1PN93-1
Night Sight

Service manual
AL3.812.221 RE

CONTENTS

INTRODUCTION

This manual describes design, operation, performance features and presents service instructions and troubleshooting guide for 1PN93-1 Night Vision Sight of following versions:

1PN93-1AS;
1PN93-1AK-74

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

"Shooting guide" for appropriate type of weapon;
"Charge unit. Service manual AL4.799.001RE"
"Service manual for Group Maintenance Kit ZIP AL3.812.221 II1"

ABBREVIATIONS

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

1 DESCRIPTION OF DESIGN AND OPERATION

1.1 Purpose

1.1.1 The 1PN93-1 Modular Night Vision Sight (hereinafter referred to as the Sight) is designed for battlefield observation and aimed shooting with VSS, AS (1PN93-1AS version), AK-74M and AN-94 (1PN93-1AK-74 version) infantry rifles at natural night illumination conditions.

1.1.2 The sight operates in 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 performance features are specified in the table 1.

Table 1

Name	Value	Note
Magnification, x	4	
Field of view, deg	6	
Eye relief, mm	50	
Zeroing range		
elevation	±0-08	
windage	±0-08	
Battery voltage, V	1.5	
Maximal consumption current, mA	100	
Continuous operation time of NLTs-0.9 battery, h		
for t = + 50 °C	10	
t = - 40 °C	3	
t = - 50 °C	0.5	
Weight, kg:		
on a weapon	1.0	
carrying set	1.3	
transport package	7.0	
Overall dimensions of the Sight, mm:		
length	207	
width	79	
height	176	
Overall dimensions of the Case, mm:		
length	336	
width	295	
height	189	

1.2.2 The Sight provides target recognition and aiming all types of weapons specified in paragraph 1.1 under conditions of natural starlight illumination

at clear weather and grass field background at grass height up to 0.3 m.

Recognition range of man-sized target (300 m) 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 uses regular storage battery NLTs-0.9-1 or battery of R6 (AA) type.

1.2.4 For zeroing the Sight, the UV Dry Zeroing Collimator with illuminated boresighting reticule is available.

The UV-1 version is for 1PN93-1AS while the UV-2 is for 1PN93-1AK-74.

UV-1/ UV-2 Dry Zeroing Collimator specifications:

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

1.3 Nomenclature list

1.3.1 Nomenclature list for delivery version 1.

Table 2

Code	Item	Qty	Note
AL3.812.221 AL3.812.221-01	1PN93-1AS or 1PN93-1AK-74 Night Vision Sight	1	w/o battery
	Spare parts		
	NLTs-0.9-1 storage battery	3	Discharged
	Removable parts		
AL6.548.035	Eyeshield	1	
	R6 (AA) battery	1	
	Tools		
AL8.896.013	Key spanner	1	

Continue of table 2

Code	Item	Qty	Note
	Accessories		
AL5.087.326	Power supply	1	Charge Unit
AL5.100.062	YK-316 Battery Tester	1	
AL5.121.161	Charge Unit	1	Charge Unit
AL5.176.633	UV-1 Collimator or	1	For 1PN93-1AS
AL5.176.633-01	UV-2 Collimator	1	For 1PN93-1AK-74
AL5.940.671	Light filter	1	Attached to the Sight
AL6.622.291	External Battery Compartment	1	
AL6.644.493	Cable	1	Charge Unit
AL6.832.174	Soft cover	1	
AL8.890.001-01	Napkin	3	
	Carrying means		
AL4.165.033	Canvas Bag	1	
AL6.875.137	Case	1	For 1PN93-1AS
AL6.875.137-01	Case	1	For 1PN93-1AK-74
	Documentation	1	
AL3.812.221RE	Service Manual	1	
AL3.812.221PS	Logbook	1	

Note: A customization of delivery nomenclature list is available.

Nomenclature list for delivery version 2.
Table 3

Code	Item	Qty	Note
AL3.812.221-02 AL3.812.221-03	1PN93-1AS or 1PN93-1AK-74 Night Vision Sight	1	w/o battery
	Spare parts		
AL6.548.035	Eyeshield	1	
	R6 (AA) battery	4	
	Tools		
AL8.896.013	Key spanner	1	
	Accessories		
AL5.100.062	YK-316 Battery Tester	1	
AL5.940.671	Light filter	1	Attached to the Sight
AL6.832.174	Soft cover	1	
AL8.890.001-01	Napkin	3	
	Carrying means		
AL4.165.033	Canvas Bag	1	
	Documentation		
AL3.812.221RE	Service Manual	1	
AL3.812.221PS	Logbook	1	

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.

The objective lens 2 (Fig.A.2) forms a low-light image in the photocathode of image intensifier A1 arranged in focal plane of the lens 2. 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 in 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 power source G1 (G2).

