

Mobile Perimeter Protection Set “Rady BRK”
Operating manual

This manual contains information concerning principle of operation, technical specifications, application and other information necessary for proper perimeter protection mobile set "Rady BRK" application.

The abbreviations used in the manual are the following:

PSU-Power Supply Unit

DZ-Detection Zone

TMR-Transmitter

RCR-Receiver

ARCR-Alarm Receiver

MW-Microwave

1. General Description

1.1 Application

- 1.1.1 Mobile Set "Radiy BRK" (hereinafter "set") is a medium capacity alarm system designed for perimeter protection against unauthorized human intrusion.
- 1.1.2 The set is designed for normal 24-hour outdoor operation.
- 1.1.3 The set contains up to 20 microwave (MW) mobile perimeter protection barriers and alarm signals receiver (ARCR).
- 1.1.4 MW set is supplied from 10.2V Li batteries and ARCR - from 12V Ni-Cad battery. ARCR used indoors can be supplied by set battery charger.
- 1.1.5 Individual numbers of all MW perimeter protection barriers of the set are stored in ARCR memory.

1.2 Technical specifications

1.2.1 Basic technical specifications of the set

- 1.2.1.1 ARCR output alarm signal delay from the moment of perimeter crossing - no more than 5 sec.
- 1.2.1.2 Set up time (transportation time is not included) - no more than 2 hours
- 1.2.1.3 ARCR working frequency - 433,92 MHz +/- 0,2%

1.2.2 Basic technical specifications of MW set.

- 1.2.2.1 Maximum DZ length -100m (measured by received signal level that is not less than 6 dB)
- 1.2.2.2 Maximum DZ height at maximum DZ length - not more than 1,6m
- 1.2.2.3 MW set provides coded alarm radio signal generation when:
 - 1) Walking or crawling human crosses DZ with 0,3-8 m/s speed;
 - 2) Batteries are discharged;
 - 3) Any unit of the set breaks down;
 - 4) Normal MW receiver-transmitter operation is disturbed when a trespasser uses external electromagnetic field to influence the MW receiver.
- 1.2.2.4 MW set is tolerable against:
 - 1) electromagnetic fields influence;

- 2) small objects movements in DZ of no more than 0,2m size ;
 - 3) Vehicles and groups of people movements at a distance of more than 1,5m from DZ axis.
- 1.2.2.5 Continuous set operation time till batteries replacement (if there are no more than 5 alarm signals during 24-hour period) - not less than 725 hours.
- 1.2.2.6 MW set size in package bag – not more than 840x250x250 mm.
- 1.2.2.7 MW set weight in package bag - not more than 3 kg.

1.2.3 ARCR basic technical specifications

- 1.2.3.1 ARCR can store and delete from its memory up to 20 MW barriers individual numbers.
- 1.2.3.2 In direct sight conditions ARCR receives alarm signals from MW barriers of the set at a distance up to 1000m and generates sound signal and blinking barrier individual number on display until operator makes reset.
- 1.2.3.3 Upon alarm signal reception ARCR opens the output relay contacts for not less than 3 sec and can switch up to 100 mA, 72 V load.
- 1.2.3.4 ARCR availability time – not more than 30 sec after power up.
- 1.2.3.5 Continuous stand-by operation time of ARCR supplied from the battery - not less than 2 days.
- 1.2.3.6 ARCR size - not more than 165x125x60 mm
- 1.2.3.7 ARCR weight - not more than 1,2 kg

1.3. Set components

- 1.3.1 For the set normal operation during its life time Li batteries and other components may be delivered.

1.4. Set operation

1.4.1 General information

1.4.1.1 In general, “Radiy BRK” set works as follows. MW barriers are installed along protected perimeter at all directions of possible intruder(s) approach. ARCR is placed near the guard. As an intruder crosses the protection border a respective MW barrier generates coded alarm radio signal. This signal is detected and analyzed in ARCR which in its turn generates alarm message for duty personnel.

Alarm message is generated in the same manner in case of batteries discharge and in other cases described in 1.2.2.3.

