TM ®

WIRE-WAVE DETECTOR
for perimeters

"IMPULS-12TM"	OMLD. 04.002-00
"IMPULS -12TPM"	OMLD. 04.002-01

TU 4372-005-44873746-00

SIC "Omega-microdesign"

CERTIFICATE № РОСС RU.ОСО3.В01401

INSTALLATION AND OPERATION MANUAL

OMLD. 04. 002 OM

Moscow, Penza

CONTENS

1. INTRODUCTION

1.1 The following definitions and abbreviations are used for the purposes of this manual: **detector** – a wire-wave detector "Impuls-12TM" ("Impuls-12TPM"); **RU** – a receiver unit; **TU** – a transmitter unit; **SU** – a sensor unit; **UW** – the SU's upper wire; **LW** – the SU's lower wire; **SA** – sensitivity area; **DA** – detection area; **IPK** – installation parts kit; **WMA** – the SU's wire mounting attachments; **CIU** – control and indicating unit.

1.2 The detector consists of a two-wire SU mounted on dielectric consoles or supports, a RU and a TU (see Fig.1.1), and two earthrods.

Fig.1.1

1.3 The RU is connected to the CIU, a power supply unit, the SU's start and to an earthrod.

1.4 The TU is connected only to the SU's end, and to an earthrod.

1.5 The spatial DA (section A, Fig.1.2, Fig.1.3) is formed around the SU's wires and follows all the turns and heights variations there of.

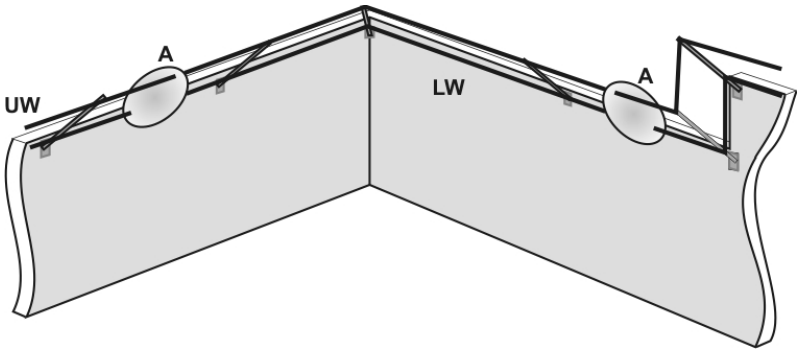


Fig. 1.2

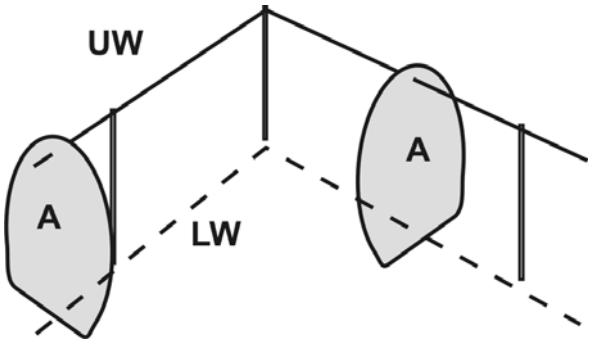


Fig. 1.3

2. PURPOSE

2.1 The detector is designed to form and monitor an extended spatial DA with turns and various heights, and to generate an alarm signal in case of intruder detection in the DA.

2.2 The SU follows the turns and height variations along a rugged terrain aligning the DA with the roughness of the guarded perimeter.

2.3 Depending on application the DA can be formed:

a) in the upper part of a barrier: a "canopy-type" version with any pitch (Fig. 2.1a), where the UW and the LW are attached to the dielectric consoles (IPK1 or IPK2);

b) along the barrier, as to monitor breaching, getting over or undermining, where the UW is attached to the dielectric consoles (IPK3), and the LW is buried 5 to 10 cm. underground (Fig. 2.1b);

c) along the ground surface (Fig.2.1c), where the UW is attached to the dielectric supports (IPK4), and the LW is buried 5 to 10 cm. underground;

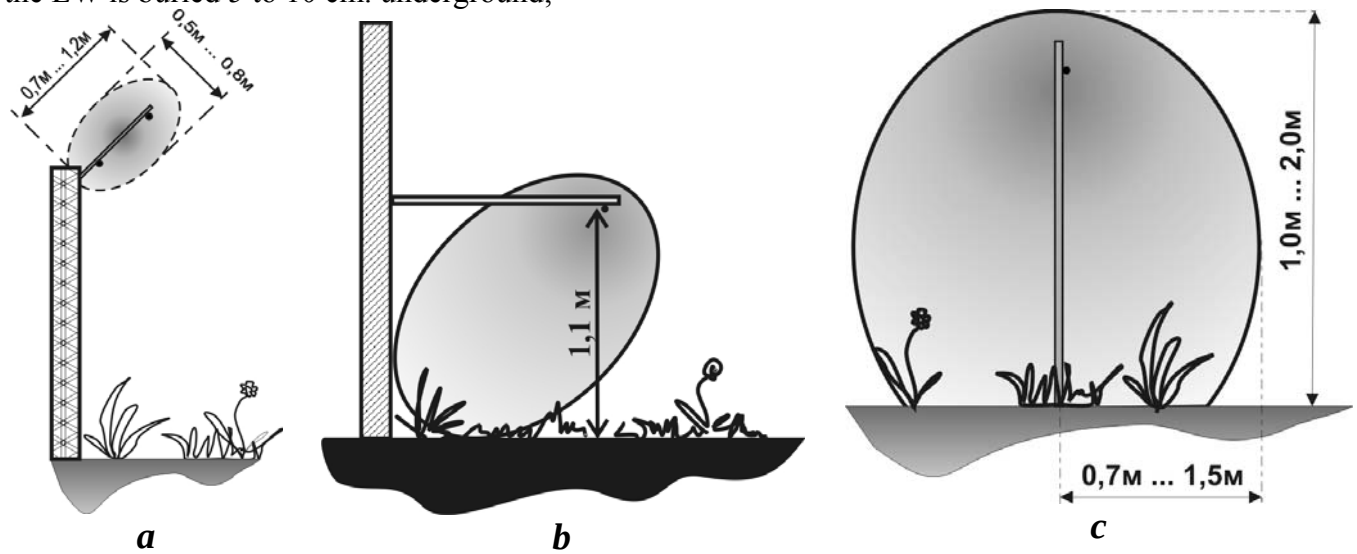


Fig. 2.1

2.4 If necessary, physical obstacles can be included into the DA (a barbed wire net AKL, Fig.2.2, barbed wire, etc.). At that the DA must be free of long metal pieces, as false operation due to swinging or rain may occur.

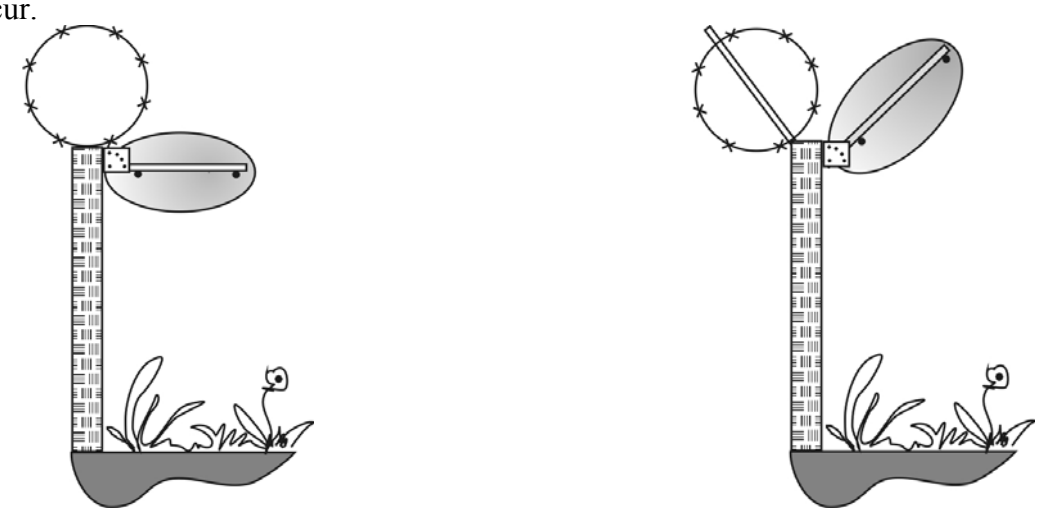


Fig. 2.2

3. TECHNICAL DATA

3.1 The detector maintains continuous round the clock operation.

3.2 The detector is capable of operating with a DA from 10 m to 250 m long.

3.3 The detector is capable of safe operation in temperate or cold climate (Temperate and Cold Climate (UHL) construction, category 1 under GOST 15150-69, yet in the temperature range from -50°C to + 50°C).

3.4 The detector is capable of safe operation at wind velocities of up to 30 m/sec and rainfall of up to 30 mm/hr.

3.5 The detector is powered from a power supply unit with rated voltage of 24VDC at permissible voltage fluctuations:

"Impuls-12TM"	**20 V … 36 V**
"Impuls-12TPM"	**11 V … 36 V**

3.6 Peak current drawn by the detector in the power lines will not exceed 40mA, where maximum power consumption will not exceed 1.0W.

3.7 The detector is capable of generating an ALARM signal in the monitoring circuit with lasting from 2 to 5 sec. An ALARM signal is generated through a change of the monitoring output circuit resistance from less than 35Ohms to more than 1000kΩ, or through “interruption” of an external control resistor Rtr positioned into terminals at the face plate of the RU. Upon the change of the monitoring output circuit resistance the voltage must not exceed 38V, and the current must be limited at a level of no more than 100mA. It is possible to connect control indicators on the face panel of the RU, which will be used when making adjustments.

3.8 The detector is capable of generating an ALARM signal and relevant indication on the RU’s face panel in case of intrusion attempts within the DA, opening or shorting of the SU’s wires.

3.9 The detector is capable of generating a continuous ALARM signal in case of power supply interruption.

3.10 Generation of an ALARM signal on touching the detector’s units, the SU’s wires and earthing is allowed.

3.11 The detector is capable of remote control of its operation. A remote control signal must be generated by means of sending a direct-voltage pulse (within the power supply voltage of the detector) to the DK (Remote Control) contacts of the RU’s terminals that will have a length of no less than 0.5 sec. (fig.3.1). In case of healthy operation the detector will answer the DK signal by generating an ALARM signal.