The Sight is powered by NLTs-0.9-1 storage battery 10 of R6 (AA) type. The "On/Off" tumbler SA1 switches the Sight on and off.

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 nut 3.

All components of the Sight with the exception of objective lens 2 are placed in the body 4 under cover 10.

1.4.4 Controls:

- "On/Off" tumbler 7 (Fig.A.6);
- "<" reticule brightness adjustment handwheel 17;
- "U↔D" elevation screw 1 (Fig.A.7);
- "R↔L" windage screw 4.

The "On/Off" Tumbler (Fig.A.6) activates the powering of image intensifier A1 (Fig.A2) and LED VD1.

1.4.5 The cap 8 (fig.A.6) covers the battery compartment. The cap 2 (Fig.A.7) with rubber gasket 3 cover the nipple for purging of interior space. The cord 9 (Fig. A.6) secures the cap 8 to the Sight.

1.4.6 The weapon mount unit consists of the bracket 16 (Fig.A.6), lock screw 12, latch 13, lock lever 14, handle 15 and washer 11.

1.4.7 The eyepiece is provided with the eyeshield 6 fastened with the collar 5. The eyeshield guides an eye to exit pupil position of eyepiece and protects the eye against accidental injures.

1.4.8 Click of the Elevation and Windage Screws is 0-00.3.

1.4.9 Proper polarity of battery is engraved on cover 10.

1.4.10 The figure A.4 presents an image of 1PN93-1AS reticule for AS and VSS rifles. Aiming marks are sized in mils.

The upper pike is the aiming point for 100 m range,

- the second for 200 m,
- the third for 300 m,
- the forth for 400 m

correspondingly.

Heights of the pikes 1-3 correspond to prone target 0.3 m for appropriate ranges 100, 200 and 300 m. Height of fourth pike corresponds to running target 1.5 m at range of 400 m. Each aiming pike is accompanied with appropriate row of windage correction marks. In right down part there is a

range finding scale for running target 1.5 m. The scale range is from 200 to 800 m.

1.4.11 The figure A.5 presents an image of 1PN93-1AK-74 reticule for AK-74M and AN-94 rifles. Aiming marks are sized in mils.

The upper pike is the aiming point for 400 m range,

- the second for 600 m,
- the third for 800 m,
- the forth for 1000 m

correspondingly.

Height of the upper pike corresponds to running target 1.5 m at range 1000 m. Each aiming pike is accompanied with appropriate row of windage correction marks. The marks of upper row are used for range estimation also. Their heights correspond to running target 1.5 m at ranges from 400 to 1000 m. Each row is designated with according aiming range in hectometer units.

1.4.12 Design of the eyeshield 4 (Fig.A.1) prevents an illumination of a face from shining eyepiece when an eye does not press it in order to ensure the covert operation of the Sight in night conditions.

1.4.13 The canvas carrying bag 9 (Fig.A3) is for carrying the Sight in service.

1.5 Tools and accessories

1.5.1 Key spanner 6 (Fig.A.1) is intended for adjusting the elevation and windage screws 1 and 4 (Fig.A.7) and mounting/dismounting the protective glass of UV Dry Zeroing Collimator 1 (Fig.A.11). The key spanner is placed 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 placed in the pocket 2 of the case 1 (Fig.A.3).

1.5.3 Placement of Power Supply 1 (Fig.A.1), Charge Unit 2 and Cable 3 for charging the NLTs-0.9-1 storage battery is presented in the figure A.3.

1.5.4 The UV Dry Zeroing Collimator 5 (Fig. A.1) is designed for:

- dry zeroing the Sight to the design zeroing point;
- determination of Individual Zeroing Point (IZP) for the Sight and rifle;
- dry zeroing the Sight with IZP.

The shank 3 (Fig A.11) aligns the collimator unit trough holder 2 along a weapon bore axis. The UV Dry Zeroing Collimator is equipped with the light source 4 and fabric hose 5 for high ambient illumination conditions.

Set of the UV-1 Dry Zeroing Collimator comprises the shank N4 (9 mm caliber) and hose of 330 mm for AS and VSS rifles.

Set of UV-2 Dry Zeroing Collimator comprises the shank N1 (5.45 mm caliber) and hose of 600 mm for AK-74M and AN-94 rifles.

1.5.5 The YK-316 Battery Tester 11 (Fig.A.1) 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 carried mounted on rifle.

1.5.7 External Battery Compartment 13 is designed for prolonging the battery continuous operation time in cold conditions when ambient temperature is below +2^{O}C. It consists of container 2 (Fig. A17), cap 1, contact 6, captive nut 5 and cable 4. For using it, remove the battery from 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.6) there are following designations:

- the 1PN93-1AS or 1PN93-1AK-74 code designation of the Sight;
- logo of the manufacturer;
- serial number.

1.6.2 On the cover of Case 1 (Fig.A.3) there are the 1PN93-1AS or 1PN93-1AK-74 code designation and serial number of the Sight.