- 1.4.1.2 The set has two modes of operation: stand-by mode and alarm mode.

In stand-by mode ARCR does not generate alarm messages (no sound signal, output relay contacts are closed).

In alarm mode (starting when MW barrier generates alarm signal) ARCR generates alarm message - sound signal is on, MW barrier respective number is displayed on indicator, output relay contacts are open for a short period of time. Alarm mode ends upon reset of all received alarm signals.

1.4.2. MW barrier functions and operation

MW barrier represents a microwave detectors couple with self-contained power supply unit (PSU) and built-in radio signal transmitter.

RCR and TMR are installed on tripods and connected to the batteries with special connectors.

RCR design is shown on picture 1.1.

TMR has similar design; the only difference is the unit's height.

RCR is equipped with built-in radio signal transmitter.

RCR and TMR units are placed in dust and drip-proof enclosure.

Battery 9 has cylindrical non-separable enclosure made from shockproof plastic with three Li power cells inside.

The bag is intended for carrying and storing MW barrier parts.

TMR emits radio signal in RCR direction. A human moving in DZ causes radio signal changes at RCR input. These changes depend on human's weight and height, actual location of DZ crossing, moving human speed and terrain features. If these changes correspond to the intruder model parameters, the internal processor turns on the alarm radio signal transmitter which transmits the coded signal. The coded signal contains MW barrier individual number. Individual number is unique and is set by manufacturer.

1.4.3 In case of batteries discharge MW barrier generates alarm signal every 3 minutes.

1.4.4 RCR functions and operation

RCR set contains ARCR, charger, battery and carrying bag.

Charger is used to charge the battery and to supply DC voltage to ARCR in indoor mode of operation.

ARCR design is shown on picture 1.3.

All individual numbers of MW barriers of the set are stored in ARCR memory. During special registration procedure the number displayed on the indicator (when alarm signal is detected) is written in ARCR nonvolatile memory. During registration every MW barrier gets an individual number in the 0-19 range. When necessary, any new number can be set or the old one can be deleted from ARCR memory. The numbers are marked on the MW barriers' cases. In case of number change during exploitation the marking of MW barriers should be made by the user.

When alarm signal is received from MW barrier ARCR generates alarm message (contacts of output relay are open for approximately 3 seconds; sound signal appears approximately every 5 seconds; blinking MW barrier number is displayed on digital indicator). To return to the stand-by mode “RESET” button should be pushed.

If alarm signals from other MW barriers are detected before resetting their numbers are not displayed and written in special list of alarm detections in ARCR memory. ARCR is able to memorize and later display the numbers of all MW barriers which generated alarm signals before resetting. In such case, after the “RESET” button is pushed the other blinking number would be displayed and the sound would not turn off. By multiple pressure of the “RESET” button it is possible to review the list of alarm detections. The MW barriers’ numbers are displayed in ascending order. In case of new alarm detection during revision, ARCR similarly switches the output relay and adds the respective MW barrier number to the list.

After the alarm detections list revision, the sign “-” (minus) is displayed on indicator, which shows that the ARCR has returned to stand-by mode.

ARCR status (the mode of operation and the list of alarm detections) is fully restored after switching off and further switching on the power supply.

1.5. Marking and sealing.

1.5.1 The set components have the following marking:

- Component symbolic notation;
- Manufacturer serial number;
- Year and quarter of production;
- QC mark.

1.5.2 The packaging has the following signs:

- “Fragile”;
- “Keep away from moisture”
- “Top”

2. Application

2.1 Pre-installation operations

2.1.1 Security measures

Installation and technical support of the set should be carried out according to electrical code and safety precautions.

2.1.1 MW barrier installation

2.1.2.1 The following requirements for barrier's installation placement and should be met while deployment:

Surface irregularities should be no more than $\pm 3\text{m}$.

Moving or winging items are not allowed inside the installation sector at 1,5 m distance from its axis.

Maximum grass height is no more than 0.3m.

Maximum snow height is no more than 0.4 m.

Maximum slope of the installation sector should be less than 30 degrees.