3.12 The detector is equipped with integral single-level protection from voltage induced by lightning or other electrical discharges, where the said protection covers all the external circuits of up to 500 m long connected to the RU’s terminals. Protection of input circuits activates when input voltages exceed a value of ~39…40V. However, if the length of the lines connected to the RU’s terminals exceeds 500 m it is required to use KSUM (universal junction box) distribution boxes with lightning-discharge protection.

3.13 Service life of the detector units and the fiberglass WMAs will not be less than 10 years.

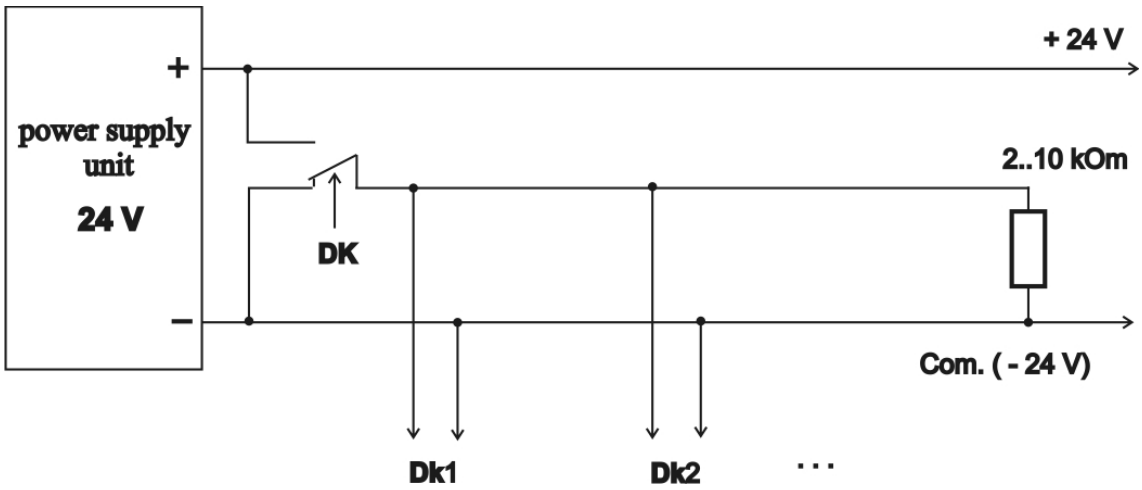


Fig. 3.1

4. INSTALLATION AND OPERATION INSTRUCTIONS

4.1 The detector's SU is placed at the guarder perimeter and incorporates two wires: the upper (signal) and the lower (common) respectively marked as "ВП" (UW) and "НП" (LW).

4.2 The DA's cross-section is an ellipse with its long axis in the plane of the SU's wires or in a plane that includes the UW and a perpendicular to grade.

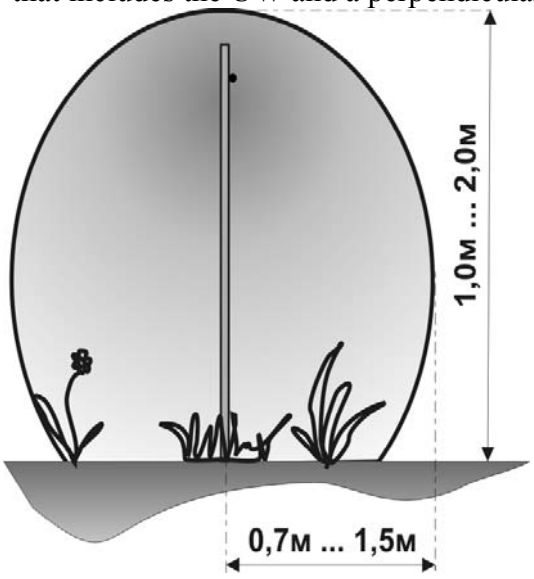


Fig. 4.1

4.3 If installed on an open ground, where the DA is formed along the grade, the UW shall be located at a height of no more than 1.8 m above grade, the LW shall be buried 5 to 10 cm. underground or located at a required height. A UW shall be a cupriferous wire of adequate strength and durability, for example, type P-274, or uninsulated bimetal, for example, BSM-1. A LW shall be of P-274 type or other cupriferous wire of adequate strength, durability and insulating properties. If the LW is installed on dielectric consoles, i.e. without a direct contact with ground or barrier, the said wire, in the same way as the UW, will not necessarily have an insulation coating.

4.4 The UW shall be attached to dielectric supports if the perimeter is guarded without a barrier; or to dielectric consoles arranged on a barrier, pole, trees, walls of buildings, etc. by means of plastic clamps.

4.5 The UW can be installed at a height exceeding 1.8 m, for example, on the upper part of the barrier. At that the DA will move up accordingly following the UW (the DA concentrating and contracting around and gradually forming into a circle with the UW as the center).

4.6 If a UW 1 is installed close to a conducting barrier 2 (a steel mesh, grate, reinforced concrete panels, etc.), as shown in Fig.4.2, a DA 3 can be concentrated between the UW 1 and the barrier 2, where the LW 4 may be ignored. Therefore, the UW must be moved away from the barrier as to make the distance from the said wire to the grade smaller than that to the barrier.

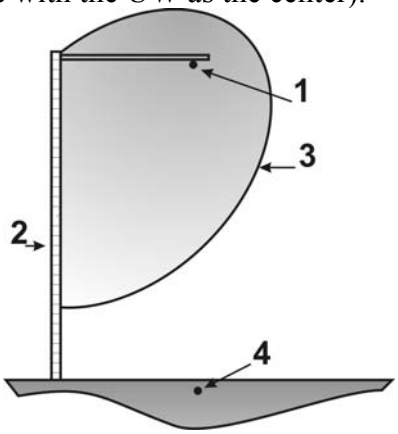


Fig. 4.2

4.7 The LW may be raised so as to approximate it to the UW in order to limit the section of the DA concentrated between the SU's wires.

4.8 It is necessary to bear in mind that closely located cupriferous wires and cables parallel to the UW can be recognized by the detector as false LWs, where the DA may be formed between the UW and the false LW.

4.9 It is necessary to bear in mind that only the UW must be a single wire, where in case of a buried LW usage of a twisted pair is allowed, in which case the LW's conductors shall be connected parallel with each other.

4.10 The UW and the LW must not have a swing of more than 5 cm in the wind, neither must they touch cases of the units and other objects.

4.11 Presence of swinging trees and other moving conducting objects at a distance of less than 1.5 to 2 m is not allowed as movement thereof may cause an ALARM signal generation. Presence of any mov-

ing objects in the DA is not allowed, including any vegetation taller than 0.3 m, except for single bents at a distance of less than 0.5 m from the UW.

4.12 A distance from the UW to the barrier, the structure of which contains conducting or metal elements, must be larger than that between the SU's wires or between the UW and the grade.

4.13 When forming a near-the-ground DA, the UW must be located no closer than 0.7 m from the barrier (the structure of which contains conducting or metal elements) or the wall of a building. At that the following condition must be strictly observed (4.6).

4.14 A close presence of poles, tree-trunks and other conducting objects near the UW in the DA will increase signal loss in the circuit and reduce maximum length of the guarded perimeter; a UW used without an insulation coating will reduce signal loss in the circuit.

4.15 Proximity of the UW of the SU to the ground surface and conducting barriers will also significantly increase signal loss and reduce maximum length of the guarded perimeter.

4.16 Proximity of the UW of the SU to barbed wire barriers with a distance of less than 1 m (if the distance to the LW is larger than that to the barbed wire) will increase signal loss by almost one third and therefore reduce maximum allowed length of the guarded perimeter.

4.17 Proximity of the UW of the SU to conducting barriers with a distance of less or approximately equal to the distance to the LW will cause deformation of the DA (see Fig.4.2), which may lead to false operations under rain or gusts.

4.18 Increasing the distance from the SU to the ground surface or to conducting barriers will decrease signal loss, where the same decrease occurs at increasing the distance from the LW to the ground surface or to conducting barriers, locating the LW closer to the UW.

4.19 Proximity of the UW to the non-conducting surface of snow cover will in no manner affect the formation of the DA. At that it is necessary to bear in mind that with formation of snow crust a possibility of unmonitored trespassing over the DA employing the high snow cover. Also, a certain reduction of sensitivity is possible resulting from distortion of the DA caused by the UW becoming closer to a conducting surface due to wet film formation on the snow cover.

4.20 Earth terminals located on the cases of the units must be connected by means of an isolated conductor to the earthrods placed in the ground as close as possible to the projections of the units and having a spreading resistance of no more than 30 Ohm. At that the cases of the TU and RU must not come in contact with the barrier.

4.21 The earthing conductor must be of any isolated copper wire with cross-section of 0.5 mm^2, to be properly connected with the earthrod, to be installed along a shortest path, without coming into contact with foreign objects from the earth terminal on the unit to the earthrod's terminal located as close as possible to the ground surface.

4.22 The length of a guarded perimeter must not exceed 250 m and shall not be less than 25 m.

4.23 It is prohibited to connect to the terminals of the detector transmission lines having voltage of more than 36V. If the ALARM circuit is monitored the current on the "TP" (ALARM) terminals of the RU must be limited to a value not exceeding 20mA.

4.24 When installing multiple detectors serially or in parallel along the perimeter it is necessary to synchronize their operation. At that external synchronization wires must connect **"BC0"** (RU1) and **"BC1"** (RU2) or **"BC1"** (RU1) and **"BC0"** (RU2) of or adjacent or parallel detectors "1" and "2".

4.25 **With any number of detectors they are synchronized in pairs.** Only analogous detecting units can be installed adjacently.

4.26 Installation to be done taking into consideration a minimum inductive coupling between TU units and between the wires of adjacent detectors' SUs at location of the TUs and the earthrods.

4.27 If it is required to monitor a closed perimeter using one detector, installation to be done taking into consideration a minimum inductive coupling between TU and RU units (see Fig.4.3), between the wires at the ends of the SU, and between the earthing wires at location of the detector's TU. A distance between the earthrods of the TU and RU must not be less than 1 m.

