1PN93-2 AK47

Night Vision Sight

SERVICE MANUAL

AL 3.812.222 RE

CONTENTS

This manual describes the design, operation, performance features, service instructions and guides to troubleshooting for 1PN93-2 AK-47 Night Vision Sights.

Besides the present manual, the following documents are needed for using the 1PN93-2 AK-47 Night Vision Sight:

"AK-47 Assault Rifle. Service Manual"
"Charge unit. Service Manual AL4.799.001RE".
"Group Maintenance Kit. Service Manual ZIP AL3.812.222 RE1".

List of abbreviations

IZP - Individual Zeroing Point
MPI – Mean Point of Impact
BZO - Battlesight Zero

1 DESCRIPTION OF DESIGN AND OPERATION

1.1 Purpose

1.1.1 The 1PN93-2 AK-47 Night Vision Sight (hereinafter referred to as the Sight) is designed for battlefield observation and aimed shooting with AK-47 assault rifle under natural night illumination conditions.

1.1.2 The Sight operates in ambient temperature range from –50°C to +50°C and relative humidity up to 100% at temperature 25°C.

1.2 Performance features

1.2.1 The table 1 specifies the performance features

Table 1

Name	Value	Note
Magnification, x	4	
Field of view, deg	6	
Eye relief, mm	50	
Elevation adjustment range	± 0-08	
Windage adjustment range	± 0-08	
Battery voltage, V	1,5	
Maximum consumption current, mA	100	
Continuous operation time, h		
for t = + 50 °C	10	
t = - 40 °C	3	
t = - 50°C	0,5	
Weight, kg		
On the rifle	1,3	
Carrying set	1,6	
Transport set	7,0	
Overall dimensions of the Sight, mm		
Length	220	
Width	90	
Height	193	
Overall dimensions of the Case, mm		
Length	336	
Width	295	
Height	189	

1.2.2 The Sight provides target recognition and aiming the AK-47 assault rifle under natural starlight illumination conditions at clear weather, grass esplanade background, grass height up to 0.3 m.

The recognition range (400 m) for man-sized target depends on ambient illumination level, atmosphere transparency and object/background contrast. High ambient illumination, artificial illumination, moonlit night, clear atmosphere, light background (sand or snow) increase the recognition range. Low ambient illumination, clouds, foggy atmosphere and dark background (tillage, forest etc.) decrease the recognition range.

1.2.3 The Sight can use the following types of battery:

- NLTs-0.9-1 storage battery;
- R6(AA) size battery.

1.2.4 The Sight is zeroed by means of the UV Dry Zeroing Collimator provided with illuminated boresighting reticule.

The UV Dry Zeroing Collimator specifications:

- repeatability 0-00.25
- reticule graduation 0-01
- basis zeroing angle
  - vertical -0-02
  - horizontal 0
- reticule illumination T(3)-08 light cell

1.3 Nomenclature list

1.3.1 The nomenclature corresponds to the table 2
Table 2

Code	Item	Qty	Note
AL3.812.222	The 1PN93-2 AK-47 Night Vision Sight	1	Battery removed
	Spare parts		
	NLTs-0.9-1 storage battery*	3	Discharged
	Removable parts		
AL6.548.035	Eyeshield	1	
	Tools		
AL8.896.013	Key spanner	1	
	Accessories		
AL5.100.062	UK-316 Battery Tester	1	
AL5.940.676	Light filter	1	Attached to the Sight
AL6.832.174-01	Soft cover	1	
AL8.890.001-01	Napkin	3	
	Carrying means		
AL4.165.033	Canvas Bag	1	
AL6.875.137	Case	1	
	Documentation		
	Documentation according to AL3.812.222 VE	1	

*A R6(AA) battery can be used

1.4 Design and operation

1.4.1 The Sight is an electro-optical instrument that intensifies light from low-light night scene up to the human visual perception level.

1.4.2 Electro-optical function diagram is presented in the figure A.2 (All pictures are listed in the appendix A).

The objective lens 2 (fig. A.2) forms a low-light image in the focal plane arranged in photocathode of image intensifier A1. The intensified image from the screen of image intensifier and aiming marks of reticule 4 are viewed through the eyepiece 3.

The light emitting diode VD1 illuminates the reticule 4 through the side surface. The aiming marks of reticule shines with red against the yellow-green background of image intensifier screen. Brightness of the reticule is adjusted

with resistor R1.

The microassembly A2 converts and multiplies voltage of the power source G1 (G2).

The Sight is powered by NLTs-0.9-1 storage battery or R6 (AA) sized battery.

The "On/Off" tumbler SA1 (Fig. A.2) activates the Sight.

The light filter 1 protects the image intensifier against light overloads above 1.5 lx and allows zeroing the Sight in daylight and twilight conditions.

1.4.3 The Sight consists of two main units: they are the body 4 (fig. A.6) and the objective lens 2 attached by means of threaded joint and secured with the nut 3.

All components of the Sight with the exception of objective lens 2 are placed in the body 4.

1.4.4 Controls:

- "On/Off" Tumbler 7;
- "$\angle$" reticule brightness adjustment handwheel 17;
- "U←→D" elevation screw 1 (Fig. A.6);
- "R←→L" windage screw 4.

The Sight operates if the "On/Off" Tumbler 7 is set into upper position (fig. A.5).

1.4.5 The cap 8 (fig. A.5) covers the battery compartment. The cap 2 (fig. A.6) with rubber gasket 3 covers the nipple intended for purging the interior space. The cord 9 secures the cap 8 to the Sight.

1.4.6 Rifle mount unit consists of the bracket 16 (fig. A.5), lock screw 12, latch 13, lock lever 14, handle 15 and washer 11.

1.4.7 The collar 5 fastens the eyeshield 6 to the eyepiece. The eyeshield guides an eye to exit pupil position of eyepiece and protects it against accidental injures.

1.4.8 Click of the Elevation and Windage Screws corresponds to angular value of 0-00.3.

1.4.9 Proper polarity of battery is engraved on the cover 10.

1.4.10 The figure A.4 presents the aiming reticule for AK-47 assault rifle. Aiming marks are sized in mils.

The upper pike is the aiming point for range of 300 m,
the second pike for 500 m,
the third pike for 700 m,
the forth pike for 900 m.
Height of the upper pike is equal to running target (1.5 m) at the range 900 m.

The horizontal rows consist of windage correction divisions. Heights of the upper divisions correspond to silhouette target of 1.5 m height at the ranges from 300 to 900 m. Appropriate ranges are designated in hectometers.

1.4.11 The flap eyeshield 4 (fig. A.1) prevents an illumination of face with shining eyepiece when an eye does not press it, for reason of covert operation in night conditions.

1.4.12 The Sight is provided with a canvas bag 9 (fig. A.3) for carrying.

1.5 Tools and accessories

1.5.1 Key spanner 6 (Fig. A.1) is intended for adjustment of elevation and windage screws 1 and 4 (Fig. A.6) and dismounting the protective glass of UV-1 Dry zeroing collimator (Fig. A.12). The key spanner is located in the pocket 2 of the case 1 (Fig.A.3).

1.5.2 The napkin 8 (Fig. A.1) is for cleaning the outer optical surfaces and battery contacts. It is located in the pocket 2 of the case 1 (Fig. A.3).

1.5.3 The NLTs-0.9-1 storage battery is to be recharged by means of power supply 1 (Fig. A.11), charging unit 2 and cable 3 from Group Maintenance Kit and Repair Kit.

1.5.4 The UV Dry Zeroing Collimator (Fig. A.12) is designed for:

- quick initial zeroing the Sight to the rifle;
- determination of individual zeroing point for the Sight and rifle;
- dry zeroing the Sight to individual zeroing point.

The shank 3 aligns the collimator unit trough holder 2 along the rifle bore axis.

The UV Dry Zeroing Collimator is equipped with the light source 5 and fabric hose 6 for various ambient illumination conditions.

