Intrusion Radiowave Local Detectors
FONAR
FONAR -RC

Description Manual & Service Instruction
4372-43071246-045 TO

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Description Manual & Service Instruction

1. INTRODUCTION

1.1 The present description manual and service instruction contain information about principle of operation, structure and operating rules of the intrusion radiowave detector “Fonar” (hereinafter referred to as the detector).

1.2 The following abbreviations are used in the present document:

ПРД (Tx)	- transmitting unit;
ПРМ (Rx)	- receiving unit;
ССОИ (DAPD)	- data acquisition and processing device;
ЗО (DZ)	- detection zone;
КМЧ (MK)	- mounting kit ;
БП (SU)	- supply unit;
ПЦН (CSCP)	- centralized surveillance control panel;
АКБ (SB)	- storage battery;
КИП (TAK)	- tools and accessories kit

2. PURPOSE

2.1. The detector is a bistatic intrusion device. Its transmitting and receiving units are made in the form of park lamps. The purpose of the detector is to form concealed long protective boundaries and at the same time it is intended for outdoor (street) lighting.

2.2. The detector is intended for continuous round-the-clock operation under the conditions of open space. It keeps operating at the ambient temperature from -40…+65 °C and relative humidity up to 98% at the temperature 35 °C.

2.3 The detector is made in tree modifications different in methods of alarm transmission to DAPD and voltage of standby power source:

ЮКСО 45.00.000 (individual point relay, RS-485 interface);

ЮКСО 45.00.000-01 (radio channel Риф Стринг RS-200 (Rif String RS-200) symbolic notation “Фонарь-РК” (“Fonar-RC”);

ЮКСО 45.00.000-02 (individual point relay),

Detectors of ЮКСО 45.00.000 and ЮКСО 45.00.000-02 design are intended to be used with DAPD recording the break of individual point relay contacts. The detector of ЮКСО 45.00.000 design can operate as a component of alarm complex “Forteza-KS”; data exchange is made over RS-485 interface.

Data exchange between Rx and DAPD is made over a radio channel in the detector of ЮКСО 45.00.000-01design; the board of centralized surveillance “Rif String RS-200R” is used as DAPD (it‘s delivered on a special order). Practically the detector of this design is an alarm system of average capacity.

3.SPECIFICATIONS

3.1 The length of a detection zone (DZ) is 10…75 m.

3.2 If the sector length is maximum; the width of a detection zone is 3 m maximum.

3.3 If the sector length is maximum, the detection zone height is 1,6 m.

3.4 Rx generates alarms:

- when an intruder moves in DZ at a speed of 0,3…10m/sec. at his full height and in “bent” position with probability 0,98 minimum;

- when there is no signal from Tx;
- when supply voltage is below standard;
- when there is no supply voltage;
- when there is an attempt to mask the detector receiver;
- when there is an attempt to demount the detector;
- when the detector units are out of order.

An alarm is generated by opening the contacts of optoelectronic individual point relay (NC contacts) for 3 sec. minimum.

3.5 Specifications of individual point relay: maximum switched current is 0,06 A maximum; maximum voltage is 50 V maximum; resistance in closed condition is 350 Ohm maximum.

3.6 Specifications of the lamp: 40 W, 220 V, type of lighting unit - incandescent lamp 40 W or energy-saving 20 W frost proof one (equivalent to incandescent lamp 100 W). The lamp is switched on/off automatically according to the change of outdoor illumination level.

3.7 The detector is supplied from 220 $^{+10\%}_{-15\%}$ V, 50 Hz mains with the possibility of connection for the detector power supply. **The standby power source does not provide power supply of the lamp.** For ЮКСО 45.00.000 and ЮКСО 45.00.000-02 designs standby power supply is provided with dc source within 9…20 V voltage and 0,02 V ripple maximum For ЮКСО 45.00.000-01 design standby power supply is provided with a dc source within 15…27 V voltage and 0,02 V ripple maximum.

3.8 When the lamp is on, consumption current of Tx (Rx) from 220 V mains is 0,2 A maximum. Transit load-carrying capacity of a terminal board on current is 4 A maximum.

3.9 Values of consumption currents from a standby power source are given in table 3.1.

Table 3.1

Design	Unit	Maximum consumption current, A
ЮКСО 45.00.000	Tx (ПРД)	0,02
	Rx (ПРМ)	0,1
ЮКСО 45.00.000-01	Tx (ПРД)	0,02
	Rx (ПРМ)	0,2 (in impulse)
ЮКСО 45.00.000-02	Tx (ПРД)	0,02
	Rx (ПРМ)	0,05

Transit load-carrying capacity of a terminal board on current is 3,5 A maximum.

3.10 The radio channel range for ЮКСО 45.00.000-01 design depends on the type of antenna used at the receiving side of the radio channel. Within the filed of vision it is:

- 200…400 m for the antenna included into ПЦН RS-200P;
- 800…1000 m for remote spike antenna АШ-433;
- 1500…2000 m for remote directional antenna АН-433.

The use of RR-701RET retransmitter provides the increase of the radio channel range up to 3000…5000 m.

The real range depends on the presence and the nature of obstacles preventing radio propagation, nature of the ground, intensity of radio noise, the weather, etc.

3.11 The detector does not generate alarms under the influence of ultra-short beaming source within 150-175 MHz with power up to 40 W located at the distance over 6 m from the detector.

3.12 The detector is immune to the influence of EMI according to ГОСТ Р 50009-92 (voltage impulses in the supply circuits, breaks of mains power supply, electrostatic discharges, electromagnetic fields).

3.13 The detector does not generate alarms when small objects (dimensions not over 0,2m) move in its detection zone.

3.14 The detector does not generate alarms:

- under the influence of rain and snow;
- under the influence of solar radiation;
- under the influence of wind at a speed of 20m/sec. maximum;
- if the height of irregularities in the sector is ±0,3 m maximum;
- if the height of snow is 0,5 m maximum;
- if the height of grass is up to 0,3m.

3.15 The detector mean lifetime is 8 years.

3.16 Maximum dimensions of the units without a mounting kit, mm:

Rx, Tx - 1450*∅160;

3.17 Maximum weight of the units, kg:

Rx, Tx - 5.