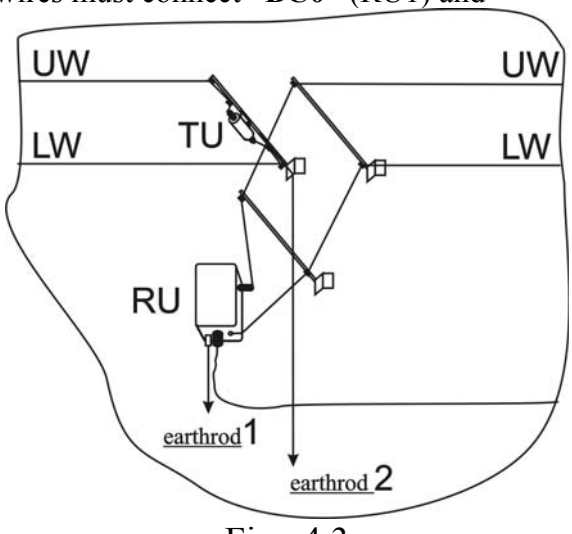


Fig. 4.3

5. CONTENTS OF DELIVERY

5.1 Contents of delivery for a detector and IPK to be chosen from tables corresponding to the packages.

a transmitter unit **(TU)**	1 ea.
a receiver unit **(RU)**	1 ea.
Passport	1 ea.
Installation and operation manual	1 ea.
Package	1 ea.

"IPK1" (WMA-01P) – for guarding a sector of perimeter using dielectric poles or barriers to attach the SU's wires.

Holders, 0.3 m consoles, clamps, washers, screws, nuts	set
Package	1 ea.

"IPK2" (WMA-02P) – for guarding a sector of perimeter using dielectric poles or barriers to attach the SU's wires.

Holders, 0.75 m consoles, clamps, washers, screws, nuts	set
Package	1 ea.

"IPK3/1,2" (WMA-03P/1,2) – for guarding a sector of perimeter using barriers to attach the SU's wires.

Holders, 1.2 m consoles, clamps, washers, screws, nuts	set
Package	1 ea.

"IPK3/1,5" (WMA-03P/1,5) – for guarding a sector of perimeter using barriers to attach the SU's wires.

Holders, 1.5 m consoles, clamps, washers, screws, nuts	set
Package	1 ea.

"IPK4" (WMA-04P) – for guarding an open sector of perimeter without barriers or along conducting barriers.

Holders, 1.8 m supports, clamps, washers, screws, nuts	set
Package	1 ea.

Notes: 1) A TU can be installed on a barrier, on an "end" attachment point IPK-0…PK or directly on a earthrod; 2) To install on a barrier use an adaptor holder; 3) An IPK-04PK simultaneously functions as an earthrod.

Earthrods – are designed for earthing the detector's units.

Earthrod	2 ea.
A RU attachment plate	1 ea.

Note:

Two variants are possible for attaching a RU: 1) on a barrier or wall surface; 2) on an earthrod, at that an optional plate to be ordered.

Wire sensing elements

SU-1/250	Two insulated wires, 250 m each.	250 м
SU-3/250	Two (uninsulated and insulated) wires, 250 m each.	250 м

6. DESIGN AND OPERATION OF DETECTOR

6.1 Principle of operation

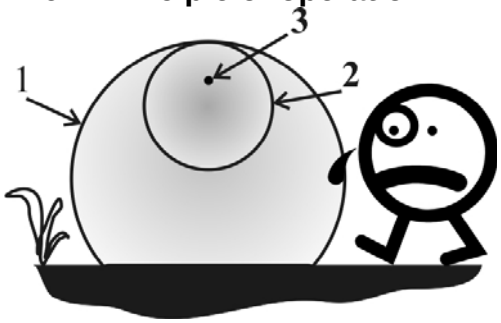


Fig. 6.1

6.1.1 The detector's principle of operation is based on detecting a trespasser by an induced change of parameters of the electromagnetic field between a TU and a SU along a two-wire SU. At that the TU and RU units are connected to the opposite ends of the two-wire SU.

6.1.2 Two independent DA are formed along the SU: the main, 1 (see fig. 6.1), adjustable in its cross-section within the range of 0.5 to 2 m, and the secondary, 2, adjustable in its cross-section within the range of 0.1 to 0.8 m. (3 – UW). A signal processing algorithm includes two channels: the main, and the secondary combined using an "OR" logic. Both channels equally generate an alarm signal unless turned off at a face panel of a RU of one or both channels. The main channel analyses the area of DA overlapped by a trespasser and a rate of motion of the latter. The main channel, as its name implies, bears the main load in detecting trespassers moving through the DA "all the way", "two-double", "on haunches", "on all fours",

etc. (when set accordingly). It is necessary to bear in mind that with large cross-sections of the DA wind shaken vegetation or other moisture containing or conducting objects may enter it to cause a decreased interval between false alarms. The cross-section of the DA will be even larger for closely moving vehicles of other large-size machinery.

The secondary channel analyses only the cross-section overlapped by the trespasser and is set mainly to detect an "all the way" running trespasser with the near-the-ground (open) version of the SU, or a trespasser moving over the canopy-type version of the SU. The DA cross-section of the secondary channel therefore must be as small as possible (not larger than required).

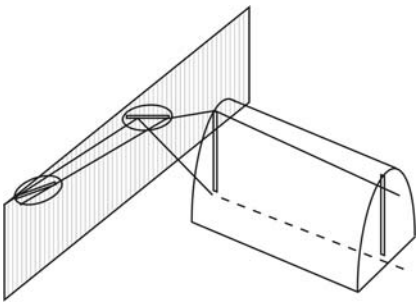


Fig. 6.2

6.2 Detection area

A cross-section of a DA can be from small (0,3m×0,3m), as to monitor the upper part of a barrier (for the main and the secondary channels), to maximum (2m×2m), as to monitor the perimeter at the ground surface (for the main channel only). The DA cross-section may be chosen for the entire SU of the detector or for a part of its sector, i.e. the DA will change following the change in the spacing between the SU's wires, as shown in fig. 6.2. However, the cross-sections of the DA must be chosen also depending on a condition of the guarded perimeter. The determining factor for cross-sections of the DA will be a distance between the UW and the LW or between the UW and the conducting surface (the ground). The

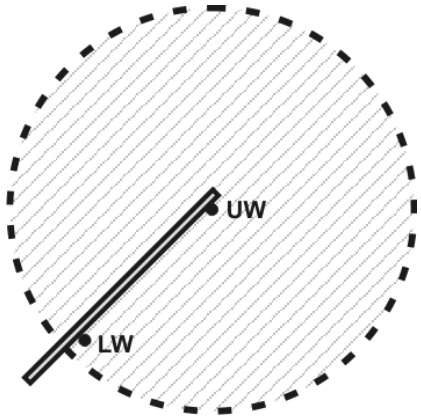


Fig. 6.3

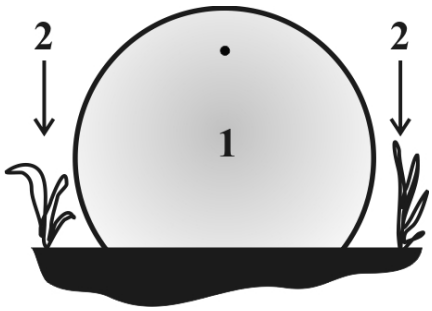


Fig. 6.4

condition of the guarded perimeter must conform to the set cross-section of the DA. If large-size metallic objects (steel or reinforced concrete poles, etc.) are present at the guarded perimeter it is necessary to install the detector's SU so as the distance from the UW to a metallic object is not less than 1.1 times longer than that from the UW to the LW (for the canopy-type version), or from the UW to the ground surface (for the near-the-ground version). The LW must always be located closer to the UP as compared with other foreign metallic objects (barbed wire, reinforcement, etc.). The zone within the dotted line (see fig.6.3) must not contain any conducting objects (except for the ground surface). In any case, the distance from the UW to a metallic object (a pole, a support used, for example, for attaching the UW of both wires) must not be less than 0.3 m. Moving objects (vegetation, animals, etc.) must not be within the DA. Thus, for the near-the-ground location, vegetation swinging in the DA or the DA crossed by an animal weighing more than 5 kg may degrade the signal-to-noise ratio and lead to false operation. Grass or bushes at the guarded perimeter will significantly influence the choice of the DA's cross-section. Battle or moist stems and branches when swinging under wind will induce noise in the re-

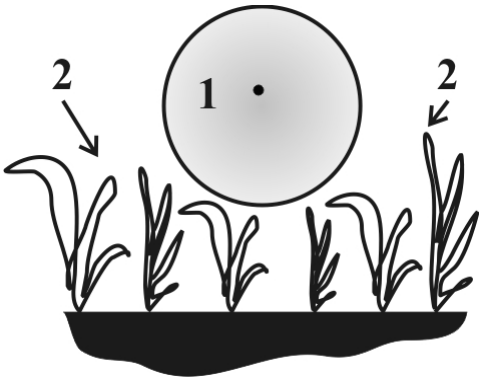


Fig. 6.5

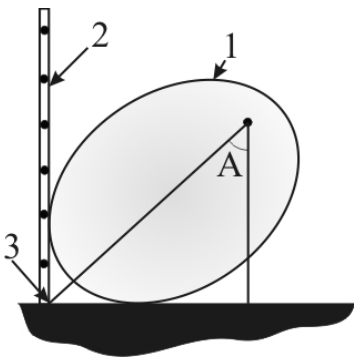


Fig. 6.6

ceiver that may have a spectrum close to that of the legitimate signal and therefore cause "false" alarms. There are two ways to control these "false" alarms: 1) to cut the grass within the DA, as shown in fig. 6.4; 2) to retrain the detector, where an operator will cross the perimeter so that his body center of gravity is above the vegetation, thus decreasing the DA's cross-section (see fig. 6.5) until the swinging grass of bushes do not interfere with it, and accepting a possibility of "permitting" trespassers under the DA. Larger bushes are easier to handle: they can be slinged to stop them from swinging under wind. Majority of manufacturers of detectors with electro-magnetic sensitivity area, allow for a certain height of vegetation within the

