frequency is set by manufacturer and do not changes during the exploitation. The transmitter's input resistance 50Ω .
3. The sensitivity of the receiver, which is placed in the housing of RR-VHF repeater, is not less than $0,35\mu\text{V}$; operating frequency range from 146 to 174 Hz. Operating frequency is set by manufacturer and does not change during the exploitation. The receiver's input resistance 50Ω .
4. The repeater has seven external inputs with the resistance of $2,2\text{k}\Omega$ at the end of the line, designed to switch the security equipment on. Two inputs are applied for the needs of the repeater and generate messages about changes of operating mode of the device. Internal controller of the transmitter power supply voltage generates message as power supply voltage drops to 11,5V or restores to 12,6V. Power supply unit has the terminal, connected with the input of the transmitter, which state indicates the power supply from the AC network. As the state of the terminal changes, appropriate message is sent.
5. The transmitter and the receiver of the RR-VHF repeater have ports, available for their parameter programming or for data interchange with other external devices.
6. The power to the repeater is supplied from the AC network with the frequency of (50 ± 1) Hz and nominal 220V voltage and from back-up battery of 12V/7Ah capacitance. Permissible range of

alteration of alternating voltage is 10%. The current supplied from the network does not exceed 0, 15 A.

7. Operating hours of the repeater, which is supplied from the fully charged battery, do not exceed 5÷7 hours. Average current used from the battery does not exceed 0,3A, in transmission mode increases to 1,5A.
8. The RR-VHF repeater operates and maintains indicated parameters at the temperature from -10°C to +55°C and relative humidity at +20°C to 90%.
9. Overall dimensions of the repeater do not exceed 410x310x90 mm
10. Mass does not exceed 5 kg.

Programming of the repeater

Windows program Hyper Terminal is used for programming the transmitter and the receiver. Operating mode, account and serial numbers, communication parameters, broadcasting listen time, message codes, periodicity of communication channels test, parameters of the receiver and format of information output are set by programming.

Manufacturer or his authorized person, according to programming instructions of separate nodes, performs the programming and configuration of the repeater, in accordance with algorithm of the network being organized. Parameters during exploitation will not be changed. Changing of the parameters is possible only after changing the algorithm of retransmission network activity or the location, where the repeater is mounted.

Selection of the location of the repeater

The site for mounting the repeater and its antenna is selected according to relief and extent of the region, necessary route of wireless communication and application of the repeater, considering inaccessibility to intruders.

Reliable communication is gained when transmission and reception antennas are in the zone of direct visibility. Ferro concrete constructions and metal obstacles should be avoided or decreased their number in the route of communication. Neighbouring repeaters, operating in urban conditions, is recommended, to locate at the distance of 6÷15 km from each other.

External antennas with circle directional diagram and amplification not less than 4dB are used for retransmission. It is recommended to use the antennas the amplification of these reaches 5÷7 dB. Coaxial cable, having wave resistance 50Ω and possible lower attenuation in VHF frequency range is applied for interconnection the antenna with the repeater. The length of antenna cable is unlimited, however if it exceeds 10m, the cable with lower attenuation is used. In any case good high frequency contact and adjustment between the transmitter and the antenna should be ensured.

Mounting and connection of the repeater

The repeater should be mounted in a room (without heating as well) on vertical wall and fixed with no less than three screws.

The antenna is coupled with the repeater, the back-up battery is switched on and voltage from AC network is applied. Hermetic battery of 12V voltage and 7Ah capacitance, operating in continuous mode is applied (for example Power Sonic PS-1270, Alarm Supplies PB12-7).

Coaxial cable with low attenuation should be used for coupling the repeater and antenna. (Recommended RG213 cable).

The construction works is recommended to perform as follows:

1. Fix the repeater to the vertical wall. Four self-drilling screws, the dimensions of which are not less than 4mm in diameter and 35mm in length, are used for fixing the repeater. Plastic collets are embedded into the wall and upper self-drilling screws are partially drilled in. The repeater is hung on them, the cable of the AC network is connected and the antenna cable is passed through the mounting hole. The lower self-drilling screws are drilled in. The box of the repeater is reliably fixed by drilling all the screws to the end.
2. Put the mast, assemble the antenna, connect coaxial cable and check adjustment between the antenna and operating frequency. The adjustment should be checked with the cable as well as without it. In any case, the coefficient of standing wave should be no more than 1,5.
3. If two antennas are used, one of which directional antenna, they must be mounted as shown in fig. No3, applying two coaxial connective cables.