Note: The UV Dry Zeroing Collimator is the part of Group Maintenance Kit and Repair Kit.

1.5.5 The UK-316 Battery Tester 11 (Fig. A1) is designed to check the NLTs-0.9-1 storage battery voltage. One of the four light emitting diodes indicates corresponding voltage of tested battery. Polarity of battery is marked on the Tester.

1.5.6 The Soft Cover 12 protects the Sight when it is landed or carried mounted on rifle.

1.5.7 External Battery Compartment 13 is designed for prolonging the continuous operation time in cold conditions when ambient temperature is below $+2^{o}$C. It consists of battery container 2 (Fig. A10), cap 1, contact 6, nut 5 and cable 4. For using it, remove the battery from the regular battery compartment, insert it into container 2 and close the cap 1. Connect the contact 6 to the Sight instead battery and secure with nut 5. Place the container with battery into inside pocket of winter uniform.

1.6 Designations and seals

1.6.1 On the cover 10 (Fig. A.5) of the Sight there are the following designations:

- the 1PN93-2 AK-47 code designation of the Sight;
- logo of the manufacturer;
- serial number.

1.6.2 On the cover of the Case 1 (Fig. A.3) there are the 1PN93-2 AK-47 code designation and serial number of the Sight.

1.6.3 The Case containing the Sight, Single Maintenance Kit and service documents is secured with seals.

1.7 Package

1.7.1 The Sight with Single Maintenance Kit and service documents is carried and stored in the Case 1 (Fig. A.3).

2 OPERATION

2.1 Operating limitations

2.1.1 In the order to prevent a damage of the Sight:

- do not activate the Sight without light filter 1 attached (Fig. A.5) in daytime illumination conditions. **Daylight damages the Sight!**
- do not aim the Sight at bright light sources (fires, headlights etc.) even with light filter attached.

2.1.2 In the case a bright source has appear in the field of view, switch off the sight (lower position of tumbler "On/Off" 7).

2.1.3 After operation, the Sight should be switched off.

2.1.4 Avoid a short circuit between contacts of battery through metal objects.

2.1.5 Carrying of storage battery separate from the idle Sight (e.g. in a pocket) allows to avoid a casual short circuit and extends the battery life at ambient temperature below zero. Instead regular NLTs-0.9-1 storage battery, other AA battery is allowed at voltage from 1.15 to 1.5 V.

2.1.6 The UV Dry Zeroing Collimator is a precision instrument requiring careful handling under the following rules:

- store and carry the UV Collimator with dismounted shank only;
- do not apply bending force to shank when mounting to or dismounting from a rifle;
- do not mount the device to dirty barrel or barrel with damaged muzzle;
- a disassemble or adjustment of the UV Collimator is allowed in authorized workshop only.

2.2 Preoperation instructions

2.2.1 Learn the design and fastening of the Sight on the rifle and in the Case.

2.2.2 Survey the operation terrain under daytime illumination in advance before night operation.

2.2.3 The Sight delivered from storage facility must be depreservated before using. Remove lubricant from mounting surfaces of the Sight and UV Dry Zeroing Collimator by means of rags. Clean outer optical surfaces with napkin 8 (Fig. A.1).

2.2.4 In the case of a black-out battle task, set the flap eyeshield 4 on the Sight as follows:

- loosen the collar 5 (Fig. A.5);
- remove the eyeshield 6 with the collar 5;
- remove the collar 5 from the eyeshield 6;

- put the opened collar 5 (Fig. A.5) on the flap eyeshield 4 taken from the Single Maintenance Kit (Fig. A.3);
- pull the eyeshield 4 (Fig. A.3) on the eyepiece mounting;
- tighten the collar 5 (Fig. A.5).

2.2.5 In the case there is no a charged storage battery NLTs-0.9-1, use an R6 (AA) battery as follows:
- switch of the Sight;
- remove the cap 8;
- remove the storage battery from battery compartment;
- insert the fresh battery R6 (AA) into battery compartment ensuring the polarity designated on the cover 10 (Fig. A.5);
- close the cap 8;
- switch on the Sight, check its operation and switch off.

2.2.6 In the case of using a gas-mask, loosen the collar 5 and remove the eyeshield 4 (Fig. A.1) or 6 (Fig. A.5).

ATTENTION! The image of aiming reticule indicates the storage battery charge state. If the image intensifier operates but the reticule is dim or invisible the battery is discharged.

2.3 Mount

2.3.1 The Sight uses a side rail mount of dovetail type. Attach the Sight to the rifle in the following order. Align the mount slot of the Sight with the dovetail mount rail of rifle, push the Sight forward up to the stop and secure it by turning the handle 15 (Fig. A.5) forward up to latching it in the holder 16. The Sight must be fastened secure.

In the case an adjustment of mount is needed, shift the latch 13 with the spanner key 6 (Fig. A.1) from under the head of screw 12 (fig. A.5) and remove it, then reset the handle 15 by a number of teeth providing secure fastening with no playing and attach the latch 13 again.

2.3.2 The UV Dry Zeroing Collimator is attached to the rifle in the following order:
- insert the shank 3 (Fig. A.12) into the hole of the holder designated as "N1" (Fig. A.13). The key flat of shank 3 (Fig. A.12) prevents it against a turning.
- tighten the screw 4 up to the light touch, to lock the shank 3 in the holder.
- insert free end of the shank 3 into the rifle barrel up to the rubber ring.

2.3.3 For zeroing in dark conditions, remove the protective glass 1 (Fig. A.12) by means of key spanner 6 (Fig. A.1) and screw in the light cell 5 (Fig. A.12) up to the stop.

2.3.4 For zeroing in high illumination conditions, use the fabric hose 6. Wide end is intended for objective lens 2 (Fig. A.5) of the Sight while narrow end is for collimator. The ends of hose are fastened with laces.

2.4 Preparation for shooting

2.4.1 In day or twilight time, prepare the Sight for shooting in the following order:

- select a fire position;
- put the rifle on the ground right side down in such a way as to avoid an entering a sand, snow etc. in the bore;
- put the Case of Sight at left from the rifle as the cover of the Case would be opened to the left;
- take the Sight and attach to the rifle according to the p. 2.3 "Mount" of the present manual;
- ensure the light filter 1 is attached to the Sight (Fig. A.5);
- switch on the tumbler "On/Off" 7 (into upper position). Within 4 seconds, the screen of image intensifier will shine with yellow-green and the reticule with red;
- adjust reticule brightness by means of handwheel "$\angle$" 17.

2.4.2 Under night illumination condition, the preparation procedure is the same with the exception the light filter is to be removed.

2.4.3 Mounting the UV Dry Zeroing Collimator and zeroing should be carried out by two riflemen (out of convenience reasons) in the following order:

- take the UV Collimator from Group Maintenance Kit;
- remove the Muzzle Brake from the rifle bore;
- attach the shank to the holder of the UV Collimator according to p. 2.3.2;
- insert the shank into the rifle bore up to the rubber ring;
- turn the UV Collimator around bore axis by 360^{o};
- in the case of need, illuminate the zeroing reticule of UV Collimator with a light source at horizontal position of the rifle;
- turn the UV Collimator around bore axis to align the vertical lines of zeroing reticule in parallel to vertical axis of the aiming reticule while looking trough the Sight mounted to the rifle. In the case of difficulty for one rifleman, the operation can be carried out by two riflemen;
- take a usual position for zeroing, e.g. prone with usual stock-weld and force. Do not rest the barrel against foreign objects. Prevent the UV Collimator against touching foreign objects. Determine the position of upper aiming mark relative to the zeroing reticule of UV Collimator and check out if the position is stable at repeating setting of UV Collimator. In the case the repeatability is worse than 0-00.25 (ref. to Note 1), eliminate the problem according to the p. 4.2 of the present manual;
- check out the fastening of Sight by means of UV Collimator reticule when tilt, swing and tight stock-weld the rifle. Displacement of the aiming mark must be within 0-00.25, otherwise eliminate the problem according to the p. 4.2 "Troubleshooting" of the present manual.