DA by hardware limitation of the DA cross-section so that is does not cover the vegetation. At that the possibility of unmonitored passing under the DA can be eliminated using a barbed wire or net; however it creates big problems with maintenance of the guarded perimeter. As it was mentioned in article 4, when locating the UW close to a conducting barrier of a steel mesh 2 (grates, reinforce concrete panels, etc.), as shown in fig. 6.6, the detection area 1 will be concentrated between the UW, the ground and the barrier. Therefore, the UW of the SU must be at a sufficient distance from the barrier as to make the distance from the said wire to the grade smaller than that to the barrier. The fig. 6.6 below shows an arrangement, where the distances from the UW to the grade and to the conducting barrier are approximately equal, so the angle **A**≈45°. As shown the DA looks attracted by the line of intersection of the barrier with the ground. Though the example is rather conventional (as it does not take account of the conductance of the ground surface and the barrier), it, however, helps evaluate possible distortions of the DA. The fig.6.7 schematically shows tendencies of inclination of the axis of the DA's ellipse when the UW is moved away from the barrier (zone 2) or the UW moved closer to the barrier (zones 3, 4) relative to the DA 1 identical to that shown in the fig.6.6. The DA must be free of swinging or chattering barbed wire or other loosely attached metal objects, as these may cause false operations. By adjustments the cross-section of the DA must be limited so as to stop the noise induced in the signal processing channels (blinking of the LED on the face plate of the RU) by the swinging or chattering of the barbed wire of the SU's wires relative to the barbed wire. As it was mentioned above, anything relating to the influence from the barbed wire also relates to any other metal objects at the guarded perimeter (loosely attached metal sheets, parts of wires, mesh, etc.). When arranging a DA in a forest or a park (see fig. 6.8), the UW 1 of the SU must be located at a tactically chosen height observing all the recommendation set forth herein. Grass, bushes, branches of trees and other intensively swinging vegetation as well as animals moving within the DA 2 will increase the bio-noise and lead to false operations. To avoid such inconveniences either the cross-section of the DA must be decreased to the size 3 shown in the fig.6.8, or the grass must be cut, bushes and young trees knitted up, access of animals (weighing more than 5 kg) restricted.

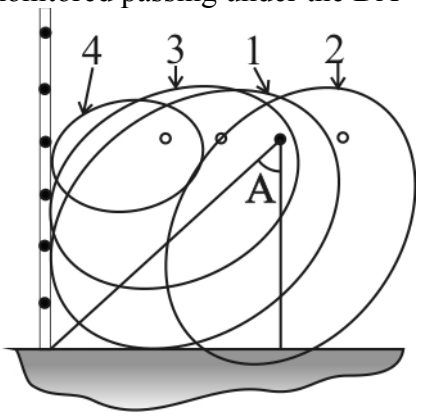


Fig. 6.7

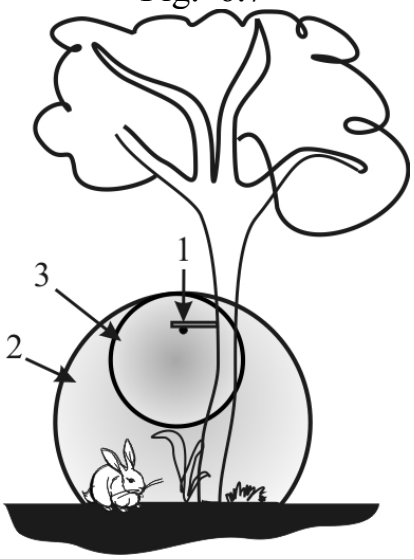


Fig. 6.8

6.3 Sensor unit

6.3.1 A two-wire SU along with a TU and a RU, is designed to form a spatial DA at the guarded perimeter.

6.3.2 For the near-the-ground version, the UW will be located at a height (1.0 to 1.8 m) from the ground surface, the LW buried 5 to 10 cm underground below the UW, or located at a chosen height.

6.3.3 The spatial DA is formed around the SU's wires, concentrates along them and has a cross-section of a truncated ellipse, depending on the conductance of the ground. Variants to build a SU and a DA cross-section are shown in the fig.6.9.

6.3.4 Supports of a non-conducting material (fiberglass or well impregnated wood coated with water-repellant paint) are mounted on holders installed at the perimeter with a spacing of 3 to 5 m.

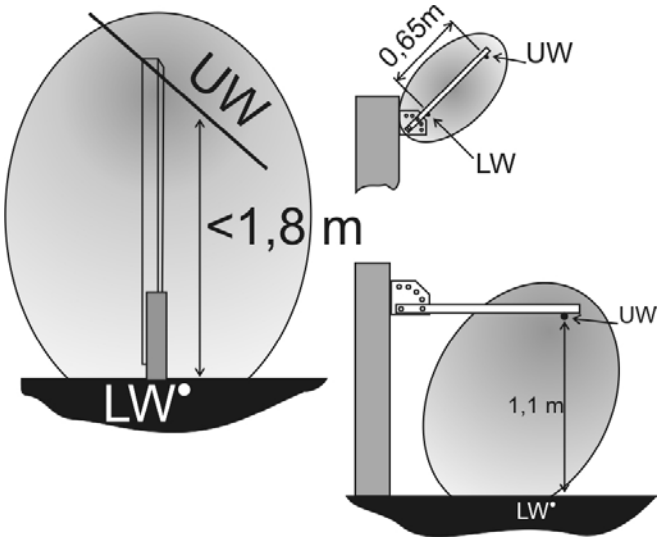


Fig. 6.9

6.3.5 If it is necessary to make a DA along a barrier or using the poles and tree-trunks existing along the perimeter, the SU will be installed using an IPK1 (with stub consoles), IPK2 (standard), and IPK3

(reinforced, with extended consoles). In such case the UW of the SU will be installed on dielectric consoles, which are attached to the barrier of the poles by means of appropriate holders.

6.3.6 The design of the holder allows choosing any inclination of a console from 0° to 90° in steps of ~22° (fig.6.10). The inclination can be easily changed depending on the task to be solved and properties of the barrier's construction.

6.3.7 The SU's wires are attached to supports and consoles using clamps, by means of screws or wood screws.

6.3.8 The LW is located between the TU and the RU and is attached either to the lower part of a console or at a chosen distance from the ground surface, or in case of near-the-ground location of the DA, is buried to a depth of 5 to 10 cm, where it will significantly ease maintenance of the perimeter (removal of snow, cutting of grass).

6.3.9 The UW is attached to the upper part of supports or consoles, in parallel to the LW.

6.3.10 The slack of the wires in the middle of span between two neighboring consoles must not exceed 50 mm.

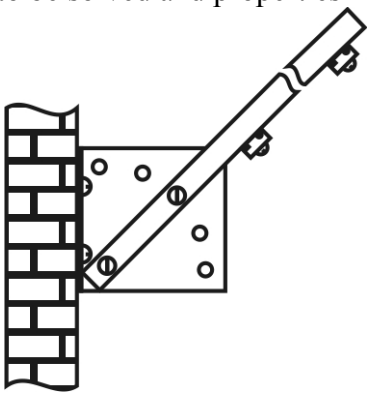


Fig. 6.10

6.4 The units design description

6.4.1 TU design

6.4.1.1 A printed circuit board based sub-unit is installed in a cylindrical steel case (fig.6.11). On the cylinder of the case a plate for attaching the unit to a console or support from an IPK (version 1), to an earthrod (variant 2), or to a special holder for attaching to a barrier or a wall of a building (version 3) is arranged. A terminal for the TU earthing is arranged on the said plate. Contacts for connection of the UW and the LW are arranged on the end surfaces of the case and protected from weather impacts by means of protective caps.

Fig. 6.11

A lead-in of the lower wire is on an end surface with a designation strip with the serial number of the TU on it.

6.4.1.2 The SU's wires are connected to the "ВП" (UW) and "НП" (LW) contacts by means of screws and washers. In order to prevent ingress of moisture into the cases the UW must be fixed by means of a pressure-seal feed-through of the protective cap. The pressure-seal feed-through ensures protection from ingress of moisture on to the "ВП" (UW) contact and the uninsulated part of the SU wire. At that a free drainage of water condensate from inside of the TU's case must be ensured through the lower wire's lead-in. Therefore it is not required to seal the LW lead-in, where some inclination towards the marked side of the case when installing should be maintained. This can be done in three ways: by inclining the end console holding the unit; 2) by installing the unit onto an earthrod; 3) by installing the unit on a barrier.

6.4.2 RU design

6.4.2.1 A panel is installed in a cast aluminum box with and opening cover. A sub-unit consisting of printed circuit boards is attached to a panel having two windows to provide access to adjustment and indication elements, contacts and terminals for connecting external circuits. On the back side of the RU's box there are plates for attaching the unit either to a barrier or a wall of a building, or to an earthrod. Contacts (fig. 6.12) "ВП" (UW) and "НП" (LW) for connecting the upper and the lower SU's wires accordingly protrude from holes in the right part of the panel. The SU's wires are fixed by means of screws and washers. Windows are provided in the panel for access to the following circuitry: clamps "ВС0", "ВС1", "DK", "Rтр", "Тр", "24В", switch "SA", indicators and potentiometers "1", "2", "3", "4" on the printed circuit board. The cover is attached to the box by means of screws, where in closed position it can be sealed by service personnel. In the base of the box there are sleeves, through which LW and the external synchronization wires are fed, a gland lead-in with a sleeve-nut for feeding a CIU or a concentrator connection cable into the switching compartment, and a terminal to connect an earthing wire attached by means of a bolt. The upper right part of the box incorporates a gland lead-in for the UW, where the wire is mechanically fixed by means of a sleeve that provides protection from dust and moisture ingress into the box.

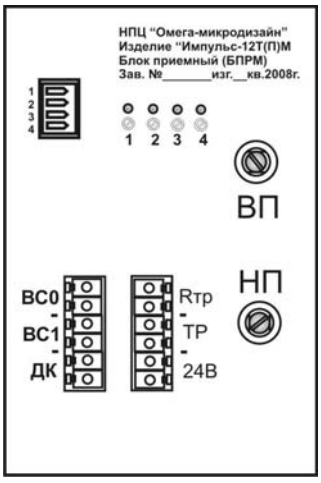


Fig. 6.12

6.4.2.2 The switch arms (SA) have the following functions:

1 - stepped (rough) adjustment of the main channel's sensitivity (fine – by regulator 1); 2 - switching off the main signal processing channel; 3 - switching off the secondary signal processing channel; 4 - switching the indication on.

7. MARKING AND SEALING

7.1 The detector's units bear the following:

a manufacturer's trademark; product code; year of manufacture.