1.6.3 The Case with the Sights, 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 to be carried and stored in the Case 1 (Fig.A.3).

1.7.2 In the Case 1 there are special beds, fastening bars and pockets for Sight 3 with light filter 1 attached (Fig.A6), UV Dry Zeroing Collimator 11 (Fig.A3), Charge Unit 8 and Service Documentation according to the Inventory Sheet.

2 OPERATION

2.1 Equipment limitations

2.1.1 In order to prevent a damage of the Sight:

- Do not shoot an attached grenade launcher with mounted Sight;
- Do not activate the Sight without light filter 1 attached (Fig.A.6) 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 and metal objects.

2.1.5 Carrying of storage battery separate from the Sight switched off (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 that requires 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 weapon;
- Do not mount the collimator to dirty barrel or barrel with damaged muzzle;
- A disassemble or adjustment of the UV collimator is allowed in authorized workshop only.

2.2 Preparation

2.2.1 Learn design and fastening of the Sight in the package Case and to a weapon.

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

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

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

- loosen the collar 5 (Fig.A.6);
- remove the eyeshield 6 with collar 5;
- remove the collar 5 from the eyeshield 6;
- set the opened collar 5 (Fig.A.6) on the flap eyeshield 4 from Single Maintenance Kit (Fig.A.1);
- pull the eyeshield 4 (Fig. A.1) on the eyepiece mounting;
- tighten the collar 5 (Fig.A.6).

2.2.5 In the case there is no charged storage battery NLTs-0.9-1, set 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 into battery compartment ensuring the polarity designated on the cover 10 (Fig.A.6);
- close the cap 8;
- switch on the Sight, check its operability and switch off again.

2.2.6 In the case a gas-mask is used, loosen the collar 5 and remove the eyeshield 4 (Figs.A.1, A.6).

ATTENTION! Aiming reticule at maximal brightness indicates the charge of storage battery. 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 a weapon in the following order. Align the Sight's mount slot with the weapon's dovetail rail, push the Sight forward up to the stop and secure it, turning the handle 15 (Fig.A.6) forward up to latching it in the bracket 16. The Sight must be fastened secure.

The locking lever can be adjusted. To do it, shift the latch 13 with key spanner 6 (Fig.A.1) from under the head of screw 12 (fig. A.6) and remove it, then reset the handle 15 by a number of teeth providing secure fastening with no playing and set the latch again.

2.3.2 The UV Dry Zeroing Collimator is attached to a weapon as the follows.

- Insert the shank 3 (Fig.A.11) into the hole designated as "N1" (Fig.A.12) of holder. The key flat of shank 3 (Fig.A.11) prevents it against turning.
- Tighten the screw 1 (Fig.A.12) up to the light touch to lock the shank 3 in the holder.
- Insert free end of the shank 3 into the weapon barrel up to the rubber ring.

2.3.3 For zeroing in dark conditions, remove the protective glass 1 (Fig.A.11) by means of key spanner 6 (Fig.A.1) and screw in the light cell 4 (Fig.A.11) up to the stop.

2.3.4 For zeroing in high illumination conditions, use the fabric hose 5. Wide end is intended for objective lens 2 (Fig.A.6) 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 For daytime and twilight shooting:

- Select a firing position;
- Put the rifle on ground right side down in such a way as to avoid an entering of sand, snow etc. in the bore;
- Put the Case with Sight at left from the rifle as its cover 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.6);
- Switch on the tumbler "On/Off" (upper position). The image will shine with yellow-green and the reticule with red;

- Adjust the reticule brightness by means of handwheel 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 (from convenience reasons) as the follows:

- Take the UV collimator from the Case;
- Remove the muzzle brake or other muzzle extensions;
- Attach the shank to the holder of the UV collimator according to p.2.3.2;
- Insert the shank into the weapon 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 weapon;
- Turn the UV collimator around its axis to align the vertical lines of zeroing reticule parallel to vertical axis of the aiming reticule while looking trough the Sight mounted to the weapon. 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 a foreign object. Prevent the UV collimator against touching a foreign object. Determine the position of upper aiming mark in the collimator zeroing reticule and check out if the position is stable at repeating setting of UV collimator. In the case the aiming mark moves more 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 when tilting, swinging and tight stock-weld of weapon, by means of UV collimator reticule. 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 weapon lying horizontal.

2.5 Zeroing procedure

2.5.1 Frequency of zeroing the Sight is the same as for iron sight according to the shooting manual for appropriate rifle.