Notes:

1 Angular thickness of wide zeroing dashes is 0-00.3, that can be used for estimation of displacement at repeated settings of UV Collimator or mount slackness.

2 Zeroing procedure is applied to the rifle lying horizontal.

2.5 Zeroing procedure

2.5.1 Zeroing period for the Sight is the same as prescribed for iron sight by the shooting manual for the AK-47 rifle.

2.5.2 For zeroing with iron sight under daylight or natural night illumination conditions:

- attach the Sight to the rifle according to the p.2.3 "Mount" of the present manual;
- fasten the rifle in a stable aiming rest;
- set the elevation bar of iron sight to range 400 m;
- aim the rifle with the iron sight to an aiming point at the range 100 m. The rifle is aimed under bull's eye;
- ensure the light filter 1 (Fig. A.5) is attached to the Sight;
- switch on the Sight (upper position of tumbler "On/Off");
- adjust brightness of aiming reticule by means of handwheel 17;
- check the alignment of the upper aiming pike with the aiming point of iron sight.

2.5.3 If the aiming points do not coincide, align them in the following order:

- adjust the elevation screw "U<->D" 1 (Fig. A.6) and windage screw "L<->R" 4 by means of the key spanner 6 (Fig. A.1) to align the aiming point of Sight with the aiming point of iron sight;
- detach the rifle from the aiming rest;
- fire four single shots at thorough and uniform aiming with the Sight;
- determine the grouping and the Mean Point of Impact (MPI) according to the shooting manual. The grouping should be not worse then one for iron sight. If grouping is acceptable, determine the MPI position relative to the Reference Point. The Reference Point for AK-47 rifle is above aiming point by 22 cm. The displacement of the MPI from the Reference Point must be within 5 cm. If the displacement exceeds the 5 cm, adjust the elevation and windage screws with key spanner 6 (Fig. A.1). Turn the elevation screw to "U" mark if the MPI is below Reference Point or to "D" mark otherwise. Turn the windage screw to "R" mark if the MPI is at the left of Reference Point or to "L" otherwise. One click of the screw corresponds to 3 cm displacement of MPI at range of 100 m;
- test the settings with repeated shooting;
- switch off the Sight.

2.6 Zeroing with UV Collimator

2.6.1 Dry zeroing the sight with UV Collimator

2.6.1.1 Attach the UV Collimator and the Sight to the rifle according to p. 2.4.3.

2.6.1.2 Align the upper pike of aiming reticule with the center of zeroing reticule (x=0; y=0) by means of elevation and windage screws. The position corresponds to mean aiming angle for AK-47 rifle at range 100 m.

2.6.2 Determination of Individual Zeroing Point (IZP)

2.6.2.1 Attach the UV Collimator and the Sight to the rifle according to p. 2.4.3;

2.6.2.2 Zero the aiming reticule as prescribed by p. 2.6.1.2.

2.6.2.3 Remove the UV Collimator from the rifle and attach the muzzle brake.

2.6.2.4 Fire four single shots at thorough and uniform aiming through the Sight under bull's eye at target ranged by 100 m.

2.6.2.5 Determine grouping, Mean Point of Impact (MPI) and displacement (x,y pair reading with appropriate signs) of MPI from Reference Point according to the shooting manual to rifle and p. 2.5 of the present manual.

2.6.2.6 If the displacement exceeds the limit prescribed by shooting manual, attach again the UV Collimator to the rifle according to the p. 2.4.3 of the present manual and shift the upper aiming pike to the point having coordinates (x,y) in zeroing reticule of UV Collimator by means of elevation and windage screws. The division 0-01 of zeroing reticule corresponds to 10 cm displacement at range 100 m.

2.6.2.7 Detach the UV Collimator from the rifle and repeat the pp. 2.6.2.4 and 2.6.2.5 again.

2.6.2.8 If the displacement of MPI from Reference Point is acceptable, the point having the (x,y) coordinates where the aiming pike was positioned to, is taken as the Individual Zeroing Point for this Sight (IZP).

2.6.2.9 Record the coordinates of IZP, serial numbers of UV Dry Zeroing Collimator and rifle in the Logbook of the Sight.

2.6.3 Dry zeroing the Sight to Individual Zeroing Point

2.6.3.1 The dry zeroing of the Sight is need in the case of misalignment of aiming axis from rifle's bore axis due to an impact, accidental disadjustment etc.

2.6.3.2 Attach the UV Collimator and the Sight to the rifle according to p. 2.4.3.

2.6.3.3 Check the alignment of the upper aiming pike with the IZP.

2.6.3.4 In the case of a misalignment, align the upper aiming pike with IZP recorded in the Logbook.

2.6.3.5 Detach the UV Collimator from the rifle. The Sight is zeroed.

Note: The IZP position can change during long or extensive service. So in the case of significant misalignment, determine new position of IZP with test fire according to the p. 2.6.2.

2.7 Range estimation with the Sight

2.7.1 Range to a target can be estimated through angular size of target or landscape detail of known height.

The figure A.15 guides on estimation the range to a target of known height by means of reticule aiming marks.

Range to a target near a landscape detail of known height is estimated in the following order:

- match the landscape detail of known height with a mark of aiming reticule (angular sizes of aiming marks are presented in the figure A.4 in mil units);
- calculate the range with the formula:

$$R = \frac{B \cdot 1000}{y}$$

where R = range to the target, m;
B = height of the target (or reference object), m;
y = angular size of the target (or reference object), mil.

2.8 Operation with the Sight

2.8.1 General

2.8.1.1 Result of surveillance and shooting with the Sight depends on experience, since color, appearance and contrast of image differ from usual for a naked eye under daylight. When surveillance and searching a target, minimal brightness of aiming reticule is recommended.

2.8.1.2 In the order to prevent a light overload of Sight, first practice studies with the Sight (3-5 lessons) should be carried out at illumination below $5x10^{-3}$ lx only.

2.8.2 Operation

2.8.2.1 Switch on the Sight.

2.8.2.2 Point the aiming pike at a target. For range within BZO range (300 m), aim the upper pike under bull's eye or at center if the target is high (e.g. running). Aiming point is located below point of impact:

- by 22 cm for range 100 m;
- 30 cm for 200 m;
- 0 cm for 300 m.

Beyond BZO range (300 m), select the reticule aiming mark according to the range and aim it at the center of target.

2.8.2.3 For incoming or receding target, select the aiming mark corresponding to range predicted on fire opening moment. If the range is within BZO range 300 m, use the upper aiming pike.

Transverse moving target is engaged either by tracking or ambush methods. Lead for tracking method, transverse moving target at speed of 3 m/s and range 300 m is 0-05. For range above 300 m the lead is 0-07. For aiming point shifting, use the aiming marks.

For ambush method, use the vertical line aiming marks as a predetermined engagement point (instead of landscape detail as for daylight shooting). In the case of fast-moving target, the lead is proportional to the target speed. To repeat shoot with the ambush method, shift the aiming point ahead of the target and repeat shot (burst) at the moment the target approaches.

The figure A.14 guides on engaging examples.

2.8.3 Preparation to carrying

2.8.3.1 Prepare the Sight to carrying in the following order:

- switch off the Sight (tumbler "On/Off" 7 (Fig. A.5) in bottom position);
- attach the light filter 1 to the Sight if removed;
- open the cap 8, remove the battery 9 (Fig. A.1) and place it into the bag 9 (Fig. A.3);
- close the cap 8 (Fig. A.5);
- remove the Sight from the rifle and pack it into the bag 9 (Fig. A.3).

The napkin 8 (Fig.A.1) and key spanner 6 should be packed into the bag 9 also.

3 MAINTENANCE

3.1 General

3.1.1 Keep the Sight clean, prevent it against dust or dirty. Outer optical surfaces must be clean always.

For cleaning the outer optical surfaces and electric contacts, use white flannel of grade N1 GOST 29298-92, cotton wool for optical industry, refined ethyl alcohol of high grade GOST 18300-87, medical ethylic ether EM or mixture of them (10% alcohol with 90% ether).