7.2 One of the screws for fixing the panel to the detector's RU box is placed into a suitable cup being sealed by the QC representative.

8. BOXING AND PACKAGE

8.1 Transportation boxes will have the handling marks as follows:

HANDLE WITH CARE, FRAGILE, KEEP DRY, TOP, DO NOT TURN OVER.

8.2 The transportation boxes will have a QC stamp by the manufacturer.

9. SAFETY PRECAUTIONS

9.1 Setting the detector up is done by two operators.

9.2 Maintenance of the detector must be carried out by personnel with strong skills in its operation and having a permission to work with electrical devices with voltage of up to 1000V.

9.3 It is necessary to remember that negligence in use of the detector and violation of the requirements of the present manual may cause failure of the detector.

9.4 When lines longer than 500 m are connected to the RU's terminals, additional lightning protection must be installed to ensure draining of charges induced during lightning or other electrical charges. KSUM distribution boxes can be used installed at spaces of 500 m for the cable lines located underground or laid onto an earthed metal base, and 250 m for aerial lines.

9.5 It is prohibited to apply voltage higher than 38V to the RU's terminals.

10. ORDER OF INSTALLATION

10.1 Installing on a barrier

10.1.1 Before the installation it is required to decide how the DA will form the guarded perimeter. Laying on internal and external corners, height variations or switching from one side of the barrier to the other, for example, when bypassing a wall of a building, shall be made in accordance with the fig.10.1 … fig.10.4. It is necessary to provide smooth curves of the SU sections, by variation of attachment points and inclinations of consoles. It is also necessary to bear in mind that a large number of bends of the SU or proximity of the UW to conducting barriers will increase signal loss and reduce maximum permitted length of the guarded perimeter.

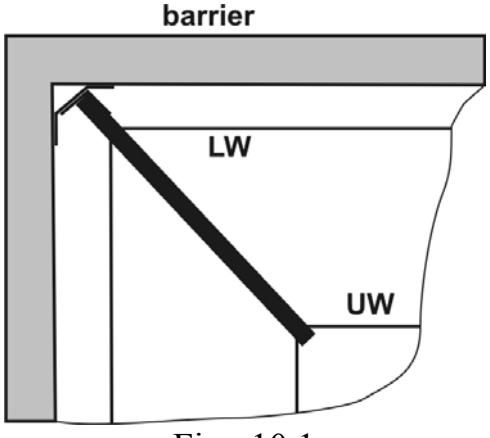


Fig. 10.1

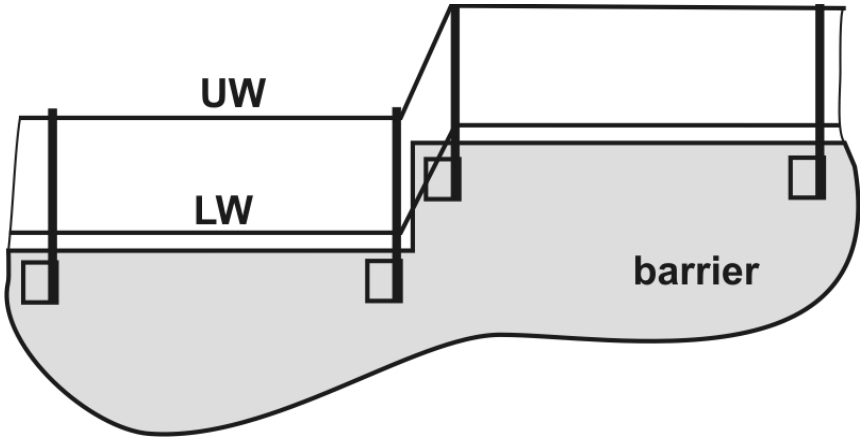
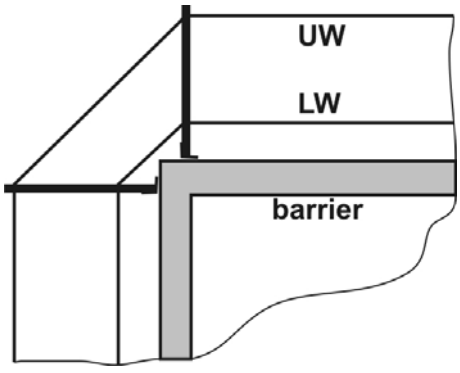


Fig. 10.2



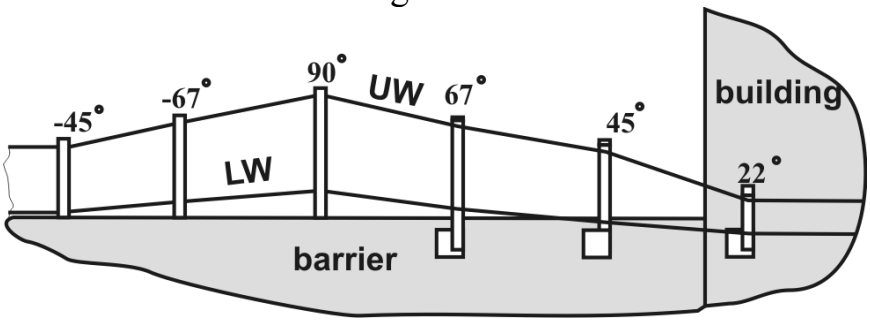


Fig. 10.4

Fig. 10.3

10.1.2 Clean the barrier and the space within and near the DA from garbage (wires, steel sheets), remove interfering grass, bushes and branches of trees, fix wires and cables slack and swinging under wind.

10.1.3 Install the holders with dielectric consoles from the installation parts kit onto the barrier at intervals of ~3…5 meters. The holders 1 should to be attached to the barrier 3 by means of screws, bolts or other hardware 2 (fig.10.5). Install the dielectric console 4 onto the holder 1. Attach the LW 6 to the lower part of the console 4 by means of a clamp and screw (wood screw) 7. Attach the UW 8 to the upper part of the console in the same manner.

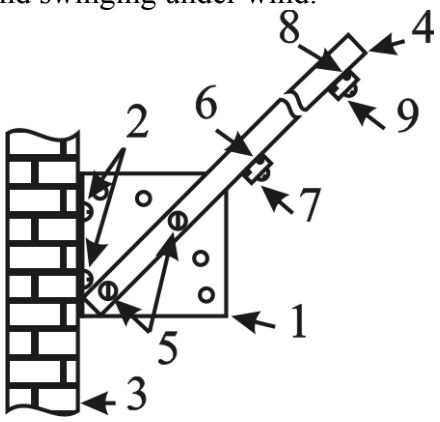


Fig. 10.5

10.1.4 Attach the TU to the end holder of the guarded sector complying with the requirements of cl.6.4.1.2; attach the RU on the barrier near the attachment point of the UW on the start holder. The TU attachment plate 1 (see fig.10.6) is to be fixed on the console (support) by means of screws 3. If the console is installed vertically, the said plate shall be fixed so as the TU is under the lower (on the ground side) surface of the console. At that the console must not obstruct attaching the ground wire to the earthing terminal. Remove the sleeve-nut 5, run the UW 6 through the holes of the sleeve-nut 5, the washer and the rubber sleeve; remove the protective cap 7 and also run the UW 6 through the inner hole thereof, under which a contact for the UW connection is located; fix the UW to the proper contact; assemble in the inverse order. The same is to be done with the sleeve-nut 8, the LW 9 and the cap 10. Attach the UW and the LW to the bottom surface of the console by means of clamps and screws 11,12.

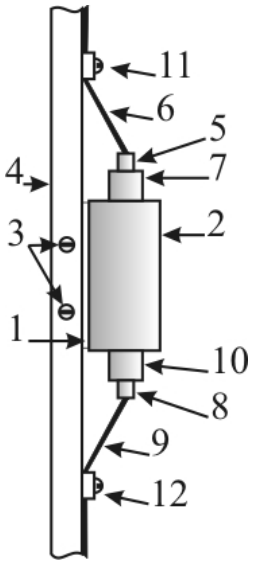


Fig. 10.6

10.1.5 If multiple detectors are installed serially the following recommendation to be taken into account. When installing adjacent TUs, maintain minimal inductive coupling between the wires and the earthrods of adjacent SUs of neighboring detectors. There are at least two ways of mounting end consoles with the adjacent detectors' TUs attached thereto on a barrier. Fig.10.7 and 10.8 show the end surfaces of the end consoles. The distance A between them must not be less than 200 to 300 mm. The SU1 and SU2 must not have parallel or crossing sectors, and must therefore have minimum inductive coupling (fig.10.9). In case of parallel installation the distances between the parallel SUs must not be less than a double distance between the upper and the power wires. All the TUs shall be connected to their own earthrods placed in the ground not closer than 500 mm to each other. An earthing conductor will be laid in downward direction along the console and further along the surface of the barrier (wall) to its own earthrod. An insulated wire of no less than 0.5 mm in diameter must be used as the earthing wire. No stringent requirements exist for closely located RUs of adjacent sectors provided they are mutually synchronized.

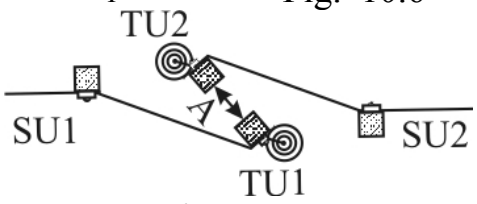


Fig. 10.7

At that the adjacent SU1 and SU2 can be installed as shown in the fig.10.7 … fig.10.9 and earthed to a common earthrod.

10.1.6 Earthrods or earth posts with a spreading resistance of no more than 30 Ohms shall be installed under the RU and the TU. For the adjacent RUs being synchronized a common earthrod can be used. For the adjacent TUs a separate earthrod must be installed un-

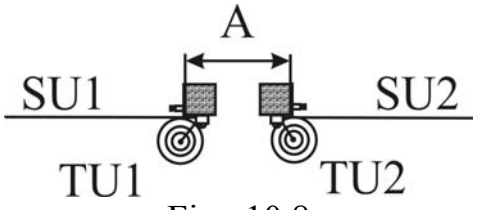


Fig. 10.8

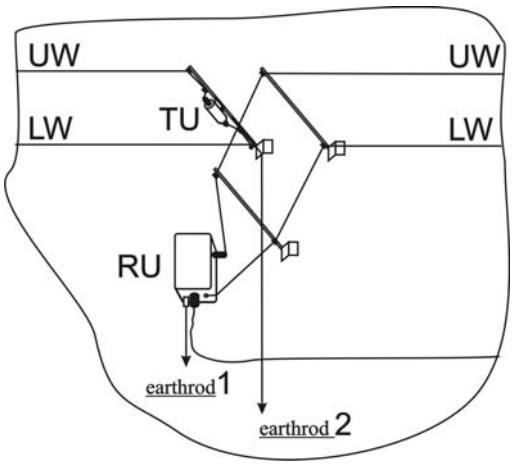


Fig. 10.9

der each of them.