4. DETECTOR COMPONENTS

4.1 The detector components are given in table 4.1.

Table 4.1

Sign	Name, symbolic notation	Quantity	Note
ЮКСО 45.00.000 design			
ЮКСО 45.04.000	Utmost receiving unit	at order	
ЮКСО 45.01.000	Utmost receiving unit	at order	
ЮКСО 45.03.000	Utmost transmitting unit	at order	
ЮКСО 45.02.000	Middle receiving unit	at order	
ЮКСО 45.10.000	A mounting kit includes:		
ЮКСО 45.10.100	support	1	Quantity per one unit Rx or Tx middle or utmost
	nut M10	6	
	washer M10	6	
	tie rod ALR-300ВН	1	
	safety fuse ВПБ-6-1 0,16 А-250 В	2	
ЮКСО 45.15.000	Kit of tools and accessories includes:		
	wrench S14x17	1	Quantity per a kit at order
	socket wrench 10	1	
	magnet	2	
4372-43071246-045 ТО	Description manual and service instruction	1 (in one book)	
4372-43071246-045 ПС	Certificate		
4372-43071246-045 Т10	Package	1 kit	

Table 4.1 (continued)

Sign	Name, symbolic notation	Quantity	Note
ЮКСО 45.00.000-01 design			
ЮКСО 45.02.000-01	Middle receiving unit	at order	
ЮКСО 45.04.000-01	Utmost receiving unit	at order	
ЮКСО 45.01.000	Middle transmitting unit	at order	
ЮКСО 45.03.000	Utmost transmitting unit	at order	
ЮКСО 45.10.000	Mounting kit includes:		
ЮКСО 45.10.100	support	1	Quantity per one Rx or Tx middle or utmost
	nut M10	6	
	washer M10	6	
	tie rod LR-300BH	1	
	Safety fuse ВПБ-6-1 0,16 А-250 В	2	
ЮКСО 45.15.000	Mounting kit includes:		
	wrench14x17	1	Quantity per a kit at order
	socket wrench 10	1	
	magnet	2	
4372-43071246-045 ТО	Description manual and service instruction	1 (in one book)	
4372-43071246-045 ПС	Certificate		
4372-43071246-045 Т10	Package	1 kit	
ЮКСО 45.00.000-02 design			
ЮКСО 45.02.000-02	Middle receiving unit	at order	
ЮКСО 45.04.000-02	Utmost receiving unit	at order	
ЮКСО 45.01.000	Middle transmitting unit	at order	
ЮКСО 45.03.000	Utmost transmitting unit	at order	
ЮКСО 45.10.000	Mounting kit includes:		
ЮКСО 45.10.100	support	1	Quantity per one Rx or Tx middle or utmost
	nut M10	6	
	washer M10	6	
	tie rod ALR-300BH	1	
	Safety fuse ВПБ-6-1 0,16 А-250 В	2	
ЮКСО 45.15.000	Kit of tools and accessories includes:		
	wrench S14x17	1	Quantity per a kit at order
	socket wrench 10	1	
	magnet	2	
4372-43071246-045 ТО	Description manual and service instruction	1 (in one book)	
4372-43071246-045 ПС	Certificate		
4372-43071246-045 Т10	Package	1 kit.	

DETECTOR ARRANGEMENT & OPERATION

Detector Principle of Operation.

The detector is a bistatic radio wave detecting unit. Its principle of operation is the following. A volume detection zone is generated in the space between a transmitting and a receiving unit. Designs of Tx and Rx provide considerable economy of material means when long protection boundaries are organized.

Tx and Rx are made in the form of park lamps keeping the functions of lighting.

In Tx there are two transmitters: lower and upper. The upper and lower transmitters of Tx differ in the structure of a signal to prevent the influence of adjacent sectors on each other. In Rx there are two receivers of beaming: upper and lower (they are equipped with their boards of processing). A detection zone of the sector is formed by one beam between a transmitter and a receiver of beaming. At the same time a pair of transmitter and receiver of beaming of one sector must be either upper or lower. Detailed information about it is given in the description of "Synchronization" regime.

The principle of protection sector formation is given in fig. 5.1.

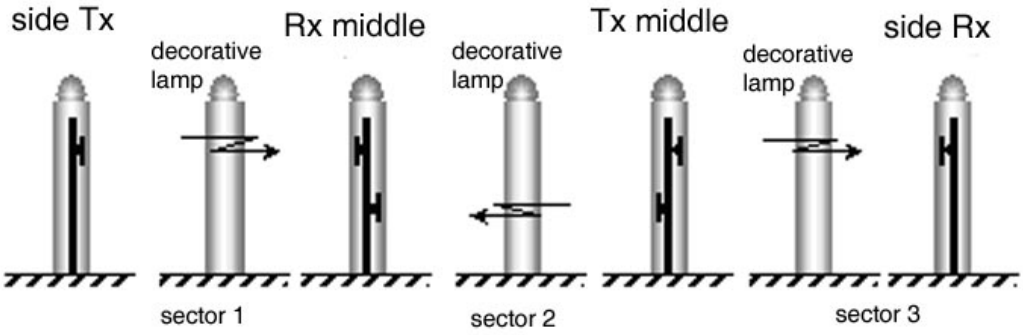


Fig. 5.1

Note. A decorative lamp is a lighting unit which does not differ from Tx (Rx) in appearance with the function of automatic switching on/off depending on the outdoor illumination level. It is mounted and connected similarly toTx (Rx). It is used at the customer's request according to item 8.1 (see below) to light long sectors. It is delivered on a special order.

The configuration of a protection boundary can be of any form. It is provided by the rotation of the Tx upper transmitter and the Rx upper receiver of beaming on the angle of azimuth about lower ones within the angle 250°. In fig. 5.2 a variant of formation of a protection closed boundary from four sectors is given. At that two transmitters and two receivers (middle ones) are used.

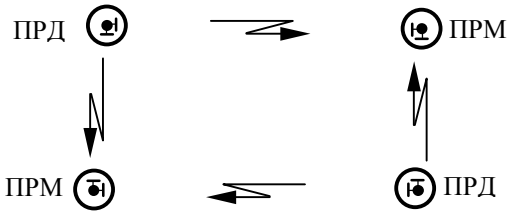


Fig. 5.2

A number of protection boundary sectors is limited by the following factors:

-over data lines the maximum number is 256 addresses (over RS-485 loop);

- according to the number of communication radio channels the maximum number is 30 (time of a check interval is 16 min.);

- over power supply lines it is limited by load parameters of terminal boards (see item 3.8, 3.9) (at serial power supply connection!).

When an intruder enters a DZ, electromagnetic field distribution is changed; and as a result the parameters of a signal received by Rx are changed either. In the operating mode Rx constantly processes a received signal, compares its value with set thresholds and on the basis of the results of processing it makes a decision on the generation of alarms. The information is processed by the microcontroller.

Change of electromagnetic field distribution in DZ can be caused not only by an intruder but it can be caused by other factors: vibration of grass, branches entering DZ, small animals, precipitation, reflection from walls and barriers, etc. These factors are interference because they make difficult reliable friendly signal extraction (caused by an intruder) against their background. More than that, interferences of considerable rate can cause the detector response; these responses are called false alarms.

Rx signal processing algorithm provides reliable friendly signal extraction against the background of fluctuations caused by interferences.