To clean a glass surface against grease stain, wipe it with clean flannel or cotton wool. In the case of severe dirtying, clean the surfaces by means of a solvent (alcohol, ether or mixture of them) in the following order:

- prepare a cotton wool swabs with wood stick;
- wet the swab with the prescribed solvent and shake up it to remove an excess;
- wipe the glass with wetted swab more than once avoiding to touch the mounting;
- wipe the glass with dry swab by circular motion from center to periphery.

Avoid a wetting of mounting with solvent because it can solve the sealing compound and break tightness of the Sight.

Clean the contact A (Fig. A.7) and contacts of storage battery against corrosive stains in the same way.

3.1.2 In order to ensure operational readiness, increase reliability, prolong overhaul life, the Sight is a subject of periodical maintenance.

The maintenance system includes the following procedures:

- inspection;
- daily maintenance;
- maintenance procedure TO-1;
- maintenance procedure TO-2;
- season maintenance;
- storage maintenance TO-1a;
- long storage maintenance TO-2a.

3.2 Safety

3.2.1 Ensure reliable fastening of the Sight and UV Collimator to the rifle to avoid an injury in service.

3.2.2 Avoid an excessive pressure to eyeshield when viewing to avoid an injury of eye. The eyeshield should be pressed only until clear boundary of field of view appears.

3.2.3 The UV Dry Zeroing Collimator comprises an ampoule containing a light emitting tritium agent T(3)-08 coming into first group of self-luminous sources according radiation hazard material classification. Ampoule glass ensures enough protection against radiation.

Broken ampoule is not dangerous in immediate proximity to a man outdoor as well as indoor if a splinter does not enter in a wound. In the last case, the injured man should wash the wound, resort to medical care and inform a local sanitary authority. Aerate the room for 0.5 hour, clear it against splinters and wash.

3.3 Maintenance

3.3.1 Maintenance system

Table 3

Type of maintenance	Terms of maintenance		
	Service	Short-term storage	Long-term storage
Inspection	Before using		
Daily maintenance	1 After each using 2 Once per two week if unused		
TO-1	1 After acceptance by military unit 2 Yearly	At placing in storage	
TO-2	1 After 1000 hours of operation 2 After replacement of unit AL5.305.125 with spare from Group Maintenance Kit		At placing in storage
Season Maintenance	Twice per year at winter/ summer season changing and vice versa		
TO-1h		After 6 month	Yearly

Material consumption rates are presented in the annex B.

3.3.2 Inspection

3.3.2.1 The Inspection ensures the Sight is ready for using. It includes a visual inspection of outer surfaces and operation test according to the table 7. The Inspection is a duty of the infantry unit personnel the Sight is assigned to.

3.3.3 Daily maintenance

3.3.3.1 The Daily Maintenance ensures regular readiness of the Sight and UV Collimator. The Daily Maintenance is carried out by infantry unit personnel in the hours and days prescribed by daily routine and after each shooting.

3.3.3.2 The Daily Maintenance includes condition inspections and operation tests according to the table 7.

In the case of need, it involves also the works prescribed in the table 4.

Table 4

Work	Requirements	Tools and materials
Clean the Sight, Charging Unit, Battery Tester, UV Collimator and Case against dust, dirty and moisture	The Sight, charging unit, UV Collimator, Battery Tester and Case must be clean	Rags
Lubricate uncoated metal mount surfaces of the Sight and UV Collimator including the shank with layer of lubricant	Uncoated outer metal surfaces must be free of corrosion	GOI-54p GOST 3276-89 viscous lubricant
Clean the contacts of Sight, buttery, Battery Tester and Charging Unit according to p. 3.1.1	Contacts must be clean	Tools and materials accord with p. 3.1.1
Clean outer surfaces of optics according to p. 3.1.1	Outer optical surfaces must be clean.	Tools and materials accord with p. 3.1.1

3.3.4 TO-1 Maintenance

3.3.4.1 The TO-1 Maintenance ensures the readiness of the Sight and UV Collimator in service. The TO-1 Maintenance is to be carried out by infantry unit personnel. In the case of need a specialist of technical servicing facility can participate.

3.3.4.2 The TO-1 Maintenance involves all procedures of Daily Maintenance and the following additional works:

1) field test of recognition range;

2) repair and painting the Case 1 (Fig. A.3) with ML-165PM GOST 12034-77 camouflage enamel.

Test the recognition range for real target (silhouette figure of 1.5 m height with helmet and field overcoat) under natural night illumination $3…5x10^{-3}$ lx without fog, rain and snowfall. The recognition ranges for various background are specified by the table 5.

Table 5

Background	Minimal recognition range, m
Snow field	400
Yellow grass (sand)	400
Coniferous forest	80

Distance from the target to coniferous forest must be 25 m at least. Start the measuring of recognition range from illumination $1...5*10^{-2}$ lx and continue the measuring up to $3…5*10^{-3}$ lx. Check the illumination each 5 minutes.

Measure the terrain illumination by means of Landolt ring of sizes prescribed in figure A.8. The Langolt ring must be black colored against of white shield.

Two riflemen are applied for measuring: an observer and an assistant. The observer stands still. The assistant removes the shield with Landolt ring from observer to the target by 15-20 m and direct its face to the observer. Then the assistant rotates the shield around the ring axis and stops it.

The observer must define position of gap in the ring. If he defines right, the assistant moves from the observer, otherwise assistant moves to observer. The observer repeats the definition of gap position.

Measure the maximal range where the observer defines gap position right. With figure A.9, determine the illumination according to the measured range.

The performance criterion for the Sight is determination of silhouette target details (contours of head, body and direction of raised hands) within 3 seconds at moment when illumination reaches $3..5*10^{-3}$ lx.

In the case of trouble that can not be eliminated by means of Single or Group Maintenance Kit, send the Sight to repair facility.

3.3.4.3 For short-term storage of the Sight and UV Collimator, the following works must be done also:

- cover the uncoated surfaces of the Sight's mount rail and the mount seat of UV Collimator with thin layer of GOI-54p viscous lubricant;
- wrap the lubricated key spanner 6 (Fig. A.1) and shank into the P-45 GOST 1760-86 parchment;
- remove the storage battery.

3.3.5 TO-2 Maintenance

3.3.5.1 The TO-2 Maintenance restores readiness of the Sight after expiration of specified operating time or after replacement of worn-out parts.

The TO-2 Maintenance is carried out by technical servicing staff on the basis of Singe and Group Maintenance Kits and general-purpose tools.

3.3.5.2 The TO-2 Maintenance consists of works prescribed for the TO-1 Maintenance (excepting field recognition tes_2t_1) and by the table 6:

Table 6

Work	Requirements	Tools and materials
Test the limiting resolution, image quality and recognition range	The Sight must resolve the pattern N10 of GOI N5 test chart and pattern test N39 of the collimator. The pattern N10 is regarded as resolved if an observer can define all four directions of bars	UKNP-1M collimator (1Yu6); GOI N5 test chart
Fill up all missing parts of Single Maintenance Kit from Group Maintenance Kit	According to the table 2 "Package Inventory"	Group Maintenance Kit according to the Inventory Sheet AL3.812.222 ZI1
Dry out the Sight	According to service manual for Group Maintenance Kit AL3.812.222 II1	
Refresh the paint coat of the Sight and UV Collimator if damaged	A damage of paint coating is not allowed	ML-165 PM black enamel 4HL1 GOST 12034-77

Test the recognition range by means of UKNP-1M collimator. In the case of urgency need the test can be carried out in a field.

3.3.5.3 In the case of preparation for long-term storage, do the following additional works:

- cover all unpainted surfaces of mounting rail of the Sight and seat surface of UV Collimator with thin layer of viscous lubricant GOI 54p;

- wrap lubricated key spanner 6 (Fig. A.1) and shank into parchment P-45 GOST1760-86;
- remove the storage battery.