10.1.7 The proper terminals of the TU and the RU must be connected to earthrods.

10.1.8 Begin attaching the UW from the middle of the sector. The UW to be attached to the upper part of the console, strained simultaneously in opposite directions and attached to the upper parts of the neighboring dielectric consoles by means of clamps and screws. Repeat straining and attaching the UW in opposite directions towards the ends of the sector.

10.1.9 The LW, depending on the chosen limitations for the DA and maintenance policy, shall be attached: either in the lower part of the console, in parallel to the UW, or buried at a shallow depth in the ground to no more than 100 mm.

Note. ***Sealing of the LW lead-in from moisture using a rubber washer shall not to be done (see cl. 6.4.1.2). If the end consoles are located horizontally, for example, when using poles to attach the UW, the TU has to be attached either to the poles or to inclined terminal consoles, or to the earthrod.***

10.1.10 Prepare and lead the UW into the TU and RU.

10.1.11 The distance between the neighboring units of adjacent sectors must exceed 200 mm, where the distance between the end consoles must exceed 300 mm.

10.1.12 When positioning the SU's wires of the adjacent TUs (not synchronizable units) of neighboring sectors provide as low as possible a capacitance coupling between them. For that purpose do not allow their parallel or close location (under any wind the wires must not approach each other closer than 100 mm) and the closest one to a perpendicular projections of their intersection.

10.2 Installation on an open ground

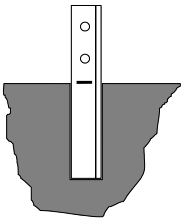


Fig. 10.10

10.2.1 Fulfill works similar to those described in cl. 10.1.1 and cl. 10.1.2. Mark the perimeter at intervals of ~4…5 meters, dig holes of 300 × 300 × 600. Install holders into the holes (stubs from IPK4) at 90° to the ground surface leaving a visible part of 0.25 m, and fill the wholes with concrete or grout (fig.10.10). After the grout sets, fix posts 1 to the holders 2 by means of screws 3 (fig.10.11).

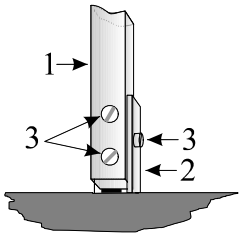


Fig. 10.11

10.2.2 Strain the UW 1 (fig.10.12) applying a force of ~10 kg and attach (as per cl.10.1.8) sequentially in the upper parts of posts 4 using clamps 2 and screws 3.

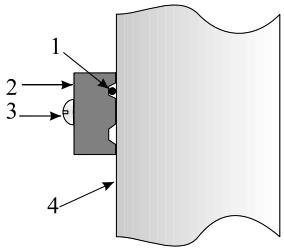


Fig. 10.12

10.2.3 Attach the LW to the lower parts of the supports with the same strain and fix with clamps and screws or bury into the ground to a depth of no more than 100 mm. Laying of the LW on the ground surface and fixing to the ground by means of clamps is allowed.

10.2.4 Install the SU using detached poles or trees by means of holders and consoles from IPK following steps in cl.10.1.

10.2.5 Install earthrods into the ground leaving a visible part of 600 mm above the ground, at a distance of no longer than 1 m from end supports of the guarded sector. Attach the RU (see fig.10.13) to the earthrod (or to the surface of a wall of barrier for wall mount version) and connect the earthing terminals on the TUs' boxes to terminals of the earthrods.

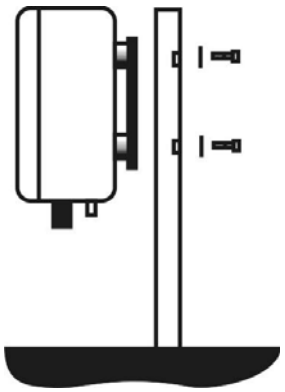


Fig. 10.13

10.2.6 When guarding lengthy perimeters, where multiple detectors are installed in series, follow the fig.10.14 (a, b), fig.10.15 (a, b) to mark the adjacent SUs (SU1, SU2) closely located to the adjacent sectors. The distance between the end posts of the adjacent SU1 and SU2 must **not be less than 500 mm**. It is necessary to maintain minimal inductive coupling between the wires and earthrods of adjacent SUs of the neighboring detectors. The earthing wire from the TU's terminal shall be laid along the post to the terminal on the support.

10.2.7 No stringent requirements exist for closely located RUs of adjacent sectors provided they are mutually synchronized. At that the can be earthed to a common earthrod.

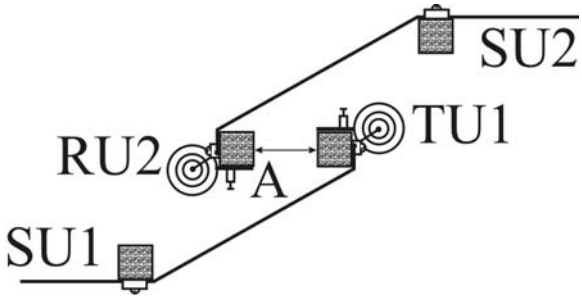


Fig. 10.14a

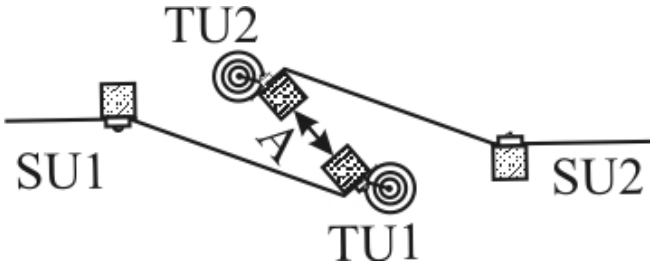


Fig. 10.14b

10.2.8 Install TU 2 on the end support in accordance with cl.10.1.4.

10.2.9 Prepare and lead the UW and LW into the TU as shown in the fig.10.16. Remove 10 mm of insulation coating at the ends of the wires, twist the lead veins and braze them. Remove the sleeve-nut 1, the washer 2, the rubber sleeve 3 (only for UW), and the cap 4. Install the removed parts over a wire in the order shown in the fig.10.16. Drive the screw 6 of the contact 7 several turns out;

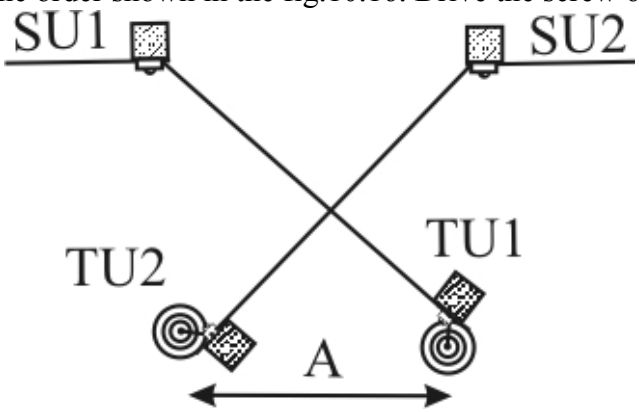


Fig. 10.115a

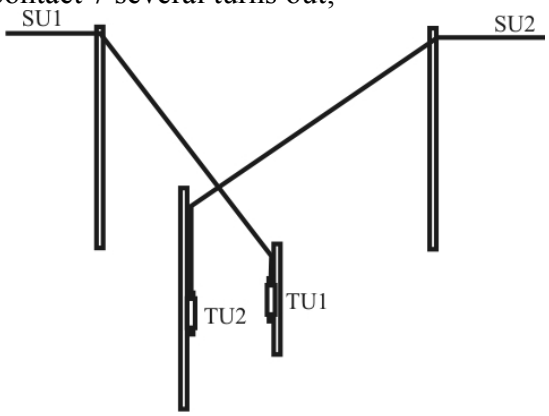


Fig. 10.115b

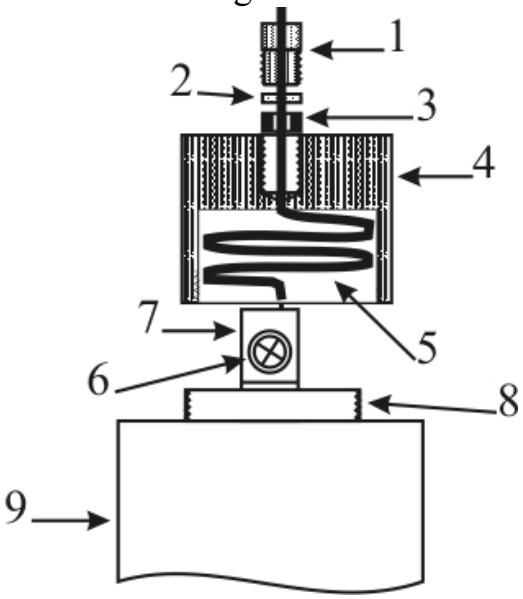


Fig. 10.16

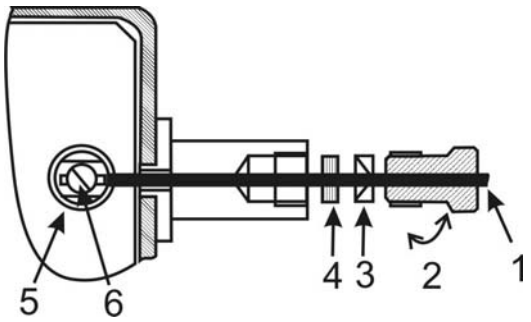


Fig. 10.17

at that the pressure washer must move away from the surface of the contact making space for leading the brazed part of the wire 5 in. Lead the brazed part of the conductor 5 under the washer of the contact 7. Holding the wire 5 in this position fix it by the screw 6; curl the excess of the wire in the protective cap (see fig.10.16) and fully turn the said cap into place. Insert the rubber sleeve 3 (only for UW) and washer 2 into the hole of the protective cap 4; lead the excess of the wire in the protective cap hole and fully turn the sleeve nut 1 into place. Prepare and lead the UW into the RU as shown in the fig.10.17. Remove 10 mm of insulation coating at the ends of the wires, twist the lead veins and braze them. Open the RU cover, drive the screw 6 of the contact UW several turns out; at that the pressure washer must move away from the surface of the contact 5 making space for leading the brazed part of the wire 1 in; remove the sleeve 2, the washer 3 and the rubber sleeve 4. Install the removed parts over a wire 1 in the order shown in fig.10.17. Lead the UW through the hole of the sleeve into the box; lead the brazed part of the wire 1 under the washer of the contact 5. Holding the wire 1 in this position fix it by the screw 6; insert the rubber sleeve 4 and washer 3 in the hole of the sleeve and fully turn the sleeve nut 2 into place.