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

- Attach the sight to the rifle according to the p.2.3 “Mount” of present manual;
- Fasten the rifle in a stable aiming rest;
- Set the elevation bar of iron sight to range 100 m for AS or VSS rifles or

400 m for AK-74M and AN-94;

- Aim the rifle by means of the iron sight to an aiming point at the range 100 m. The AS and VSS rifles are to be aimed at center but AK-47 and AN-94 under bull's eye;
- Ensure the Light Filter 1 (Fig.A.6) is attached to the objective lens of the Sight;
- Switch on the Sight (upper position of tumbler "On/Off" 7);
- Set comfortable brightness of aiming reticule by means of handwheel 17;
- Check the alignment of the upper aiming pike of the Sight with the aiming point of iron sight.

2.5.3 If the aiming points do not coincide do as the follows:

- Adjust the elevation screw "U<->D" 1 (Fig.A.7) 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 weapon from the aiming rest;
- Fire four single shots at thorough and uniform aiming with the Sight;
- Determine grouping and Mean Point of Impact (MPI) according to the shooting manual for the rifle. The grouping should be not worse then one for iron sight. If grouping is acceptable, determine the position of Mean Point of Impact relative to Reference Point. For AS and VSS rifles, the Reference Point must coincide with aiming point. For AK-74 and AN-94 rifles, the Reference Point must be above aiming point by 21 cm. The displacement of Mean Point of Impact from Reference Point must not exceed 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 100 m;
- Test the settings with repeated shooting;
- Switch off the Sight.

2.6 Dry zeroing with UV collimator

2.6.1 Dry zeroing the Sight with average zeroing point

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 of UV collimator (the point with coordinates x=0; y=0). The position corresponds to average aiming angle of all specified rifle types at range 100 m.

2.6.2 Determination of individual zeroing point

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

2.6.2.2 Align the aiming points of the Sight and iron sight as prescribed by p.2.6.1.2.

2.6.2.3 Remove the UV collimator from the rifle and attach the muzzle brake or other regular extension.

2.6.2.4 Fire four single shots at thorough and uniform aiming through the Sight at target ranged by 100 m. The AS and VSS rifles are to be aimed at center but the AK-74 and AN-94 under bull's eye of the target.

2.6.2.5 Determine grouping, MPI and displacement of MPI from Reference Point as x,y according to the shooting manual for the rifle and p.2.5 of the present manual.

2.6.2.6 If the displacement exceeds the limit prescribed by service manual for rifle, attach again the UV collimator to the rifle according to the p.2.4.3 of the present manual and move the upper aiming pike to the point with coordinates x, y in zeroing reticule of UV collimator by means of elevation and windage screws of the Sight. 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 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 Sight in the Logbook of the Sight.

2.6.3 Dry zeroing the Sight with Individual Zeroing Point

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

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

2.6.3.3 Check the alignment of the upper aiming pike with the IZP recorded in the Logbook.

2.6.3.4 In the case of misalignment, align the upper aiming pike with IZP.

2.6.3.5 Detach the UV collimator from the rifle. Zeroing procedure is completed.

Note: The IZP position can change under long or extensive service of rifle. So in the case of large misalignment, determine new position of IZP according to the p.2.6.2.

2.7 Range estimation with the Sight

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

The figures A.15 and A.16 guide on determination of 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 by following method:

- Match the target or a landscape detail of known height with a mark of aiming reticule (angular sizes of aiming marks are presented in the figures A.4 and A.5 in mil units);

calculate the target range with the formula:

$$D = \frac{B \times 1000}{y}$$

where: D = range to the target, m;
B = height of target (or reference object), m;
y = angular size of 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 image color, appearance and contrast 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) should be carried out at natural ambient illumination below $5x10^{-3}$ lx only.

2.8.2 Operation

2.8.2.1 Switch on the Sight.

2.8.2.2 Select an aiming pike according to the shooting range and point the aiming pike at a target. When shooting AS or VSS rifles aim at center of the target (aiming point and point of impact coincide).

When shooting AK-74M and AN-94 rifles up to 400 m, aim the upper pike at bottom of target or at center if the target is high (running etc). Aiming point is located below point of impact:

- by 21 cm for range 100 m;
- 38 cm for 200 m;
- 32 cm for 300 m;
- 0 cm for 400 m.

If the range exceeds 400 m for AK-74M and AN-94 rifles, select the reticule aiming pike according to the range and aim it at target center.

2.8.2.3 For incoming or receding target, select the aiming mark corresponding to range predicted on fire opening moment. Within battlesight zero range (BZO) of 400 m for AK-74M and AN-94 use the upper aiming pike.

Transverse moving target is engaged either by tracking or ambush methods. The lead for AK-74M and AN-94 rifles, tracking method, transverse moving target at speed of 3 m/s and range 300 m is 0-04. For range above 300 m the lead is 0-06. To shift the aiming point, use appropriate row of vertical aiming marks.

For AS and VSS rifle the lead must be doubled.

For ambush method, use the vertical 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. For repeat shoot using ambush method, select an aiming point ahead of the target motion and repeat shooting when the target approaches.