When the detector is switched on for the first time, it should be adjusted to be adapted for specific operation conditions (landscape, location of walls, buildings, fences which are objects of possible signal re-reflections in the place of installation). Each protection boundary is set by multiple person's crossings. In the detector setup mode the detector forms sensation levels; according to these levels an alarm is generated. The right setup practically excludes the possibility to generate false alarms because it provides setting the optimum sensation levels for each sector.

When power supply is OFF, the detector settings are stored in nonvolatile memory of the microcontroller.

During service the setup is carried out only in case of routine maintenance or electronic units replacement.

When an intruder enters a detection zone the detector generates an alarm by single opening the individual point relay contacts (ЮКСО 45.00.000, ЮКСО 45.00.000-02 designs). This alarm is transmitted to DAPD over a wireline. If the cause of alarm generation is not remedied, the detector generates multiple alarms. In case of supply voltage failure (both main and standby power supply) the contacts of individual point relay are opened. When the detector is switched to standby power supply, an alarm is not generated.

The detector of ЮКСО 45.00.000 design can be used as an addressed device in the system loop RS-485. Communications protocols and order of interface connection are given in the operating manual of "Forteza-KS" complex. If necessary the detector relay and interface outputs can be used simultaneously.

In ЮКСО 45.00.000-01 design each Rx is equipped with built-in transmitter of the radio channel providing alarms transmission from two sectors to CSCP. CSCP provides control of each communication channel; if there are not signals from any Rx during a check period of time CSCP generates "no communication" signal.

Input circuits of Tx and Rx are protected against pulse electric pickups over long communication lines (including lightning ones).

In the lower part of Tx and Rx there is a switching card. On this card a network power supply unit used for power supply of low-voltage electronics. A power supply unit is equipped with a safety fuse of 0,16 A 250 V rated value and backup option. A switching card provides connection of internal and external (through) circuits of the detector and indication of network or standby power supply switching on.

Operating Modes

5.2.1 General Information

5.2.1.1 There are three operating modes in the detector:

- standby mode;
- alarm mode;
- setting mode.

5.2.1.2 Indication of operating modes is carried out by:

- DAPD according to the state of the individual point relay contacts;
- different variants and combinations of three light indicators glow located on the processing card of the beaming receiver.

5.2.1.3 Light indicators can be monitored only when a detector case is removed; that's why they can be used during installation and setup. Positional relationship of light indicators is given in fig. 5.3. Numeration of indicators is given as an example. To the right of the indicators there is a hermetic contact necessary for control of setup modes. The control is carried out by closing the hermetic contacts using a magnet for different periods of time.

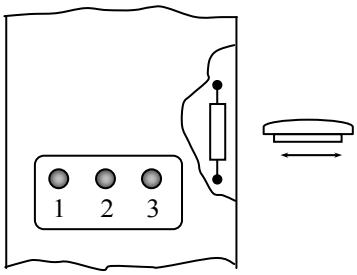


Fig. 5.3

5.2.1.4 The magnet for hermetic contacts closing is included in the detector kit of tools and accessories. Contacts are closed in two ways:

1 – long closing: contacts of hermetic contacts are closed for a period of time over 3 sec., further this action is referred to as ⌈5-6 sec.⌉;

2 – fast closing; contacts of hermetic contact are closed for a period of time over 0,3 sec. but less than 3 sec.; this action is referred to as ⌈<3 sec.⌉.

5.2.2 **Standby Mode**

5.2.2.1 Standby operating mode of the detector is indicated by:

- closed state of the individual point relay contacts;
- periodically short-time switching on of "2" indicator.

5.2.3 **Alarm Mode** is indicated by:

- opening for 3 sec. If the cause of alarms is continual or if power supply fails, the individual point relay contacts are open permanently.
- switching on indicator "2" for 3 sec. or permanently (according to the state of the individual point relay contacts).

5.2.4 **Setup Mode**

5.2.4.1 "Menu" Procedure

5.2.4.1.1 Setup mode is switched on by the action ⌈5-6 sec.⌉. Setup mode is subdivided into four procedures: menu, synchronization, alignment and training. When the setup mode is ON, "Menu" procedure is set automatically. Indication of "menu" procedure is carried out by periodical switching-on the indicators; timing diagram is given in fig. 5.4.

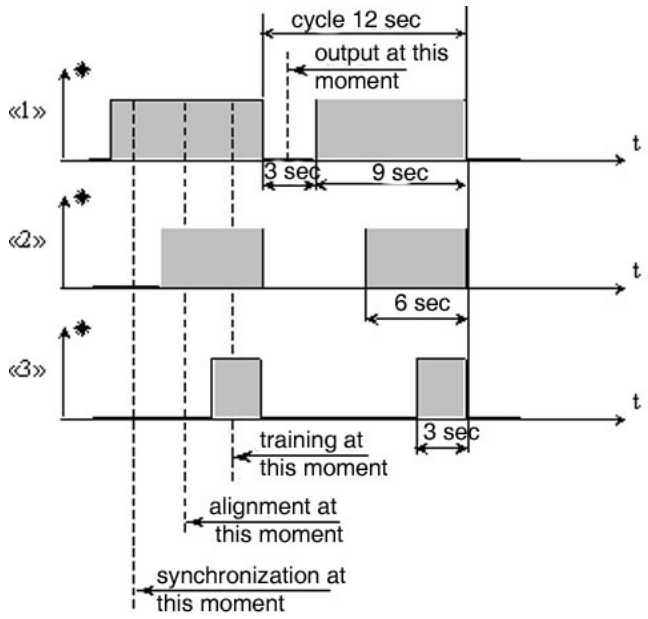


Fig. 5.4

5.2.4.1.2 From "Menu" mode one can call other procedures by action ⌈<3 sec.⌉, but this action must be synchronized with the state of light indicators (see fig. 5.4). To call "Synchronization "procedure, ⌈<3 sec.⌉ action should be carried out at the moment when only indicator "1" glows. The detector calls "Alignment" procedure, if action ⌈<3 sec.⌉ is carried out at the moment when indicators "1" and "2" glow. Thereafter "Training" mode can be switched on if action ⌈<3 sec.⌉ is carried out at the moment when all three indicators glow simultaneously. One can escape "Setting" mode and call standby mode with action ⌈<3 sec.⌉ at the moment when all indicators don't glow.

5.2.4.1.3 From procedures "Synchronization", "Alignment", "Training" one can call only **"Menu" procedure** (with action ⌈5-6 sec.⌉).

5.2.4.2 Synchronization" Procedure

5.2.4.2.1 Call the procedure (see item 5.2.4.1.2).

5.2.4.2.2 Synchronization is carried out on a beam. In this procedure the beaming receiver of this sector is set to "its own" transmitter (upper or lower). "Its own" transmitter should be considered to be that transmitter which forms a protective sector with a beaming receiver. The setting is carried out automatically when a transmitter and a receiver of beaming are positioned to each other. As a rule, the lower transmitter forms a sector with a lower receiver of beaming; the upper one forms a sector with upper receiver of beaming, but it is not critical. The sign of successful synchronization is:

- for a sector formed by the upper transmitter it is simultaneous periodical glow of all three indicators;
- for a sector formed by the lower transmitter it is simultaneous periodical glow of two indicators "1" and "2".