Note. When installing the UW and the LW it is necessary to exclude draining of water over the wires into the RU and the TU, for which purpose form a loop of each wire before the lead-in.

10.2.10 Lead the cable (power supply, DK, ALARM) into the switching compartment of the RU as shown in the fig.10.18. For that purpose remove 100 mm of insulation and shielding from the cable, remove 15…20 mm of insulation of each conductor of the wire and braze them. Remove the sleeve 1, the washer 2, and the rubber sleeve 3. Install the removed parts over the wire 4, lead the cable into the switching compartment, insert the rubber sleeve 2 and washer 3 in the hole of the lead-in and fully turn the sleeve 1 nut into place.

Note. If the outer diameter of the cable is less than 13 mm, wrap the cable with a PVC tape to obtain the diameter of 13.5 mm of the part, to which the rubber washer will be installed.

10.2.11 In accordance with the marking shown in figure 10.19 connect the conductors of the cable to the contacts of the RU's terminals and carefully pack the conductors. Connect the "BC0" input of the slave RU to the relevant "BC1" output of the adjacent (master) unit.

To connect the conductors of the cable press the clamp lever, insert the exposed end of a conductor into the opened hole and release the lever.

**Notes: 1) Place a terminal resistor "Rtr" required for the warning panel and measurements at the TR (ShS) terminals into the terminals, where the Rtr value will be determined by the control resistance required to maintain the MONITORING MODE of the warning panel.*

2) When control is based on a "close-open" condition a 100 mA fuse or a jumper strap to be used instead of the resistor;

3) When external circuits are connected to the RU's terminals it is not required to observe polarity (fig.10.19).

10.2.12 Using the SU's wires measure the alternating voltage between the earthrods. The measured voltage must not exceed 0.2V. If the measure voltage exceeds 0.2V false operations of the detector are possible. Therefore measures are required to be taken to reduce the alternating or impulse voltage between the earthrods to a value of no more than 0.2V (for example, connecting them by means of a thick steel rolled wire, etc.).

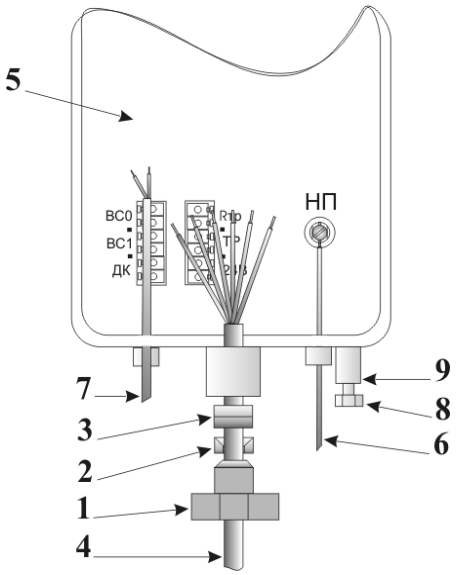


Fig. 10.18

10.2.13 Prepare the LW in the manner similar to preparation of the UW, drive the screw of the "НП" (LW) contact several turns out; at that the pressure washer must move away from the surface of the contact making space for leading the brazed part of the wire in. Lead the LW 6 (see fig.10.18) into the RU through the right sleeve in the lower part of the box; lead the brazed part of the conductor 6 under the washer of the contact "НП" (LW). Holding the wire in this position, fix it by the screw of the contact "НП" (LW).

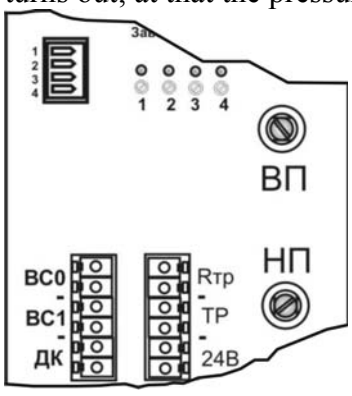


Fig. 10.19

10.2.14 Any two-wire cable of no more than 5 mm in diameter and capable of withstanding action of ambient climatic conditions and solar radiation can be used as the cable for external synchronization. Prepare the conductors of the external synchronization cable in the manner similar to that for the LW; lead the external synchronization conductor 7 (see fig.10.18) into the RU through the left sleeve in the lower part of the box; press the levers of the "BC0" ("BC1") contacts of the RU's terminals by turns, making spaces for leading the brazed parts of the conductors in releasing the levers. Having completed the entire connections close the cover of the RU.

11. SETTING UP THE DETECTOR

11.1 Setting up the detector is done by two operators, who have permissions to work with electrical devices with voltage of up to 1000V.

11.2 Setting up shall be carried out after installation of the RUs and TUs on a solid bearing surface (a wall, a fence, a console, a pole, an earthrod, etc.), attaching and connecting the SU's wires, earthing and external synchronization, laying and connecting the power supply and alarm cables.

11.3 Open the RU cover. Before applying the power supply voltage turn off the indication on the face plate (arm 4 SA in the left position). Turn on the power supply unit to verify presence of 24V (20…36 V or 11…36 V) at the "24 B" contacts of the RU's terminals by means of a multimeter.

11.4 Functional test and adjustment of the detector.

11.4.1 The operators will stand within a line of sight, one at the RU and the other at a distance of 5 m from the SU (initial position).

11.4.2 Position arms 1 and 4 (from top to bottom) of the switch SA into the right (on), and arms 2 and 3 into the left (off) positions.

11.4.3 In 1 minute after the power supply is turned on the detector will go into a MONITORING MODE, in which the indicators on the face panel of the RU are off.

11.4.4 If the MONITORING MODE does not activate, turn the power off and remove possible faults and repeat steps in cl.11.4.3

11.4.5 Test the detector in a DK mode, for which purpose by means of a button of the warning panel or in other manner temporarily, for 1 to 2 seconds, apply a voltage of 12 to 36 V to the DK's terminals. In response to the signal from the DK the detector must generate an ALARM signal, the indicator 4 on the face panel of the RU must turn on for a period of no less than 2 seconds.

Notes. Before making adjustments to the detector, determine possible distortions of the DA caused by various obstructions at the guarded perimeter. As an example, below is a procedure for adjustment of both DAs formed above the ground surface without barriers and obstructions. In case of presence of closely located conducting barriers or other obstructions all the deviations and distortions of the DAs must be taken into account to make appropriate corrections into the adjustments of the detector. Adjustment of the main and secondary channels shall be done alternatively; only the channel being adjusted is powered (fig.11.1). It is also necessary to remember that with different sized of the DAs (distance between the UW and LW) within one SU, at

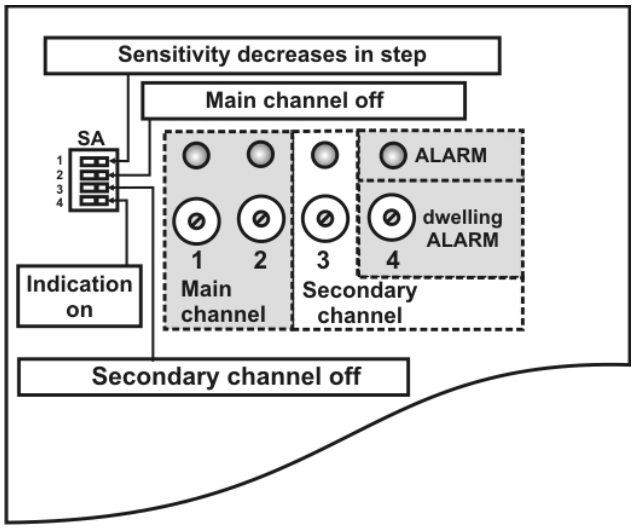


Fig. 11.1

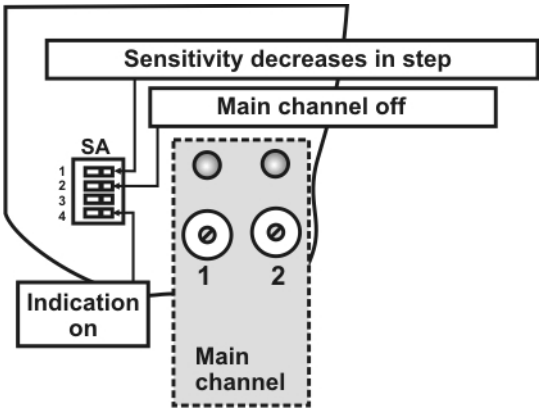


Fig. 11.2

the sectors of a DA of small cross-section ((for example, the canopy-type sectors) only one secondary channel shall be adjusted and tested (regulator 3), where at the large cross-section sectors it is the main channels. When the sensitivity increases the relevant DA widens accordingly, and vice versa, where the indicators located above the regulators visually evidence the occurrence of an expected event: 1) in range of the main DA, 2) trespasser's rate of motion is within the selected range, 3) in range of the secondary DA, 4) alarm signal generated ("TP"/"Rmp"). The main channel is to be adjusted by width of DA and a trespasser's rate of motion. When the regulators are rotated clockwise the corresponding parameters increase. Sensitivity decreases in step when the arm of the first (upper) switch (SA) is moved into the right position (fig.11.2). Switching of the second arm of the switch will stop the effect of the main channel on formation of the alarm signal. The secondary channel is adjustable only in sensitivity and only with smooth adjustment. Switching of the third arm of the switch (fig.11.3) will stop the effect of the secondary channel on formation of the alarm signal. Regulator 4 defines a time delay for the Alarm signal after the indicator 2 or 3 turns on (fig.11.4).