The Figure A.13 presents the aiming cases for AS and VSS rifles, and Figure A.14 for AK-74M and AN-94 rifles.

2.8.3 Carrying

2.8.3.1 Prepare the Sight to carrying in the following order:

- Switch off the Sight (tumbler "On/Off" 7 (Fig.A.6) in bottom position);
- Attach the Light Filter 1 to the Sight;
- Open the cap 8, remove the battery 10 (Fig.A.1) and place it in the bag 9 (Fig.A.3);
- Close the cap 8 (Fig.A.6);
- Remove the Sight from the rifle and put 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.

Clean the outer optical surfaces and electric contacts with white flannel of grade N1 GOST 29298-92, cotton wool for optical industry of grade G, 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 their mixture) 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 glass 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.8) 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-1h;
- long storage maintenance TO-2h;

3.2 Safety

3.2.1 Ensure safe fastening of the Sight to weapon to avoid an injury in service.

3.2.2 Avoid an excessive pressure to eyeshield when viewing. The eyeshield should be pressed until clear boundary of field of view will appeared only.

3.2.3 The UV Dry Zeroing Collimator comprises an ampoule containing a light emitting tritium agent T(3)-08.

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. Aerate the room for 0.5 hour, clear it against splinters and wash.

3.3 Maintenance

3.3.1 Maintenance system

The table 4 presents the maintenance system.

Table 4

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 was 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 converter AL5.305.125 from Group Maintenance Kit	-	At placing in storage
Season Maintenance	Twice per year at winter/ summer and vice versa season changing		
TO-1h		After 6 month	Yearly
TO-2h			Once per two year

3.3.2 Inspection

3.3.2.1 The Inspection is carried out before using. It includes a visual inspection of outer surfaces and operation tests according to the table 8. 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 visual inspections and operation tests according to the table 8.

In the case of need, it involves also the works prescribed in the table 5.

Table 5

Works	Requirements	Tools and materials
Wipe the Sight, UV Collimator, Charging Unit, YK-316 Battery Tester, External Battery Compartment and Case against dust, dirty and moisture	The Sight, UV Collimator, Charging Unit, YK-316 Battery Tester, External Battery Compartment and Case must be clean	Rags
Lubricate uncoated metal mount surfaces (including shank) of the Sight and UV collimator with layer of lubricant	Uncoated outer metal surfaces must be free of corrosion	GOI-54p viscous lubricant GOST 3276-89
Clean contacts of the Sight, Charge Unit, YK-316 Battery Tester, External Battery Compartment and buttery. Procedure accords with p.3.1.1	Contacts must be clean	Tools and materials accord with p.3.1.1
Clean outer surfaces of optics. Procedure accords with p.3.1.1	Outer optical surfaces must be clean	Tools and material accord with p.3.1.1
Charge the storage batteries 10 (Fig. A.1) according to the Service Manual on charge unit AL4.799.001RE	Storage battery must be fully charged	Charge unit AL4.799.001

3.3.4 TO-1 Maintenance

3.3.4.1 The TO-1 Maintenance ensures 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 works:

1) field test of recognition range;

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

Test the recognition range for real target (silhouette figure of 1.5 m height dressed in helmet and field overcoat) under natural ambient night illumination $3x10^{-3}$ - $5x10^{-3}$ lx without fog, rain and snowfall. The recognition ranges for various backgrounds are specified by the table 6.

Table 6

Background	Minimal recognition range, m
Snow-covered surface	300
Yellow grass (sand)	300
Coniferous forest	80

Distance from the target to coniferous forest must be 25 m at least. Start the measuring of recognition range from ambient 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.9. The Langolt ring must be black against of white background of 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 target by 15-20 m and direct its face to the observer. Then the assistant rotates the shield around axis of the ring 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.10 determine the ambient illumination corresponding to the measured range.

The performance criterion is the 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 cannot be eliminated by means of Single or Group Maintenance Kit, send the Sight to regular repair facility.

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

- cover the uncoated surfaces of the Sight's mount rail and mount seat of

the UV collimator with thin layer of GOI-54p viscous lubricant;

- lubricate the key spanner (Fig. A.1) and shank and wrap into the P-45 GOST 1760-86 parchment;
- remove the storage battery from battery compartment.

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 listed in the TO-1 Maintenance (excepting field recognition test) and table 7:

Table 7

Works	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 or 3 “Nomenclature List”	Group Maintenance Kit according to Inventory Sheet AL3.812.221 ZI1
Dry out the Sight	According to service manual for Group Maintenance Kit AL3.812.221 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 conditions according to the p.3.3.4.2.

3.3.5.3 For long storage of the Sight 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 GOI 54p viscous lubricant;
- lubricate the key spanner (Fig.A.1) and shank and wrap into P-45

GOST1760-86 parchment;

- remove the storage battery from battery compartment.