For expanded protected zones it is recommended to divide protection borders into sectors ensuring that the adjacent sectors overlay is about 3-5m. Similar units (RCR or TMR) should be installed nearby.

2.1.2.2 MW barrier should be deployed in following order:

- a. Take out the parts of the set form the bag.
- b. Assemble MW barrier as shown on picture 1.2 (The optimal height is provided when the lower sections of the tripod are pulled out).
- c. Adjust MW barrier "sight" in required direction. RCR and TMR should be adjusted towards each other according to the indication marked on the top of the units (see picture 2.1).

If MW barrier is used over a long period of time at the same location it is recommended to hang bags filled with sand on the tripods' hooks in order to maintain steadiness of the according device (bags belong to the assembly kit).

2.1.3 ARCR installation

2.1.3.1 While choosing ARCR installation location it is necessary to take into consideration the fact that maximum range of alarm signal transmission is provided only within field of vision between ARCR and MW barrier.

Installation location should be at maximum possible distance from high-voltage power lines and metal objects. ARCR should be installed not less than 1m away from reinforced concrete constructions.

Several ARCR' have to be installed 2-3 m apart from each other. Otherwise mutual interference could influence their normal operation.

The final location of ARCR has to be based on the reliable alarm message reception from all MW barriers.

2.1.3.2. ARCR operates normally when carried by a person. The following recommendations should be taken into consideration.

- If the ARCR antenna is placed near human, electromagnetic shielding of human body can noticeably decrease the alarm signals transmitting range.
- In situations when operator may move into areas of intermittent reception.

In this case and also in case of any obstacles for radio signal propagation between ARCR and MW barrier, (such as forestry, surface irregularities, buildings etc.) it is recommended to check the radio channel proper operation on the selected installation location by forced transmission of alarm signals.

2.1.3.3 The deployment of MW barrier should be performed according to the following order:

- a. Assemble ARCR as shown on picture 1.4
- b. If ARCR is used in handheld version place it in the bag.
- c. If ARCR is intended to be used in stationary version it should be installed at a height of 0, 8-1m from the ground surface. Antenna should be installed vertically. It is recommended to protect ARCR from precipitation. When there is 110V network on the installation site it is recommended to supply ARCR from charger connected to “12 V” connector. In this case there is no need to use the battery. Output relay contacts connected to the ARCR control panel socket can be used for connection ARCR with external alarm system.

2.1.4 Preliminary operations.

2.1.4.1 The battery should be charged in the following order:

- a. Connect the charger to the 110V AC circuit and to the battery. The charger red indicator is on.
- b. Keep the battery connected to the charger until the indicator changes the color light for green (approximately 10 hours), then disconnect the charger.

2.1.4.2 ARCR is turned on by toggle switch “Power” (ПИТ) on its control panel. Initial position of the toggle switch is opposite to the “LEARNING” (ОБУЧЕНИЕ) sign.

2.1.4.3 The list of registered MW barriers is reviewed by following sequence:

- a. Take out the ARCR from the carrying bag and set the toggle switch on the bottom of the unit to the “LEARNING” position.
- b. Turn on the ARCR – ARCR will be switched in review mode and memory cell #1 will be displayed on indicator. If memory cell is already busy, i.e. an individual number of some MW barrier has already been written in it, the number on indicator will be blinking. If memory cell is free then the number on indicator will burn continuously.
- c. Push the “RESET” button for the time not less than 0, 5 sec. The number of indicated memory cell will be increased per unit every time the “RESET” button is pushed.
- d. After all memory cells are reviewed set the toggle switch in its initial position; turn on and off the power - the ARCR will be switched into stand-by mode.

2.1.4.4 The deletion of previously registered MW barrier numbers is fulfilled in the following order:

- a. In review mode find the busy memory cell with number that corresponds to MW barrier to be deleted.
- b. push and hold the “RESET” button.

c. The cell is free after the sound signal is generated, "R" sign is indicated and the cell number stops blinking.

d. release the button, set the toggle switch on the ARCR to its initial position; turn on and off the power - the ARCR will be switched into stand-by mode.