3.3.6 Season Maintenance

3.3.6.1 The Season Maintenance of the Sight in service is carried out by infantry unit personnel. In the case of need a technical servicing specialist participates. The works of Season Maintenance are the same as for Daily Maintenance (p. 3.3.3).

3.3.7 TO-1h Maintenance during storage

3.3.7.1 The TO-1h Maintenance is carried out by storage facility staff and technical servicing specialist.

3.3.7.2 Before TO-1h Maintenance, carry out the depreservation procedure according to p. 2.2.3.

The works and tests are the same as for Daily Maintenance.

After the maintenance, restore the conservation.

3.3.8 TO-2h Maintenance during long-term storage

3.3.8.1 Before TO-2h Maintenance, carry out the depreservation procedure according to p. 2.2.3.

The TO-2h Maintenance consists of the works prescribed for TO-1 Maintenance (with the exception of recognition range test), inspection of the Sight's set packaging, optics of the Sight and UV Collimator, light filter, contacts of the Sight and storage battery. After the maintenance, restore conservation.

3.3.8.2 In the case of damage or malfunction that is not eliminated by means of the Single and Group Maintenance Kit, sent the Sight into repair facility.

3.4 Operation Test

3.4.1 The battle readiness, reliability and operation life depend on regular inspection and maintenance.

Inspect the Sight in service in proper time. The Operation Test is carried out in all kinds of maintenance. State of the Sight features the operability, set completeness, and battle readiness.

3.4.2 The table 7 presents the main procedures of testing the state and operability of the Sight.

Table 7

Subject and methods of testing	Requirements
Inventory the package contents specified by the table 2 of the present manual	Contents of package must correspond to the table 2 of the present manual
Inspect the Sight and Single Maintenance Kit visually	Outer surfaces must be free of cracks, indents, corrosion and other defects
Test the mount security by swinging	A playing of the mounted Sight is not allowed
Inspect the optical surfaces of the Sight, light filter 1 (Fig. A.5) and UV Collimator (Fig. A.12)	Outer and inner surfaces of the optics must be free of physical damages, fat stains or other dirtying
Inspect the contacts of Sight and storage battery visually	Contacts must be free of oxidation, fat stains or other dirtying
Switch on the Sight (light filter 1 must be attached) with tumbler "On/Off" 7 (Fig.A.5) to check its operability	Eyepiece must shine
Test the reticule brightness control and image purity as the follows: attach the light filter 1, switch on the tumbler "On/Off" 7 (upper position) and rotate the handwheel 17	Brightness of aiming marks must change and their contrast must be enough
Check the voltage of storage battery G1 (G2) by means of a voltmeter. Accuracy grade of voltmeter must be 2.5 or above	The voltage must be within 1.15-1.5 V
Screw the light filter on the Sight to check if the thread fits	The light filter must screw without a jamming

3.5 Preservation (depreservation, represervation)

3.5.1 For preservation the Sight and Single Maintenance Kit, cover the unpainted seat surfaces of the Sight and UV collimator, key spanner and shank with viscous lubricant GOI-54p GOST 3276-89.

3.5.2 During long-term storage, refresh the preservation of the Sight and Single Maintenance Kit each two year.

3.5.3 Before reactivation the Sight and UV collimator, remove the lubricant by means of rugs.

4 REPAIR DURING SERVICE

4.1 General inspection

4.1.1 In the case of a malfunction, ensure the followings:
- the rifle mount is secure;
- the light filter is attached;
- the optics is free of dirty, dust, oil, frost and moisture;
- battery charge is enough;
- the Sight is switched on;
- the contacts are clean.

4.2 Troubleshooting

4.2.1 The table 8 guides on possible causes of malfunction and methods of their elimination.

Table 8

Trouble	Possible cause	Troubleshooting
The image intensifier screen does not shine	The battery is discharged;	Replace the battery with operable;
	Malfunction of image intensifier A1 (Fig. A.2)	Send the Sight to repair facility
Image brightness fast rises to maximum and falls down or fluctuates disturbing the viewing	Light overload	Attach the light filter 1 (Fig. A.5) to the objective lens 2
Image is weak and degraded	Sweating of outer optical surfaces	Wipe the outer optical surfaces of objective lens and eyepiece with napkin 8 (Fig. A.1)
Image is weak and degraded. There are flashes and blinks	Sweating of inner optical surfaces or of image intensifier's photocathode	Send the Sight to repair facility for drying and sealing
Dark spots have appear in the field of view, that impede viewing	The image intensifier is damaged by bright light source	Send the Sight to repair facility

Continuation of the table 8

Trouble	Possible cause	Troubleshooting
	Flaking of the photo-cathode	
When the tumbler "On/Off" 7 is switched on, the aiming reticule does not shine (Fig. A.5)	1 The battery is discharged 2 The light emitting diode VD1 is faulty (Fig. A.2)	1 Replace the battery 2 Send the Sight to repair facility
Repeatability of UV Collimator readings is worse than 0-00.25	1 The rifle barrel is dirty of worn-out 2 A burr or damage of barrel muzzle 3 The shank is dirty or deformed	1 Clean the barrel or replace the rifle 2 Repair the rifle 3 Zero the Sight with a zeroing target in night illumination conditions
Spontaneous displacement of aiming pike relative to reticule of UV more than 0-00.25	1 Loosen mount slot or wobbling rail on the rifle 2 Improper attaching the UV collimator	1 Repair or replace the rifle or adjust mount according to the p. 2.3.1 2 Set the UV collimator in barrel properly
Jamming of shank in the rifle barrel	1 The barrel is dirty 2 The shank is dirty	1 Clean the rifle 2 Clean the shank
Insufficient illumination of zeroing reticule	1 Dim ambient illumination 2 Outer surface of protective glass is dirty	1 Aim the UV collimator at bright light source 2 Clean the protective glass with napkin
Insufficient illumination of zeroing reticule with light cell	The light cell is damaged	Send the UV collimator to repair facility

Note: For replacement of light cell, request the manufacturer of UV collimator. The light cell replacement must be carried out in the assigned room.

5 STORAGE

5.1 Storage only inspected, operable and clean Sights.

The Sight is stored in its Case together with Single Maintenance Kit and Service Documentation.

5.2 The Sight is stored in heated room conditions at temperature from +5 to +35°C, relative humidity up to 85% and daily temperature variations up to 5°C.

5.3 The Sight in its Case must be placed on a shelf. Storage of the Sight on a floor or near heaters, windows or under direct sunlights exposition is prohibited.

5.4 Shelf life is 10.5 years.

5.5 In the case when storage of the Sight in a heated room is not available, store the batteries in room conditions at temperature from +10 to +25°C.

6 TRANSPORTATION

6.1 The Sight with Single Maintenance Kit and Service Documentation can be transported in its Case by any kinds of transport.

6.2 Before transportation or carrying, inspect fastening of the Sight, Single Maintenance Kit and Service Documentation in the Case. Case must be locked completely.

6.3 During transportation the Case must be set cover upward. Do not throw or turn over the Case with Sight.

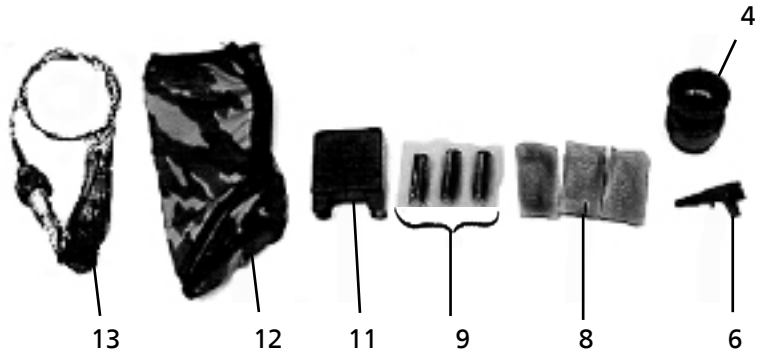
6.4 The Sight can be transported as attached to rifle in the case of absolute necessity only.