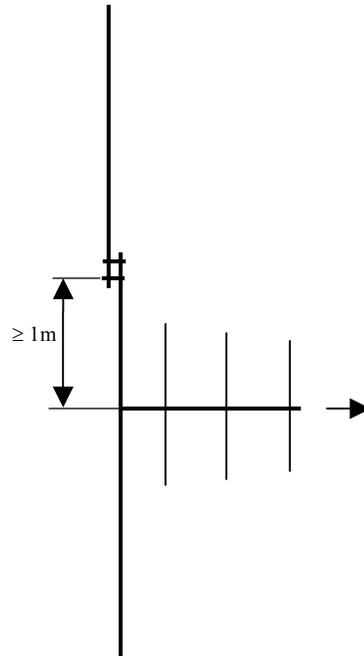


Fig. No3 Mounting of two antennas of the repeater

4. Take out the inlet fuse of AC network. Connect wires of AC network as well as grounding to the contacts of alternating voltage. No restrictions for the length of the cable. Connective cable of AC network should have double isolation and wires not thinner than $0,75\text{mm}^2$ of cross-section area. The cable should have security grounding wire of green and yellow colours. Grounding wire should be longer than that of power supply, as the wire strain occurs the grounding wire would strain endmost. Connection scheme is introduced in the annex A.
5. Connect another end of the power supply cable to the AC network, provided with additional high-speed security in both: neutral and phase wires. All connections should be performed "below the screw".
6. Check with voltmeter the voltage of AC network on the contact of alternating voltage, which should be at the range of $220\text{V}\pm 10\%$. Phase wire should be connected to the contact, which is protected with the safety fuse.

7. Fix reliably the cable from the AC network. The cable is fixed to the wall with the help of special plastic clamps, situated not closely than 1m from each other. The first point where the cable is fixed should be not further than 5 cm from the housing of the repeater. The cable cannot rotate at the point of the frame of equipment and not to be strained. The cable should be fixed in such way, that points of connection would not be stained and cover of the cable protected from friction. It should be impossible to pull the cable into the device that its wires would be damaged. Additional isolation inlet collars, sticking out through the inlet hole at the length not less than 5 diameters of the cable, should be used.
8. Connect antenna cables, lightning protectors and check the reliability and accuracy of the connections.
9. Built fully charged battery into the housing of the repeater and connect red colour lead to “+” terminal and black colour lead to the “-“terminal. Connecting the battery, the polarity of connective wires must not be changed.
10. If power is supplied green and red LEDs of power supply voltage and power supply unit are on.
11. Press RESET button of the receiver and than RESET button of the transmitter.
12. Switch the power supply on and built-in the fuse of AC network. Green LED of power supply unit turns on.

When the connection is performed (or after pressing the RESET buttons or switching power supply from the back-up battery) the state of transmitter inputs is scanned, messages are sent, red LED, indicating the transmission mode is on. If the transmitter's memory contains unsent messages, yellow LED, indicating the transmitter's memory remains lit and transmissions are repeated.

The receiver receives each message, sent by the transmitter. The message is checked and changed in accordance with the algorithm of the retransmission than via internal route it is transferred for the transmission. In 1÷2 min all messages are sent and the repeater is ready for operating.

Communication test and estimating

When the repeater is mounted completely, its communication with the centralized monitoring station is tested; as well as real operating range is determined.

Communication with centralized monitoring station is tested as follows:

1. Activated appropriate inputs of the repeater check, is the message received in the centralized monitoring station.
2. Level of the signal being received is mounted together (central receiver RI-4010V and programs MONAS32, MONAS+ enable this). The number of messages being sent should not be less than 10.

The repeater is considering to be mounted suitably and communication is reliable if all messages being sent are received properly. The signal level of the repeater at the point of reception should not be less than fifth. A week after it is reasonable to test received communication signals, by statistical data processing.

The operation zone of the repeater is set up by activating subscription transmitter, supplied from back-up battery, in various places of the territory, serviced by the repeater.