5.2.4.2.3 If during synchronization the receiver of beaming synchronizes with the features alien to "its own" transmitter or it does not synchronize at all, it means that the transmitter of another sector prevents it or there is not beaming of "its own". This situation can be in the following cases:

- axes of detection zones of adjacent sectors form an acute angle;
- adjacent sectors are different in length;
- there are re-reflections which form a considerable signal in the place where a synchronized Rx is installed;
- power supply is OFF on "its own" transmitter;

– “its own” transmitter is not positioned.

Then it is necessary to switch off power supply of other transmitters located at the distance less than 70 m which can influence the synchronization, switch on power supply and position “its own” transmitter, after that carry out synchronization.

Rough positioning of lower transmitters and receivers of beaming to each other is carried out by installation of support of Tx (Rx) (see fig. 8.2). Rough positioning of upper transmitter and a receiver of beaming is carried out by their rotation at an angle 250° at a loosened fastening nut.

The accurate alignment of the upper and lower transmitters and receivers of beaming is carried out by hinging.

5.2.4.3 “Alignment” Procedure

5.2.4.3.1 Call the procedure (see item 5.2.4.1.2).

5.2.4.3.2 While alignment two tasks are solved simultaneously:

– more accurate positioning of the transmitter and the receiver of beaming of one sector to each other;

– setting such a level of a received signal for this signal to be within the zone of consistent operation of Rx amplifier dynamic range.

5.2.4.3.3 The alignment is carried out by the turn of transmitter and the receiver of beaming on the moving hinging (while alignment the screws of hinge fastening are loosened).

5.2.4.3.4 Every indicator “1” – “3” in this procedure has five scales of glow frequency: from periodic switching-on with low frequency (infrequent blinking) to continuous glow. The increase of the indicator glow frequency corresponds the increase of the amplitude of Rx input signal.

5.2.4.3.5 If to consider all three indicators, indication of input signal increase occurs from left to right, i.e. indicator “1” is a low-order digit of this ruler (see fig.5.3). The increase of blinking frequency from left to right corresponds the increase of Rx input signal amplitude. The continuous glow of “3” indicator means that an input signal is large and the amplifier is in saturation. At the same time it is necessary to disalign the transmitter or the receiver of beaming with an up turn. Too small signal or no signal is indicated by the disconnection of all indicators.

5.2.4.3.6 While alignment it is necessary to get the maximum amplitude of Rx input signal (except the case of the amplifier saturation 5.2.4.3.5).

5.2.4.4 “Training” Procedure

5.2.4.4.1 Call the procedure (see item 5.2.4.1.2).

5.2.4.4.2 In this mode the values of thresholds are set using controlled crossings of a sector detection zone. Later on these values are used by the controller when an alarm signal is generated. This stage of the setup is very important because if it is carried out correctly it provides the high immunity of the detector to the influence of noise during operation and declared detection probability. For ЮКСО 45.00.000-01 (Fonar-RC) design it is necessary to SWITCH OFF a harness of a stationary transmitter of the radio channel from a plug-and-socket RC on the switching card of Rx (see fig. 8.2) for the period of “training”.

5.2.4.4.3 Training is carried out for each sector. Two people take part in training. One of them (an intruder) crosses a detection zone to “his full height” and in “bent” position in the centre of the sector and at the distance of ¼ length of a sector choosing “problem” places of a sector: in cavities, on heights and so on. An intruder is a person (his weight is 50-79 kg; height is 165-180 cm). The minimum number of crossings is three. In case of increase of training crossings the reliability of the result increases as well. The other person (an operator) controls the training process on indicators. The crossing of a detection zone must be complete, i.e. an intruder must enter a detection zone and after its crossing he must leave it (speed of movement is any of those specified in item 3.3). If location of the

sector does not allow to fulfill this condition, for example, a sector is located near the wall or a fence, an intruder go out to the same direction where he enters but he must cross the axis of a detection zone. The training must be carried out preventing all noise (movement of outsiders or an operator near a detection zone or in it, traffic movement near the zone, etc.). It can cause the detector training for noise but not for an intruder.

5.2.4.4.4 The indication of entrance in "Training" mode is continuous glow of "1" indicator.

5.2.4.4.5 After the fulfillment of action ⌈<3 sec.⌉ the indication of the detector availability for the next crossing is continuous glow of indicator "1" and blinking of "2" indicator. An intruder crosses a detection zone as a result an alarm is generated (indicators "1" and "2" glow constantly). Then it is necessary to carry out action ⌈<3 sec.⌉ to switch the detector to initial state (see item 5.2.4.4.4), after that an intruder can go to the next place of crossing.

Note. If during the first carrying-out ⌈<3sec. ⌉the detector does not switch to the availability for crossing (an alarm is generated) it means that an intruder does not leave a detection zone or there is an influence of noise. In this case one should leave a detection zone and eliminate the sources of noise then repeat action ⌈<3sec. ⌉and continue training.

5.2.4.4.6 Then actions 5.2.4.4.5 are repeated twice.

5.2.4.4.7 After the third crossing the feature of minimum sufficiency of a number of training crossings: indicators "1" and "3" glow permanently. If one goes on training crossings an alarm is indicated with glow of all indicators.

5.2.4.4.8 During training information is accumulated in the main memory of the microcontroller. For correct exit from "Training" mode and for retention of training results in the detector installation-specific settings it is necessary to call "Menu" mode using action ⌈5-6 c⌉. Otherwise **information of training results is lost**, and the results of the previous training or manufacturer's installation-specific settings are stored in the detector settings. This note is also referred to the attempts to complete training when the number of crossings is less than three.

5.3 The Detector Operation

After the training of all sectors of a protective boundary it is necessary to check their operability by direct crossings each sector by an intruder. Alarms are checked on DAPD. During this operation the correct connection of data communication lines (for ЮКСО 45.00.000, -02 designs) and operability of radio channel for ЮКСО 45.00.000–01 design are checked.

If there is supply voltage, during maintenance the detector operates in automatic mode, lighting units are switched off/on in automatic mode either. To increase the reliability of protection system it is recommended to supply the detector with standby power supply which provides its uninterrupted operation when mains power supply is OFF.

Note. Standby power supply must be carried out from a storage battery or from redundant supply units (they are supplied from mains but they have storage batteries for example "BPR" or "IPR").

5.4 The detector operation with the possibility of alarm transmission over a radio channel (ЮКСО 45.00.000-01 design)

5.4.1 General Information

5.4.2.1 A stationary transmitter installed in Rx is a two-channel transmitter of alarm radio signals with the possibility to check a communication channel.