3.3.6 Season Maintenance

3.3.6.1 The Season Maintenance of the Sight in service is a duty of infantry unit personnel. In the case of need a specialist of technical servicing facility 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 infantry unit personnel and specialist of technical servicing facility.

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

Works and tests are the same as for Daily Maintenance.

After maintenance, restore the conservation state.

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. After maintenance, restore the conservation state.

3.3.8.2 In the case of damage or malfunction, which can not be eliminated by means of the Single or 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 maintenance and inspection.

Inspect the Sight systematically to discover and correct defects before serious damage or failure results. The Operation Test is carried out in all kinds of maintenance.

3.4.2 The table 8 presents the main procedures for testing the state and operability of the Sight.

Table 8

Subject and methods of testing	Requirements
Compare the contents of package with the table 2 or 3	Contents of package must correspond to the table 2 or 3
Inspect the Sight and Single Maintenance Kit visually	Outer surfaces must be free of cracks, indents, corrosion and other defects
Test the fastening by swinging	A playing of the Sight mounted on rifle is not allowed

Continue of table 8

Subject and methods of testing	Requirements
Inspect the optical surfaces of the Sight, Light Filter 1 (Fig.A.6) and UV collimator 5 (Fig.A.1)	Outer and inner surfaces of 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) by tumbler "On/Off" 7 (Fig.A.6) to check its operability	Field of view in the eyepiece must shine
Test the reticule brightness adjustment and picture 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 its contrast must be enough
Check the voltage of storage battery G1 (G2) by means of a voltmeter	The voltage must be within 1.15-1.5 V
Screw the Light Filter on the Sight to check the thread fitting	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 collilmator, key spanner and shank with GOI-54p viscous lubricant GOST 3276-89.

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

3.5.3 For reactivation, remove the lubricant by means of rugs.

4 REPAIR IN SERVICE

4.1 General inspection

4.1.1 In the case of malfunctions of Sight operation, ensure the follows:

- the Sight is fastened firmly;
- 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;
- contacts are clean.

4.2 Troubleshooting

4.2.1 The table 9 guides on possible causes of malfunction and methods of elimination.

Table 9

Trouble	Possible cause	Troubleshooting
The screen of image intensifier does not shine	1 The battery is discharged	1 Replace the battery with operable
	2 Malfunction of image intensifier (Fig.A.2)	2 Sent the Sight to repair facility
Image brightness rises to maximum and falls down fast or fluctuates disturbing the viewing	Light overload	Attach the Light Filter 1 (Fig.A.6) 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 in the field of view disturb viewing	1 The image intensifier is damaged by bright light source	1 Send the Sight to repair facility
	2 The photocathode flaking appears	2 Send the Sight to repair facility
The aiming reticule does not shine when the tumbler "On/Off" 7 is switched on (Fig.A.6)	1The battery is discharged	1 Replace the battery
	2 Malfunction of light emitting diode VD1 (Fig. A.2)	2 Send the Sight to repair facility

Continue of table 9

Trouble	Possible cause	Troubleshooting
Repeatability of zeroing with UV collimator at repeat setting is worse then 0-00.25	1 The rifle bore is dirty 2 There is a burr or dent on the barrel muzzle 3 Shank of UV collimator is dirty or deformed	1 Clean or replace the rifle 2 Repair the rifle 3 Zero the sight with a zeroing target in night conditions
Spontaneous displacement of aiming pike relative to UV collimator reticule more than 0-00.25	1 Wobbling mount of Sight on weapon 2 Wrong mounting of UV collimator in the rifle	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
Illumination of zeroing reticule is insufficient	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
Illumination of zeroing reticule with light cell is insufficient	The light cell is damaged	Send the Sight to repair facility

Note: The light cell replacement is carried out in a special assigned room.

5 STORAGE

5.1 Storage only inspected, operable and clean Sights.

The Sight is stored within its Case together with Single Maintenance Kit and service documentation.

5.2 The Sight is to be stored in heated room at temperature from +5 to +35^{O}C, relative humidity up to 85% and daily temperature variations up to 5 ^{O}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 Long-term storage period is 10.5 years.

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

6 TRANSPORTATION

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

6.2 Before transportation, inspect fastening of the Sight, Single Maintenance Kit and Service Documentation within the Case. All locks must be serviceable.

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 mounted to weapon can be transported in the case of absolute necessity only.