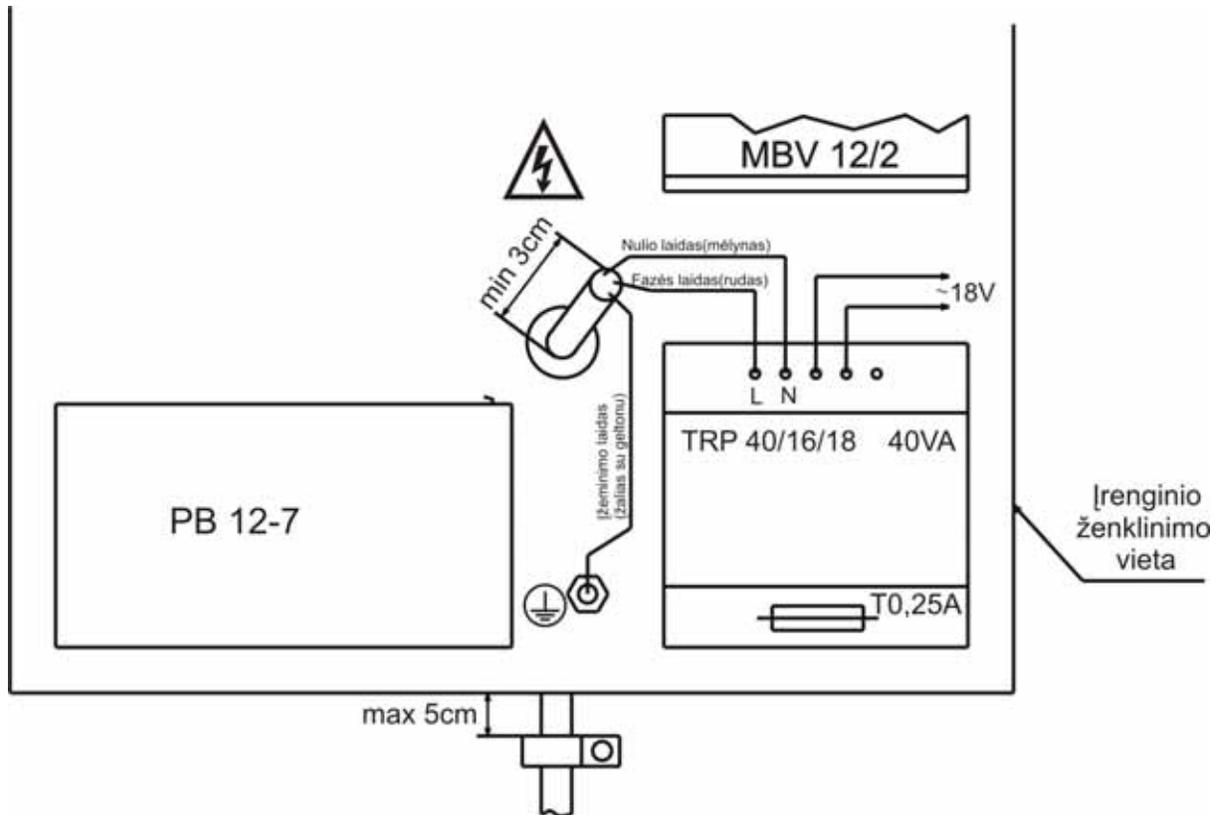
It is recommended to carry out works as follows:

1. The messages are sent when receding form the repeater in single direction each 0, 5÷1 km. The transmitter is held in a hand, the messages are sent by pressing RESET button or by activating appropriate inputs.
2. Centralized monitoring station checks is the message received. Signal level, received by the repeater, is measured together. As the level of the received signal drops to one or reaching the limits of the territory, the direct distance is measured (according to the map or indications of vehicle counter).
3. Moving around at the distance nearly equal to that indicated in the 3rd clause and sending the messages, the level received by the repeater is measured.

The repeater is considering to be equipped suitably, communication reliable and operating range sufficient, if the messages sent from the distance of 5÷7 km at not lower than the first level are received properly.

Annex A

Connection of power supply cable from AC network



Notes:

1. Connection leads of AC network must have double isolation and be not thinner than $0,75 \text{ mm}^2$ of cross-section area. Grounding wire must be longer than that of power supply, as the wire strain occurs the grounding wire would strain endmost.
2. AC network cable should be reliably fixed applying special plastic clamps. The first point where the cable is fixed should be no further than 5cm from the housing of the repeater.
3. AC network cable should be fixed immovably, because it can be damaged from the friction.
4. Voltage of AC network is turned on only than the cable and the repeater are reliably fixed and grounding wire is connected. After checking proper connection of the wires (phase and neutral) power from the battery may be supplied.

Parameters of the repeater

Type of the repeater	RR-VHF Nr.		
Number of the receiver	N		
Number of the transmitter	N		
Sequence of received object numbers			
Encoding systems	RAS-002		
Time of insensibility to the same signal	sec.		
Free broadcasting control time	sec.		
Configured for operation with	program		
Back-up battery	12V/7Ah		
Number of transmission repeat	1, interval at sec.		
Periodicity of communication test	Each h.		
Inputs (messages)			
input	Basic*	User's	
IN1	101/201		Sabotage button
IN2	102/202		
IN3	103/203		
IN4	104/204		
IN5	105/205		
IN6	106/206		
IN7	107/207		low / normal power supply voltage
IN8	108/208		failure / available 220V alternating voltage
	169	169	Failure of the transmitter's program
* Message codes are freely programmed and set according to these, chosen by user.			