5.4.2.2 A stationary transmitter is intended for combined action with CSCP "Rif String RS-200R" (hereinafter referred to as CSCP). Operating manual of CSCP is included into delivery kit RS-200R.

5.4.2 The present stationary transmitter is displayed on CSCP as two independent СТ.ОБЪЕКТА (stationary objects (type of the object) with the possibility of transmission of the following messages:

– alarm PERIMETER (ПЕРИМЕТР) (it is displayed as signal “ П Р ”;

– НОРМА (NORM) signal (it is displayed as ВЗ.НОРМА);

– ОБУЧЕНИЕ (TRAINING) signal (a service signal is displayed only in item TRAINING of the OBJECT (ОБУЧЕНИЕ ОБЪЕКТА), as ОК:ОБУЧЕН; This signal ОБУЧЕНИЕ (TRAINING) should not be mixed up with mode “training” during the detector setup).

– ТЕСТ (TEST) signal (a service signal is displayed only in item ТЕСТ ОБЪЕКТА (TEST of the OBJECT) as &).

Note. The present stationary transmitter does not transmit signals PROTECTION IS ON and PROTECTION IS OFF.

5.4.2.1 ПЕРИМЕТР alarms (perimeter alarms) are generated regardless of each other when an upper and (or) lower sectors of the detector response. An alarm is transmitted with tree messages for the time about 10 sec., it should be taken into account if an alarm is displayed on CSCP with delay from the moment of crossing because the earliest two alarms may not pass through.

5.4.2.2 НОРМА signals (norm signals) are generated regardless of each other after the upper and (or) lower sectors of the detector are switched to standby mode. Also these signals are generated once in 2-3 minutes to check a communication channel. НОРМА signal (NORM signal) is transmitted in two messages approximately for 10 sec. It means that the availability of the detector for the registration of the next crossing (taking into account 10 sec. delay on item 5.4.2.1 and 10 sec. on item 5.4.2.2) is 20 sec.

Note. Alarms signals ПЕРИМЕТР(PERIMETER alarm signals) can be generated once in 2-3 min.to check a communication channel if the detector is constantly in response.

5.4.2.3 ОБУЧЕНИЕ signals (TRAINING signals) are generated regardless from each other to register an individual number of the upper and lower sectors of a particular detector in the memory of CSCP (training on the air) by installing jumpers ОБ1, ОБ2 on a Rx switching card.

The sequence of the procedure “training on the air” for this stationary transmitter is the following:

– switch CSCP to the menu OBJECTS (ОБЪЕКТЫ) item TRAINING of the OBJECT (ОБУЧЕНИЕ ОБЪЕКТА) according to the operating manual ;

– supply power to the detector Rx;

– install jumper ОБ1 on the Rx switching card, check on CSCP the fact of “training” of a lower sector;

– remove jumper ОБ1;

– change a number for the training of an upper sector on CSCP;

– install jumper ОБ2 on the Rx switching card of the detector, check on CSCP the fact of “training” of an upper sector;

– remove jumper ОБ2.

Notes.

1 This procedure can be carried out only if there is stable radio communication between CSCP and Rx (see 3.9).

2 ОБУЧЕНИЕ signals (TRAINING signals) are prior in comparison with alarms ПЕРИМЕТР (PERIMETER alarms), i.e. if jumpers are installed alarms are not transmitted.

3 If it is necessary to transmit ОБУЧЕНИЕ signal (TRAINING signal) it is necessary to remove a jumper and install it again.

4 If a jumper keeps installed, then signals TECT (TEST signals) will be transmitted once in 10 sec. to check stable communication with CSCP. (Menu “OBJECTS” (menu ОБЪЕКТЫ), item TEST of the OBJECT (ТЕСТ ОБЪЕКТА).

5 Removed jumpers should be installed on one plug not to lose it.

After training of each sector on the air, it is recommended to record its individual number (ОБЪЕКТЫ menu (OBJECTS menu), item ПРОСМОТР (SCAN) #Rx) in the registration documentation to have an opportunity “to train” by number, that’s much more comfortable.

5.4.3 CSCP may operate together with other devices (remote antenna, retransmitter, radio button and others) included into the equipment of radio channel burglar alarm system “Rif String-200”. Detailed information can be found in CSCP operating manual “Rif string-200R”.

6 DETECTOR STRUCTURE

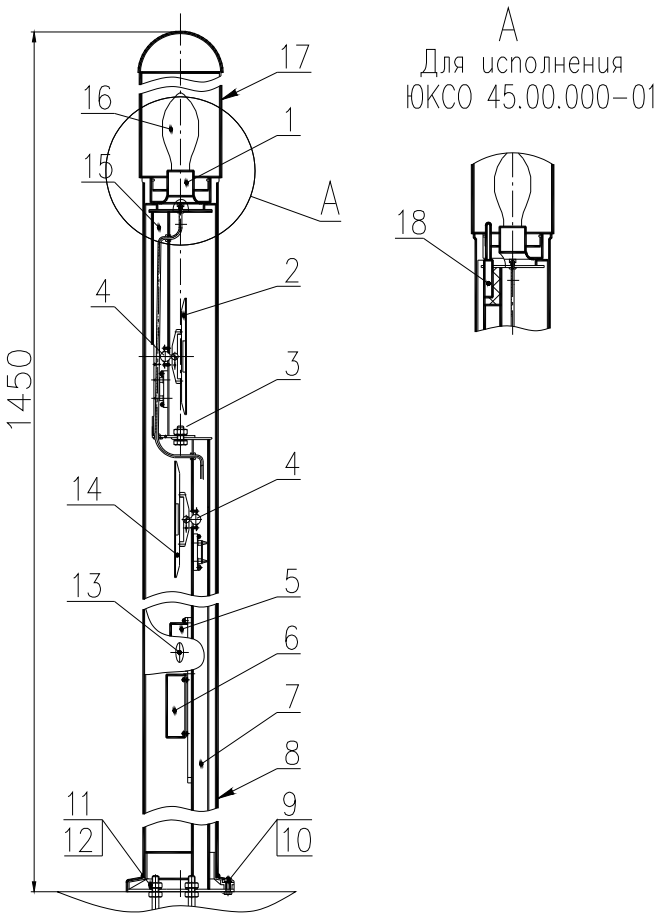
6.1 Rx Structure

6.1.1 The external view of middle Rx is given in fig.6.1

6.1.2 The bearing structure of Rx is two brackets: lower 7 and upper 15, which are joined with each other by a swivel block 3 in a movable way. During installation a lower bracket is fixed on the support with adjusting nuts 11 with washers 12.