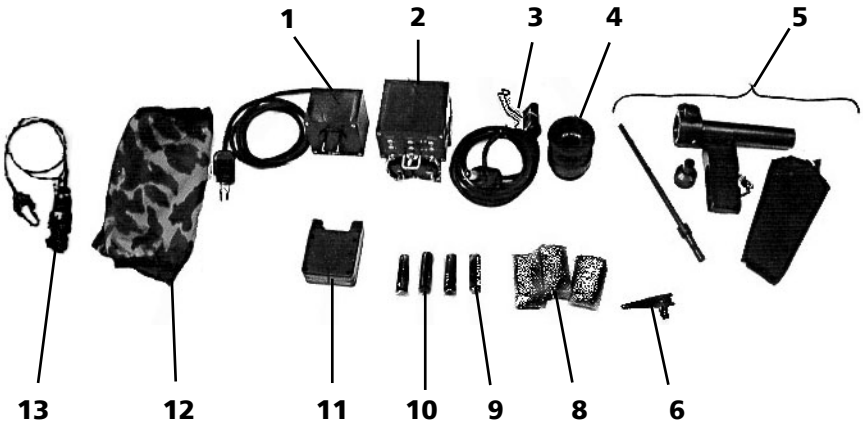
7 UTILIZATION

7.1 The UV Dry Zeroing Collimator comprises an ampoule containing a light emitting tritium agent T(3)-08. Damaged or exhausted ampoules must be transferred to local utilization facility.

Appendix

List of figures

A) Delivery version 1 (table 2)



B) Delivery version 2 (table 3)

1 – Power Supply AL5.087.326, 2 – Charge Unit AL5.121.161,
3 – Cable AL6.644.493, 4 – Eyeshield AL6.548.035,
5 – UV Dry Zeroing Collimator, 6 – Key Spanner AL8.896.013,
8 – Napkin AL8.890.001-01, 9 – AA battery; 10 – NLTs-0.9 storage battery;
11 – YK-316 Battery Tester; 12 – soft cover AL6.832.174;
13 – External Battery Compartment AL6.622.291.

Figure A.1 Single Maintenance Kit and Accessories

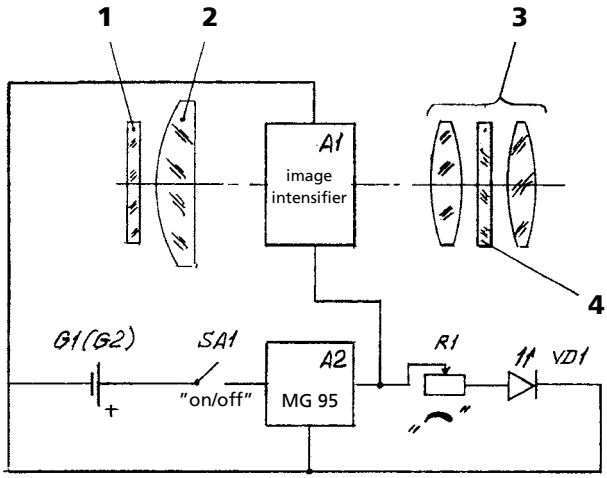
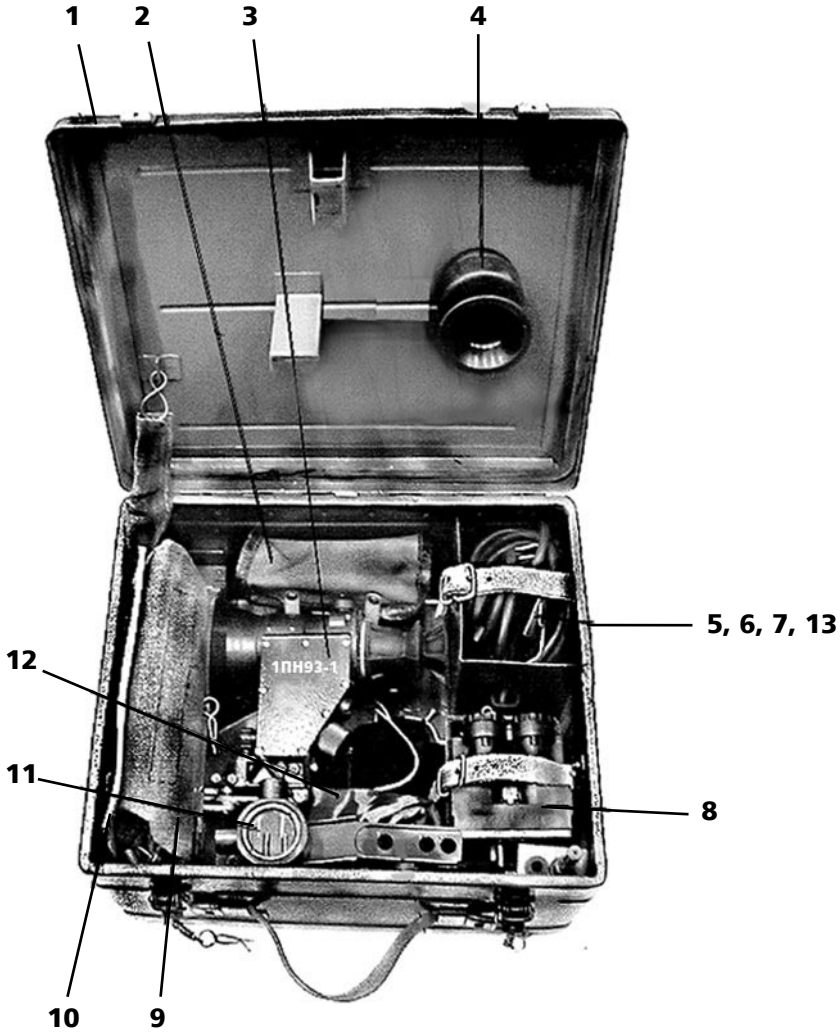