2.1.4.5. The registration of new MW barrier should be fulfilled in the following order:

a. In review mode find the free memory cell with number that corresponds to MW barrier to be registered.

b. transmit "learning" signal from MW barrier (MW barrier outputs "learning" signal during 10 seconds after power on. Then it is switched into stand-by mode. MW barrier should be turned on for no more than 30 seconds; during registration TMR may not be powered on.)

c. The individual number is registered after the sound signal is generated, "R" sign is indicated temporarily and then cell number starts blinking. If this MW barrier has already been registered in different cell, the sound signal will be generated upon "learning" signal reception, "E" sign will be temporarily displayed and then the blinking cell number (where the MW barrier has been registered) will be displayed.

d. After the learning procedure is finished, set the toggle switch on the ARCR to its initial position; turn on and off the power. After that the ARCR will be switched into stand-by mode.

2.1.5 MW barrier performance check

2.1.5.1 After installation of MW barrier switch on the ARCR and check if the set has been switched into stand-by mode. If ARCR periodically receives alarm messages from any MW barrier check the according detection zone and remove the cause of MW barrier false operations.

2.1.5.2 Cross DZ in the middle using ARCR to control alarm signals. In case of surface irregularities in the DZ are more than allowed it is necessary to cross the DZ on heights or hollows.

If there is any gaps in alarm signal reception check the site in accordance with 2.1.2.1 instructions or find the different MW barrier installation location.

2.2 Usage of the set

2.2.1 The usage principles are determined by the user.

2.2.2 In course of exploitation the set servicing should be performed according to section 3.

2.2.3 List of possible defects and troubleshooting is shown in table 2.1

Table 2.1

Description of failures and defects	Possible reason	Troubleshooting
1.Alarm signal is generated periodically (every 3 minutes)	1. The site does not meet 2.1.2 requirements 2. The tripods with units are installed incorrectly. 3. The battery is discharged. 4. MW barrier is defective.	Eliminate obstacles; if impossible find another installation site. Install MW barrier according to 2.1.2 requirements. Replace the batteries. Replace MW barrier.
2.False alarms	1.The site does not meet 2.1.2 requirements. 2. MW barrier is defective. 3. There are animals in DZ.	Eliminate obstacles; if impossible find another installation site. Replace MW barrier
3. The set does not generate the alarm signal when the protected zone is crossed by a human.	1. The distance between MW barrier and ARCR exceeds the maximum allowed for the particular exploitation conditions. 2. The batteries or ARCR accumulator are completely discharged. 3. MW barrier is defective. 4. MW barrier is not registered in the ARCR memory.	Change the ARCR installation location. Charge the batteries or accumulator. Check MW barrier registration, if there is a need register MW barrier.
Description of failures results and damages	Possible reasons	Troubleshooting
	The alarm signals are suppressed by the powerful outside radio signals with the radio channel frequency.	

3. Technical service.

3.1 When the set is used in one place over a long period of time it is recommended to ensure its reliable and effective operation using the following techniques:

- a. The correct installation and normal operation of MW barriers should be checked once a day.
- b. If there is a need, the grass should be cut and the pendent trees' branches pruned.
- c. After winter- and sand-storms and heavy rains technical service should be immediately performed according to a., b., and 2.2.1 instructions.
- d. The discharged MW barrier batteries with voltage less than 9.6 V should be replaced.

3.2 By the end of exploitation the set units should be disassembled and cleaned from dirt corrosion. Dirt should be wiped off from all contacts; bags repaired in case of any damage. After that the set should be packaged.

4. Storage.

Detectors should be stored packaged in storage facilities with the air temperature from C+5 up to +30 C with relative humidity not more than 85%.

Any aggressive environment impact during storage can cause irreparable harm to the product.

5. Transportation

Packaged sets can be transported in compartments with roof at the distance up to 10 000 km.

6. Utilization.

6.1 The set does not contain any precious, toxic and rare-earth materials (except the batteries) After the life time of the set is expired it should be utilized.

6.2. The batteries can be utilized by authorized establishments.