6.1.3 Case 8 is made from radiotransparent (unshockproof) plastic and it has a removable bowl 17. Lamp holder 1 is fixed on the upper bracket to install lamp 16. An automatic machine of lighting switching on/off provides automatic switching on/off of the lamp in case of natural illumination level change. For this purpose there is an eyelet 13 in the case.

6.1.4 An upper receiver of beaming 2 is fixed on the upper bracket; a lower receiver of beaming 14 is fixed on the lower bracket. To turn the upper bracket it is necessary to loosen a nut of the rotator; for this purpose there is a wrench in the kit of tools and accessories. Receivers of beaming are turned on hinges 4 to adjust the detector at loosened mounting screws of these hinges.



1 lamp holder E27	-	1 piece	10 washer ∅6	-	3 pieces
2 upper beaming receiver	-	1 piece	11 adjusting nut	-	6 pieces
3 swivel block	-	1 piece	12 washer ∅10	-	6 pieces
4 hinge	-	2 pieces	13 eyelet	-	1 piece
5 automatic machine of lighting switching on/off	-	1 piece	14 lower beaming receiver	-	1 piece
6 switching card	-	1 piece	15 upper bracket	-	1 piece
7 lower bracket	-	1 piece	16 lamp	-	1 piece
8 case	-	1 piece	17 bowl	-	1 piece
9 cap screw M6	-	3 pieces	18 radio channel transmitter	-	1 piece

Fig. 6.1

6.1.5 In Rx of ЮКСО 45.00.000-01 design there is a radio channel transmitter 18.

6.1.6 A switching card provides bonds of an upper and a lower beaming receivers, a radio channel transmitter, an automatic machine of lighting switching on/off, lamps and external connections.

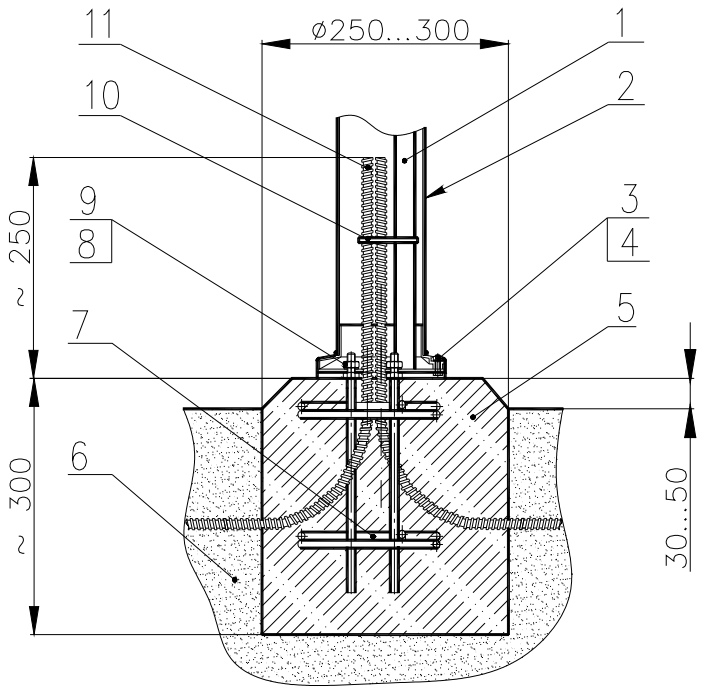
6.1.7 Installation of the support is shown in fig. 6.2. The support is installed by concreting. One must consider the necessary positioning of support 7 for sectors formed by lower transmitter and beaming receiver (see fig. 8.1).

6.1.8 Rx is installed by fastening of lower brackets 1 to vertical dowel bars of support 7 with adjusting nuts 9 with washers 8. Vertical dowel bars of support have screwing part which must be above concrete 5 during concreting. During fastening three nuts 9 are used as nuts of support (Rx lower bracket is installed on them), and the

rest of the nuts (three nuts) are used as pressing nuts. Case 2 is fixed to the lower bracket with cap screws 3 with washers 4 and it can be removed for adjustment and necessary electric connections.

6.1.9 Supply lines and data lines in spiral wrap hoses 11 (in the place of insertion they are necessary!) are inserted in the central hole of the lower bracket 1.

The utmost Rx is equipped with one beaming receiver (upper or lower).



1 lower bracket	-	1 piece	7 support	-	1 piece
2 case	-	1 piece	8 washer ∅10	-	6 pieces
3 cap screw M6	-	3 pieces	9 adjusting nut	-	6 pieces
4 washer ∅6	-	3 pieces	10 tie	-	1 piece
5 concrete			11 spiral wrap hoses	-	2 pieces
6 ground					

Fig. 6.2

6.2 Tx Structure

6.2.1 Rx structure differs from Tx structure only in the following way: transmitters are installed instead of beaming receivers.

7 SAFETY MEASURES

7.1 “Rules for Technical Operation of Users’ Electric Devices” and “Safety Regulations during Maintenance of Users’ Electric Devices” must be observed during the detector installation and setup.

7.2 The staff must have the leave for work with electrical facilities up to 1000V voltage to install, set and maintain the detector.

7.3 High-voltage circuits are connected; a safety device and lamps are replaced only when 220V voltage is OFF.

8 MOUNTING PROCEDURE

8.1 Requirements for the Sector Surface and Conditions of Use

8.1.1 The sector where Tx and Rx are installed must meet the following requirements:

a) height of irregularities is ± 0,3 m maximum;

b) height of grass is 0,3 m maximum;

c) height of snow is 0,5 m maximum;

d) maximum sector incline is 20 degrees.

e) separate stationary objects can be in the detector DZ (posts, park lamps, tree trunks without lower branches, etc.) at the distance of 1,5 m maximum from the DZ axis, but it is necessary to decrease the sector length at 10% from the maximum length (75m) per each object;

f) movable objects **are not allowed** in DZ including those which can move under the influence of wind: leaves of gates, bushes, branches and etc.;

8.2 Detector Installation

8.2.1 Carry out the layout of the perimeter for the places where Rx, Tx are installed as well as communication lines and power supply lines are laid. During the layout it is necessary to indicate the direction of supports according to fig. 8.1 and instructions of item 2.4.2.3.

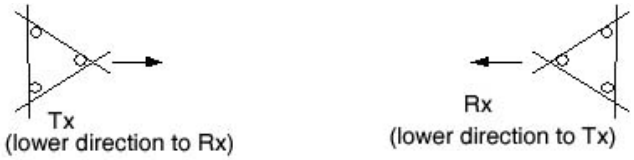


Fig. 8.1

8.2.2 Supply lines 220 V must be designed in separate spiral wrap hoses. When supply lines are designed it is necessary to calculate section of conductor cores taking into account consumption currents of Rx, Tx and lighting units; the number of flanks taking into account through traffic over the current of Rx and Tx socekts (see 3.7 and 3.8).