7 UTILIZATION

7.1 The UV Dry Zeroing Collimator comprises an ampoule containing a light emitting tritium agent T(3)-08 coming into first group of self-luminous sources according radiation hazard materials classification. Damaged or exhausted ampoules must be transferred to local utilization facility.

Appendix A

List of figures



4 - Eyeshield AL6.548.035, 6 - Key Spanner AL8.896.013,
8 - Napkin AL8.890.001-01, 9 –NLTs-0.9 storage battery;
11 - UK-316 Battery Tester; 12 - Soft Cover AL6.832.174-01,
13 – External Battery Compartment AL6.622.291

Figure A.1 Single Maintenance Kit and Accessories

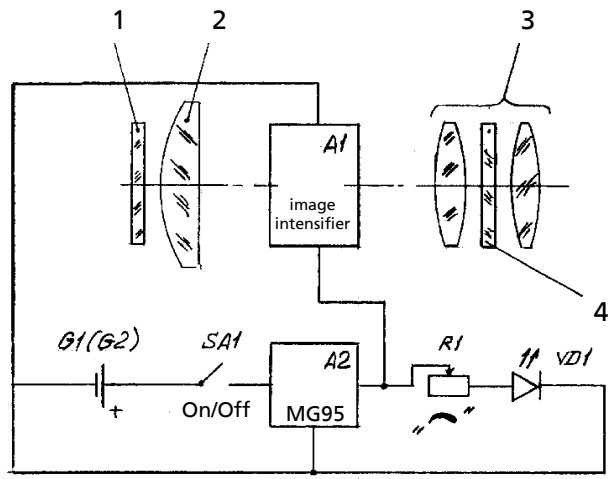
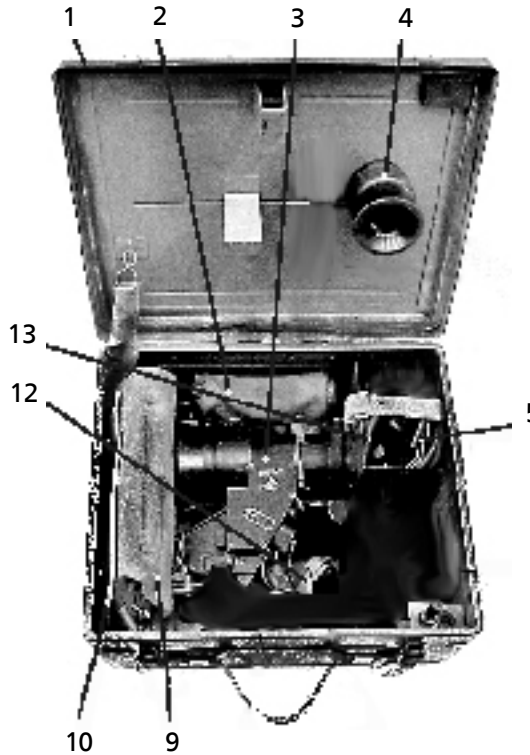


Figure A.2 Electro-Optical Function Diagram



1 – Case; 2 - Pocket; 3 – 1PN93-2 AK-47 Sight; 4 – Eyeshield AL6.548.035;
5 – UK316 Battery Tester; 9 – Carrying Bag AL4.165.033;
10 – Service Documentation; 12 – Soft Cover AL6.832.174-01;
13 - External Battery Compartment AL6.622.291

Figure A.3 Case package chart

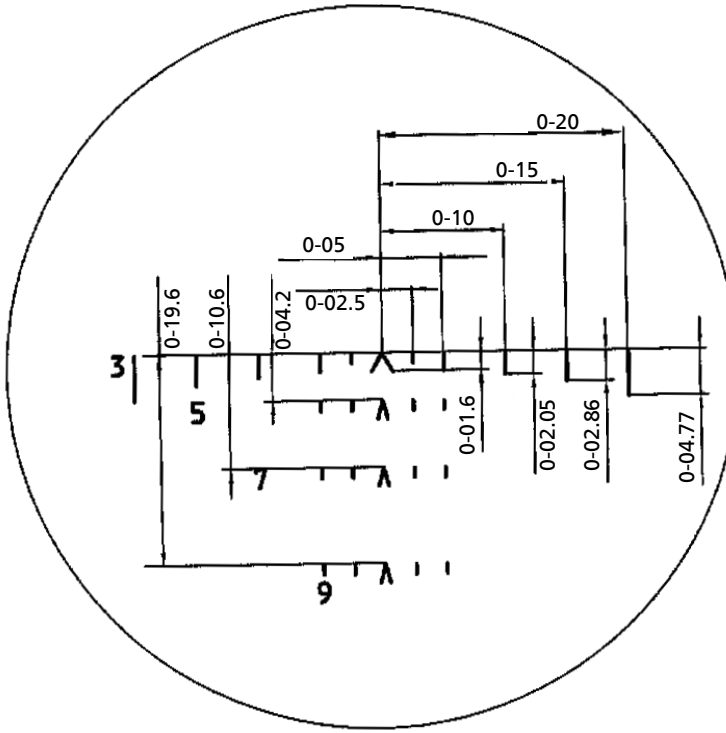
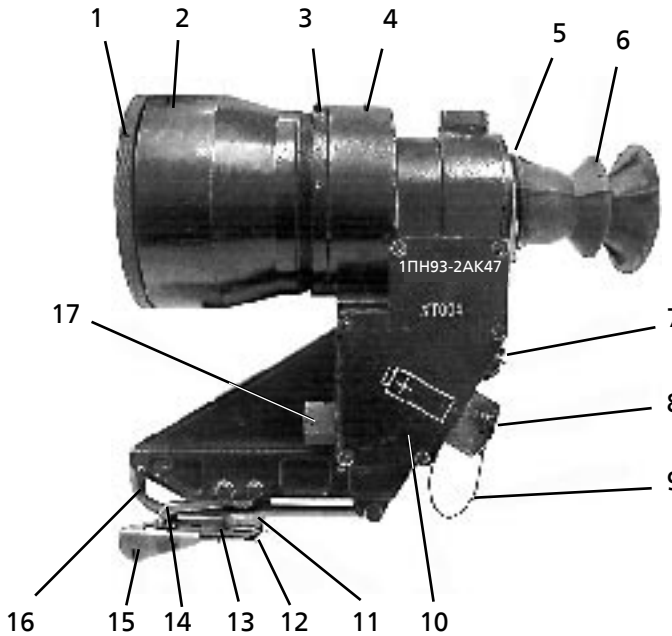
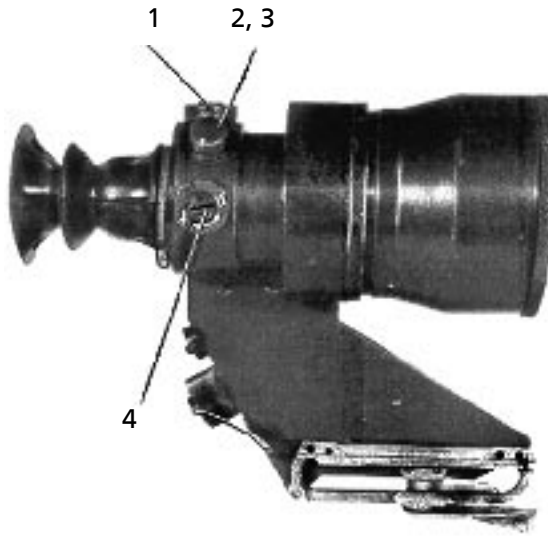


Figure A.4 Aiming reticule 1PN93-2 AK-47



1 – Light Filter; 2 – Objective Lens; 3 – Nut; 4 – Body; 5 –Collar;
6 – Eyeshield; 7 – Tumbler On/Off; 8 – Cap; 9 – Cord; 10 – Cover;
11 – washer; 12 – lock screw; 13 – Latch; 14 – Lock Lever;
15 – Handle; 16 – bracket; 17 - Handwheel