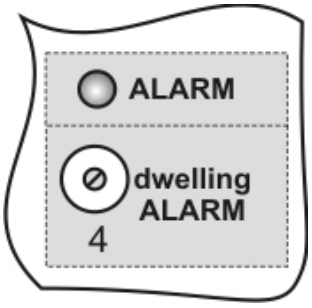
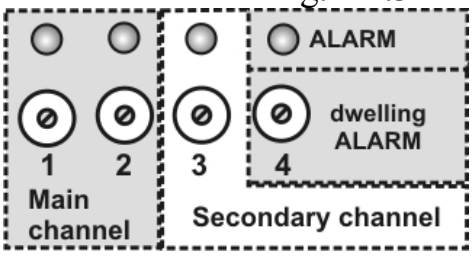


Fig. 11.3

Regulator 4 actually defines a minimal time for presence of a trespasser in the DA. When the regulator 4 is rotated clockwise the "delay" will increase and vice versa. The "delay time" is adjusted to a maximum and depends on a possible rate of motion of a trespasser (taking into account physical obstacles at the guarded perimeter).



11.4.6 Set arm 3 of the switch into the right (on) position. Fig. 11.4

11.4.7 Verify that no people or animals are present within a distance of 5 m from the SU's wires. Stand at the RU so that the operation of the indicators can be easily observed. Make a pause of 3 to 5 minutes.

11.4.8 Request the operator to start approaching the SU's wires at a rate of about 0.5 m/sec and stop when the indicators 1 and 2 go on, at that the horizontal size (width) of the DA shall be defined as the double distance from the operator to the SU' wires; increase the size of the DA if necessary by turning regulator 1 clockwise. If regulator 1 is turned clockwise to its extreme position but there is still a necessity to increase the size of the DA, set arm 1 of the switch into the left position (off) position, rotate the axis of regulator 1 anticlockwise to its extreme position and repeat the adjustments. Make pauses between the operator's approaches to the SU of 2 to 3 minutes, standing in the initial position.

11.4.9 Request the operator to cross the guarded perimeter in both directions in a "two-double" posture at a maximum rate (for the canopy-type version – between the SU's wires in any posture at a maximum possible rate),making a pause of 2 to 3 minutes between the passes. Rotate the axes of regulator 2 to 1°…2° clockwise to a position when indicators 1 and 2 turn on and therefore an alarm signal is generated (indicator 4). Make a small margin having rotated the axis of regulator 2 by 1°…2° clockwise. If necessary, correct the DA width by repeating operations in cl.11.4.8.

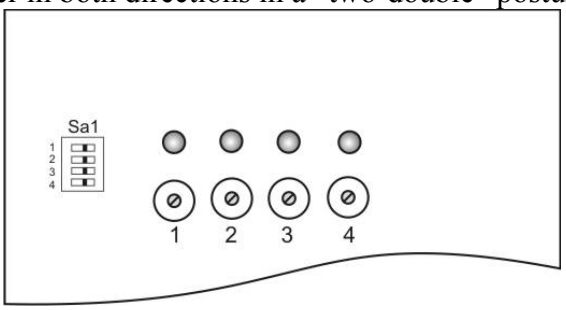


Fig. 11.5

11.4.10 The operator at the SU should move away from the wires to a distance of more than 5 m. The operator at the RU should observe indicators 1 and 2 standing still for several minutes. The indicators must not spontaneously illuminate or blink. If indicators 1 and 2 are illuminated, fix the source of noise or decrease the DA width by repeating steps in cl. 11.4.8.

11.4.11 The operator at the SU will repeat the passes over the guarded perimeter at a maximum possible rate. Rotating the axis of regulator 4 clockwise find a limit (select a position) at which an alarm signal is still generated for quick movement. Also, make a small margin having rotated the axis of regulator 4 by 2°…3° anticlockwise clockwise. Also make pauses between the operator's approaches to the SU of 2 to 3 minutes.

11.4.12 The operator at the SU will make attempts to cross the DA with intervals of 2 to 3 minutes at various locations at the guarded perimeter. After each pass the operator at the RU will monitor generation of an alarm signal by means of indicator 4 turning on.

11.4.13 Set arm 3 of the switch into the left (off) position, and arm 2 – into the right (on) position.

11.4.14 Request the operator to approach the wires in "all the way" posture at a maximum possible rate (running), rotate the axis of regulator 3 clockwise to a position when indicator 3 turns on and therefore an alarm signal is generated (indicator 4). Make a small margin having rotated the axis of regulator 3 by 1°…2° clockwise.

11.4.15 Set arms 2, 3, and 4 of the switch into their left (off) positions. Close the RU cover and test the safe operation of the detector by monitoring the signals of operation using the central control panel.

11.4.16 In case of false operations of the detector determine the generating channel by alternatively switching the channels on (arms 2 and 3). Readjust the faulty channel (the main or secondary) and test run the detector.

The detector is now operating in the MONITORING MODE

12. MAINTENANCE SCHEDULE

12.1 General provisions

12.1.1 The present maintenance schedule is the main document that defines types, content, intervals and technique of the scheduled works on the detector.

12.1.2 Maintenance will mean measures to control health of the detector and maintain it in good order.

12.1.3 Timely and complete maintenance during operation is one of the basic requirements in supporting the good working condition of the detector.

12.1.4 Maintenance of the detector provides for a scheduled completion of a package of preventive works comprising the following routines:

Routine 1 – daily maintenance;
Routine 2 – monthly maintenance;
Routine 3 – semiannual maintenance.

12.2. List of maintenance operations

12.2.1 Routine 1:
visual inspection of detector;
functional test of detector.

12.2.2 Routine 2:
visual inspection of detector;
functional test of detector;
checking of lubricant at hardware of detector units;
inspection of fastening of SU elements;
inspection of service documentation.

12.2.3 Routine 3:
visual inspection of detector;
functional test of detector;
checking lubricant at hardware of detector units;
inspection of SU elements fastening;
inspection of service documentation;
inspection of SU wires and connector cables condition.

12.3 Procedure of maintenance operations.

12.3.1 Visual inspection of detector.

12.3.1.1 During visual inspection check for:
tightness of unit box covers;
damage of paint or corrosion marks;
tears and cuts on SU wires and connector cables;
wire slacks of more than 50 mm;
icing on SU wires;
security of attachment of detector units.

12.3.2 Functional test of detector.

12.3.2.1 The operators will stand within a line of sight, one at RU and the other at SU.

12.3.2.2 The operator at SU will make attempts to cross the guarded perimeter at various locations of the perimeter. After each pass the operator will monitor generation of an alarm signal. Repeat the attempts in 2 to 3 minutes. In the alarm mode indicator 4 on the face panel of the RU is on.

12.3.3 Checking lubricant at hardware of detector units.

12.3.3.1 Check presence of lubricant at pins and nuts, by which means the detector's SU units and holders are attached. Is necessary, apply lubricant coat (type K-17, CIATIM-201, petroleum jelly).

12.3.4 Inspection of SU elements fastening .

12.3.4.1 Check fastening of holders, tighten securely if necessary.

12.3.4.2 Check attachment of wires to dielectric consoles, tighten if necessary.

12.3.5 Inspection of service documentation.

12.3.5.1 Check availability of the manual.

12.3.6 Inspection of SU wires and connector cables condition.

12.3.6.1 Turn the power supply off.

12.3.6.2 Disconnect all wires from detector units.

12.3.6.3 Wash with ethyl alcohol (GOST 18300-87) in accordance with the standing application rates.

12.3.6.4 Using a megohmmeter with working voltage of up to 500V measure a resistance between the conductors and resistance to earthrod. The resistance must not be less than 0.5 MOhm.

12.3.6.5 Connect all cables and wires to detector units according to the electrical diagram and close the units.

12.4 The following is required to carry out the scheduled work: multimeter C4313 or other device with equal or better characteristics; a megohmmeter with working voltage of up to 500V; screw drivers; spanner 7811-0457 GOST 2839-80; combination pliers; wire cutters; a ladder; a 500 gr hammer; a brazing torch; entrenching tools; rag; lubricant (type K-17, CIATIM-201, petroleum jelly GOST 15975-70); ethyl alcohol (GOST 18300-87); kerosene.

13. STORAGE AND TRANSPORTATION RULES

13.1 A detector shall be stored in a manufacturer's package in accordance with storage conditions clause 3 (a non heated storage facility) GOST 15150-69.

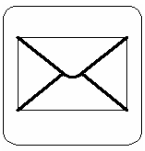
"Machines, devices and mechanical articles. Constructions for various climatic conditions. Categories, operating, storage and transportation conditions related to action of climatic environmental factors in absence of corrodent vapors".

13.2 Transportation of detectors in the manufacture's package must be conducted in a pressure compartment of an aircraft, in railway box wagons or containers without a limitation of distance, in road vehicles on unpaved roads at a speed of 40 km/hr to a distance of 1000 km.

Note. When transporting by railway low-tonnage shipment must be used.

14. TROUBLESHOOTING

Description and characteristics of fault	Possible reason	Remedy
1. None of the indicators of the RU panel is on	a) Indication if turned off b) No power supply voltage	a) Turn SA1-4 on b) Repair power cable fault
2. ALARM signal is continuously generated 2.1 Indicators 1 to 4 of the RU panel are on 2.2 Indicators 3 and 4 of the RU panel are on	 a) open or short circuit of upper or lower wire b) total length of line exceeds that indicated in cl.4.22. c) power supply voltage is less than that required by cl.3.5. SU length is less than that is mentioned in cl. 4.22.	 a) restore integrity of SU wires b) make SU length compliant to cl.4.22. c) make power supply voltage compliant to cl.3.5. Make SU length compliant to cl.4.22.
3. Frequent false operations	a) high-noise condition due to violation of sections 4 and 10. b) sensitivity of device set too high when adjusted as per cl.11.4.	a) Follow steps in sections 4 and 10. b) Adjust sensitivity as per cl.11.4.
4. Detector not always generates an ALARM signal when perimeter is crossed	a) instructions not observed for installation of SU and formation of DA as required by section 4 and cl. 6.2. b) sensitivity of device set too low when adjusted as per cl.11.4.	a) Match the required dimensions and shape of DA as required by section 4 and cl. 6.2. b) Adjust sensitivity as per cl.11.4.



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