8.2.3 Lay communication lines and supply lines in a trench.

8.2.4 Stretch communication lines and supply lines located in spiral wrap hoses in the centre of Tx (Rx) support; install the support using concreting for screwing part of vertical dowel bars of the support to be above the surface according to fig. 6.2.

8.2.5 Install Tx and Rx; fix them vertically using nuts and washers M10 from a mounting kit. A wrench for the installation is included into the kit of tools and accessories. Fix communication lines and supply lines on the lower bracket using tie 10 (see fig.6.2).

8.3 Detector Connection

8.3.1 Connect necessary supply lines and alarm lines. Layout and purpose of switching units are given in fig.8.2.

8.3.2 Switching unit provides connection “under screw” of wires with section 1,5 and 2,5 mm. Connector RC is intended for connection of a stationary transmitter of the radio channel.

8.3.3 A group of switching units located in the upper part of the card is intended for connection of upper and lower transmitters (beaming receivers) to the switching card. These connections are made in the factory of origin.

8.3.4 During service alarm lines and supply lines are connected to the groups of switching units located from the left and right sides of the switching card. “Н31” (“NC1”) – contacts of the output relay of the lower beaming receiver; the end resistor of this alarm loop is connected to the switching units “ОЭ1”. “Н32” and “ОЭ2”are intended for the upper beaming receiver. A switching card is standard for Rx and Tx that’s why these units are not installed in Tx. Switching units Р3 are intended for connection and transit of standby power supply (see 3.7).

8.3.5 If the detector operates as a part of “Forteza-KS” complex, a line of RS-485 interface is connected to switching units “A” and “B”.

8.3.6 In the lower part of a switching card there are switching units for the connection and transit of mains voltage to Rx (Tx) –“220”. A lighting lamp and a light automatic machine are connected to switching units “OCB”, “L” and “N” at the factory of origin. Safety insulating panels are installed on the switching units.

8.3.7 The switching card is equipped with a safety device to protect the detector against excess voltages in 220V mains.

ATTENTION!

1 It is prohibited to carry out “220V” circuits switching when there is mains voltage on the connected cables.

2 It is prohibited to operate with the units without safety panels located on the switching units and a safety device.

9 DETECTOR SETTING-UP PROCEDURES AND ADJUSTMENT

9.1 Setting-up Procedures

9.1.1 Check the accuracy of supply circuits and alarm lines connection to the detector switching card.

9.1.2 Install safety panels on the switching card.

9.1.3 Switch on the detector power supply. An indicator must glow on the switching card.

9.2 Detector Setup

9.2.1 Switch the detector to the setup mode and carry out the setup according to procedure 5.2.

9.2.2 Place cases of Rx and Tx according to fig. 6.1, align the eyelet on the case with the window of the light-sensitive automatic machine.

9.2.3 Check the operability of the detector by crossing the sector in several places. If the setup is accurate, an alarm is generated at every crossing of the sector.

9.2.4 Check the lamp switching on by covering the eyelet on the case for the period of time ≥15 sec. If necessary, adjust the threshold of switching-on/off of the lamp under for specific operation conditions using a regulator located on the light-sensitive automatic machine according to the marking located on it.

10 MAINTENANCE

10.1 The detector is maintained by the specially trained staff after training.

10.1.1 During the detector operation it is necessary to carry out control and preventive works occasionally.

10.1.2 Every month carry out external examination of the detector units and the state of the sector where Tx and Rx are installed.

It is necessary to check that:

- there is not dust, dirt, snow and ice from the direction of beaming of Rx, Tx antennas especially on the eyelet of the case and clean them if necessary;
- there are not foreign objects in the sector where Tx and Rx are installed.

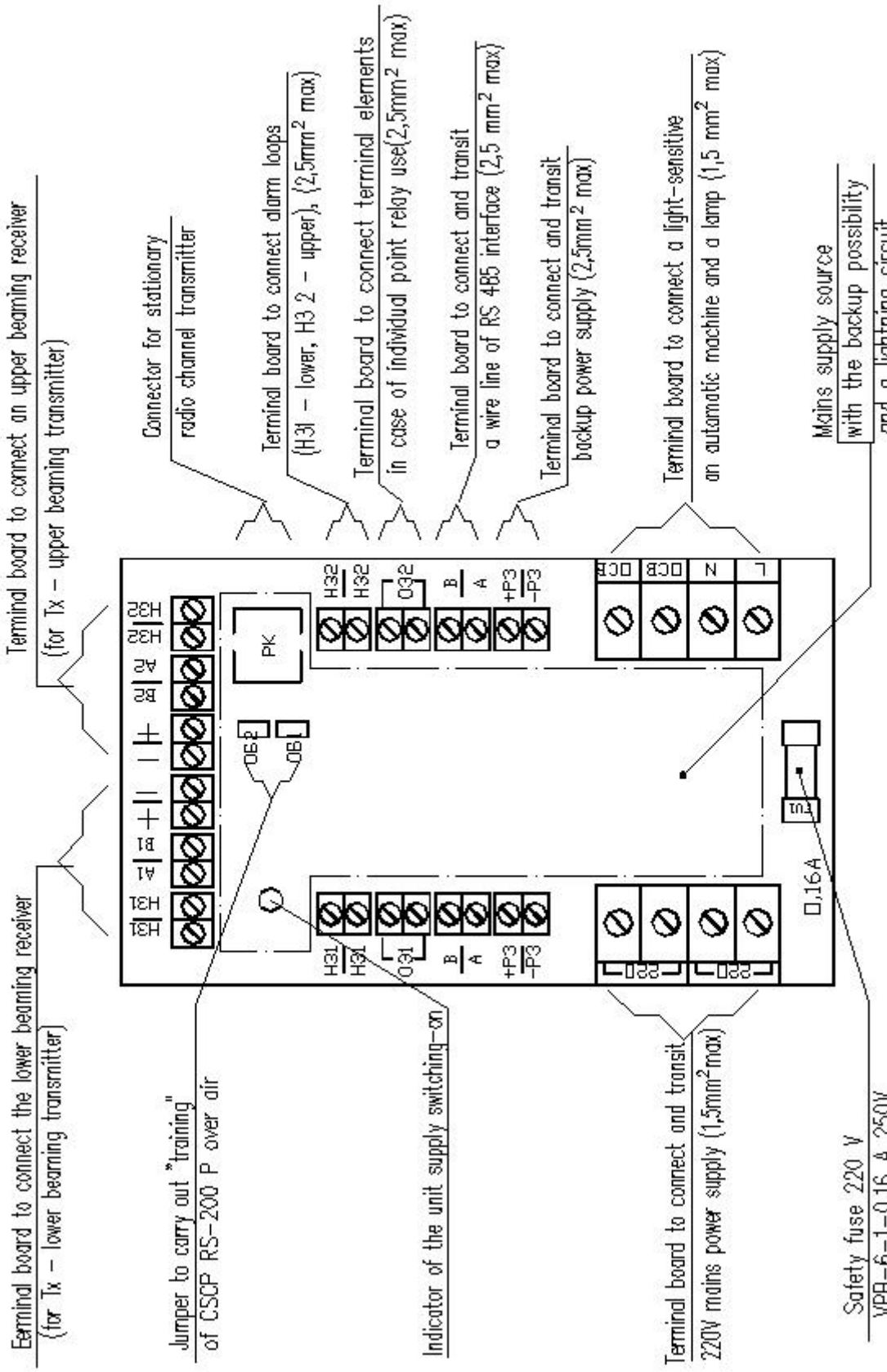
10.1.3 Quarterly:

- carry out all works specified in the list of monthly works;
- check the state of cables and cable connections.