Figure A.5 Sight with Light Filter attached



1 – elevation screw; 2 – cap; 3 – rubber gasket; 4 – windage screw

Figure A.6 Zeroing controls

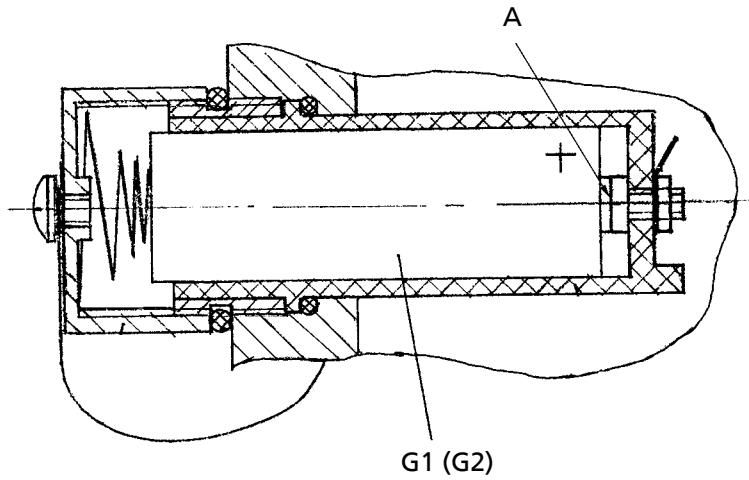


Figure A.7 Battery Compartment

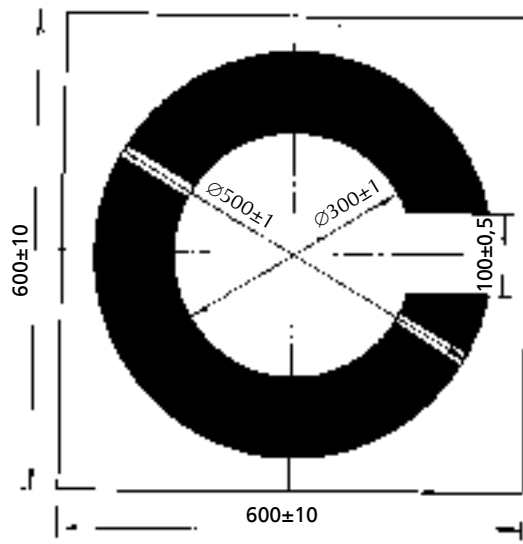


Figure A.8 Landolt Ring for estimation of ambient illumination

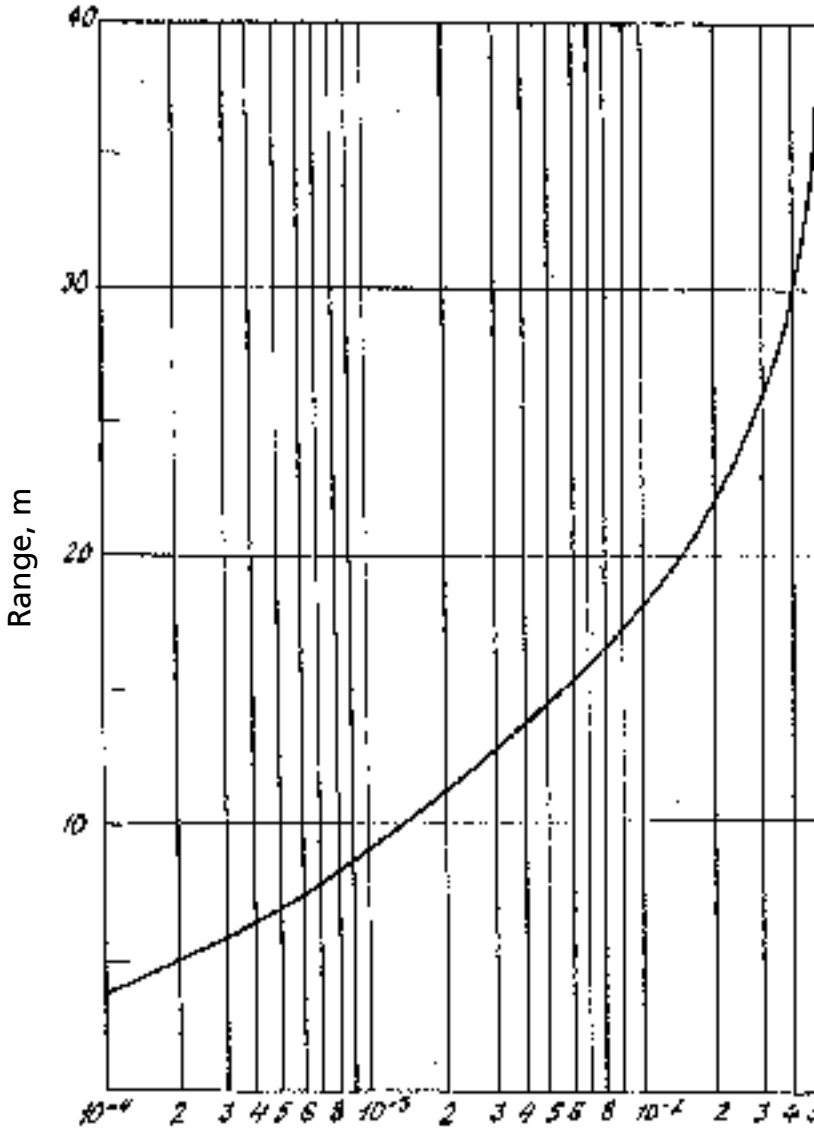
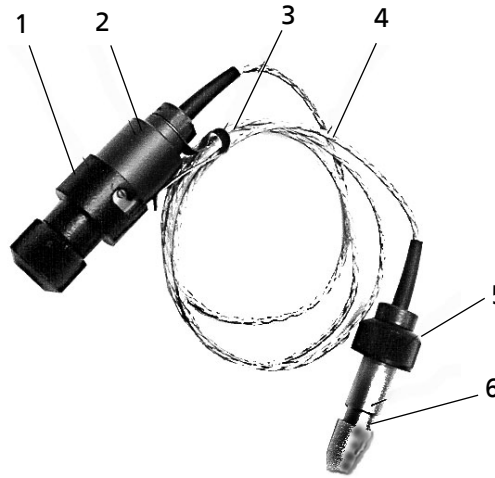
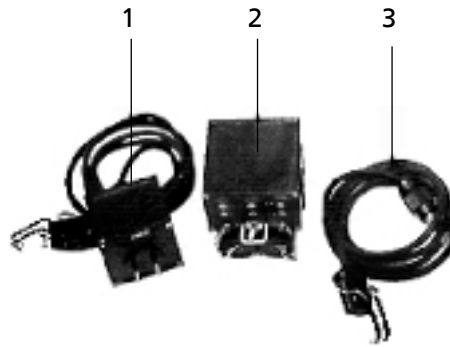


Figure A.9 Diagram for estimation of ambient illumination



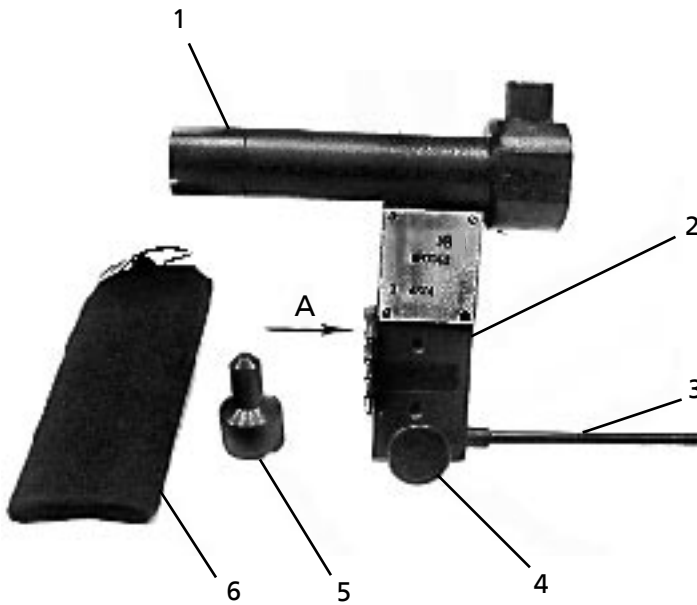
1- cap; 2 – container; 3 – clamp;
4 – cable; 5 – captive nut; 6 - contact