10.1.4 During monthly works the height of grass should be controlled. If the height of grass in the operation area of the detector is over 0,3m, the grass should be mowed or removed by any other method.

10.1.5 If the height of snow changes, false alarms can be generated because a signal at the input of Rx unit falls and there is not switching-on of the lamp. In this case it is necessary to remove snow.

11 Fig.8.2


Terminal board to connect an upper beaming receiver
(for Tx – upper beaming transmitter)
Connector for stationary
radio channel transmitter
Terminal board to connect alarm loops
(H31 – lower, H3 2 – upper), (2,5mm² max)
Terminal board to connect terminal elements
in case of individual point relay use(2,5mm² max)
Terminal board to connect and transit
a wire line of RS 485 interface (2,5 mm² max)
Terminal board to connect and transit
backup power supply (2,5mm² max)
Terminal board to connect a light-sensitive
an automatic machine and a lamp (1,5 mm² max)
Mains supply source
with the backup possibility
and a lightning circuit
Earminal board to connect the lower beaming receiver
(for Tx – lower beaming transmitter)
Jumper to carry out "training"
of CSCP RS-200 P over air
Indicator of the unit supply switching-on
Terminal board to connect and transit
220V mains power supply (1,5mm²max)
Safety fuse 220 V
VPB-6-1-0,16 A 250V
PK
H31
H32
O31
O32
B
A
+P3
-P3
N
L
0,16A

POSSIBLE MALFUNCTIONS &THEIR REPAIR

11.1.1 The list of possible malfunctions and their repair is given in table 11.1.

Table 11.1

Problem	Possible Cause	Solution
1 On DAPD an alarm is generated continuously	1 A communication line of alarms or power supply is broken (tarnish of contacts).	Check the cable integrity (cable connections) and accuracy of its connection. Restore a communication line (strip contacts).
	3 The detector alignment is disturbed	Align Tx and Rx antennas.
	4 The detector synchronization is broken	Synchronize the detector
	5 Tx is out of order.	Replace Tx.
	6. Rx is out of order.	Replace Rx.
2 False alarms of the detector.	1. Moving branches in the detection zone hinder.	Examine the sector and eliminate the possible causes of noise.
	2 Swinging high grass in the sector disturbs.	
	3 An input signal at Rx goes down because the change of snow height is above the norm or because of the change of reflected signal level.	
	4 Animals circulate in the sector.	
	5 Too low thresholds of Tx are set.	Align and train the detector
3 The detector does not generate alarms when an intruder crosses a sector.	1 Too high thresholds of Rx are set.	Train the detector
	2 Alignment is disturbed.	Align Rx and Tx antennas.
4 An indicator on the switching card of Tx or Rx is not ON	1 Mains and (or) standby voltage is not supplied.	Supply voltage
	2 When there is not standby power supply, safety fuse blows	Replace a safety fuse
5 Signals from the detector Rx are not transmitted to CSCP RS-200P	1 No contact in the connector RC on the Rx switching card.	Strip the contacts in the connector on the Rx switching card.
	2 Stationary radio channel transmitter in Rx is out of order	Replace Rx

Note. When a failed Tx and Rx are replaced, it is possible to remove transmitters or beaming receivers separately to keep operability of an adjacent sector.

12. STORAGE

12.1 The detectors must be stored in the package in storage houses at the temperature of +5°C…+50 °C and relative humidity 85% maximum.

12.2 During storage the influence of hostile environments is not allowed.

13. TRANSPORTATION

13.1 The packaged detectors can be transported by any means of transport (by air – in pressurized modules) if they are transported in covered carriages, holds or covered baskets at a distance of 10 000 km maximum.

13.2 Boxes must be stowed to prevent their shift or fall in case of pushes and blows.

Intrusion Radiowave Local Detector
FONAR
FONAR –RC

Certificate
4372-43071246-045 ПС

The purpose of the detector and its specifications are given in the corresponding items of the description manual 4372-43071246-045 ТО.

1. DELIVERY KIT

1.1 The delivery kit is given in table ПС1

Table ПС1

Sign	Name & Symbolic Notation	Quantity	Serial Number
ЮКСО 45.04.000	Utmost receiving unit		
ЮКСО 45.01.000	Middle transmitting unit		
ЮКСО 45.03.000	Utmost transmitting unit		
ЮКСО 45.02.000	Middle receiving unit		
ЮКСО 45.02.000-01	Middle receiving unit		
ЮКСО 45.04.000-01	Utmost receiving unit		
ЮКСО 45.02.000-02	Middle receiving unit		
ЮКСО 45.04.000-02	Utmost receiving unit		
ЮКСО 45.10.000	Mounting kit includes:		
ЮКСО 45.10.100	support		
	nut M10		
	washer M10		
	tie ALR-300BH		
	Safety fuse VPB-6-1 0,16 A-250 V		
ЮКСО 45.15.000	Kit of tools and accessories includes:		
	wrench S14x17	1	
	socket wrench10	1	
	magnet	2	
4372-43071246-045 ТО	Description manual and operating instruction	1	In one book
4372-43071246-045 ПС	Certificate	1	
4372-43071246-045 Т10	Package		

2. ACCEPTANCE CERTIFICATE

2.1 A kit of detectors specified in table 1 meets technical specifications ТУ 4372-43071246-045 and it is found available for operation.

Date of issue _____200 .

Mark of technical control department

3. MANUFACTURER'S GUARANTEES

3.1 The manufacturer guarantees the conformity of the detector specifications to requirements ТУ 4372-43071246-045 if a user meets the service conditions and operating rules specified by 4372-43071246-045 ТО.

3.2 Warranty period is 18 months since the date of sale by the manufacturer.

3.3 Guarantees do not cover detectors:

- with broken guarantee stamps;
- with mechanical failures,

and also those which are out of order because of natural disasters (lightning, fire, flood).

3.4 Mean lifetime is 8 years.

Send complaints to the following address:
Technical service centre
JSC "Okhrannaya technika"
Post office box 45, Zarechny, 442960,
Penza province, Russia
Fax/tel. (8412) 60-81-16 (multichannel)
E-mail:servis@forteza.ru