Figure A.10 External Battery Compartment



1 – Power Supply AL5.087.326;
2 – Charging unit AL5.121.161;
3 – Cable AL6.644.493

Figure A.11 Charging set AL4.799.001



1 – Protective Glass; 2 – Holder; 3 –Shank;
4 – Thumbscrew; 5 - Light Cell; 6 - Fabric Sleeve

Figure A.12 UV Dry Zeroing Collimator

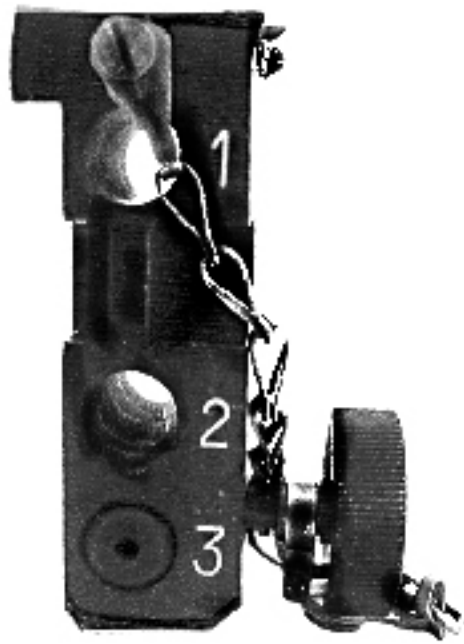
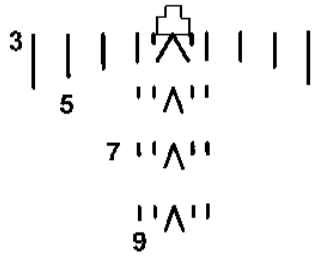
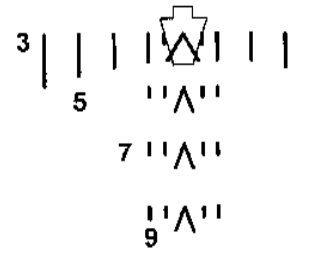


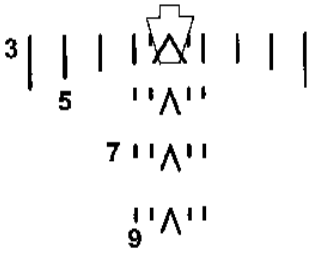
Figure A.13 UV Dry Zeroing Collimator, rear view



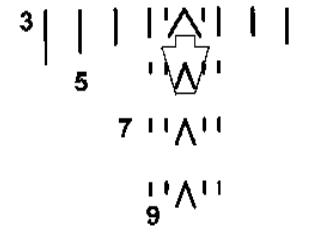
up to 300 m, half silhouette target



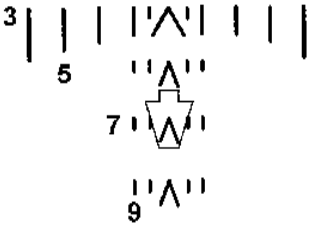
up to 300 m, running target



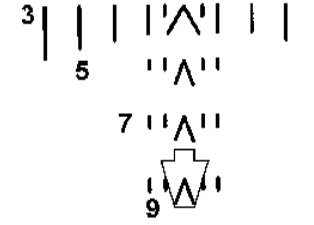
300 m, running target



500 m, running target



700 m, running target



900 m, running target

Figure A.14 Examples of target engagement with AK-47

Running target of height 1.5 m

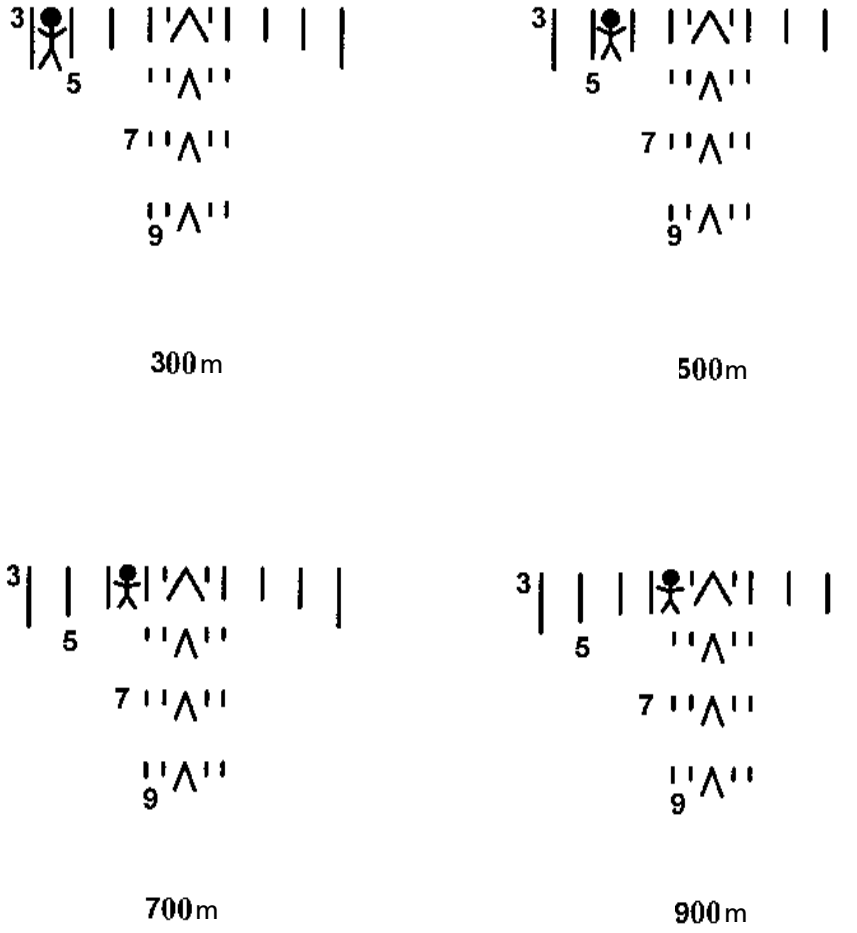


Figure A.15 Examples of range estimation with aiming reticule for AK-47

Appendix B
Recommended material consumption rates per maintenance

Material	Code OKP	Grade		Units	Rates							Notes
		Name or grade	Standard		Inspection	Daily Maintenance	Season Maintenance	TO-1 Maintenance	TO-2 Maintenance	TO-1h Maintenance	TO-2 Maintenance	
Cotton wool for optical industry	8195141230	G grade		g	-	20	20	20	20	20	20	
Parchment	5434416211	P-45	ГОСТ 1760-86	m	-	-	-	0,5	0,5	0,5	0,5	
Viscous lubricant	0254220500	GOI-54p	ГОСТ 3276-89	g	-	10	10	10	15	15	15	
Ethyl alcohol refined, industrial	9182132000	High grade	ГОСТ 18300-87	g	-	15	15	15	15	15	15	
White flannel, N1 (250x250)	8313326399		ГОСТ 29298-92	pcs.	-	1	1	1	1	1	1	
Camouflage enamel IIIU 1	2312620702	ML-165PM	ГОСТ 12034-77	kg	-	-	-	0,2	0,2	-	0,2	
Black enamel 4XL1	2312620702	ML-165PM	ГОСТ 12034-77	kg	-	-	-	-	0,2	-	-	
Ethyl ether, medicinal	1028200302	EM		g	-	90	90	90	90	90	90	

05.04