Figure A.2 Electro-Optical Function Diagram



1 – Case; 2 – Pocket; 3 – 1PN93-1 Sight; 4 – Eyeshield AL6.548.035;
5 – YK-316 Battery Tester; 6 – Power Supply AL5.087.326;
7 – Cable AL6.644.493; 8 – Charge Unit AL5.121.161;
9 – Carrying Bag AL4.165.033; 10 – Service Documentation;
11 – UV Dry Zeroing Collimator; 12 – Soft cover AL6.832.174;
13 – External Battery Compartment AL6.622.291

Figure A.3 Case package chart

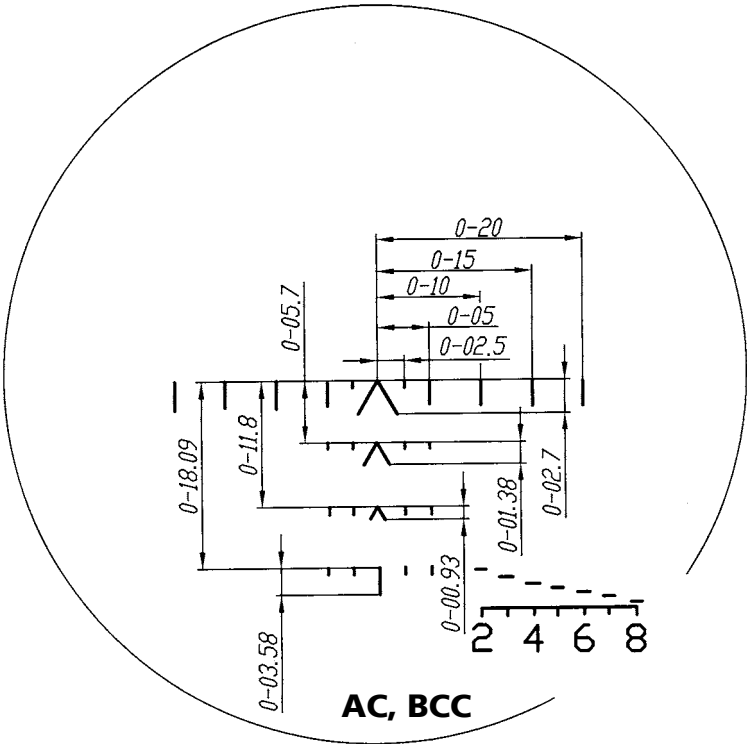


Figure A.4 Aiming reticule for 1PN93-1AS version

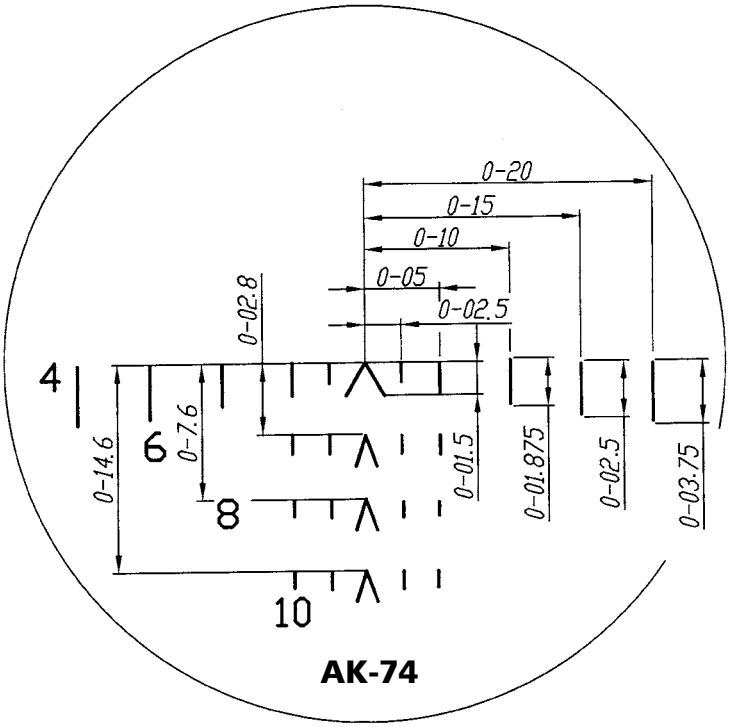
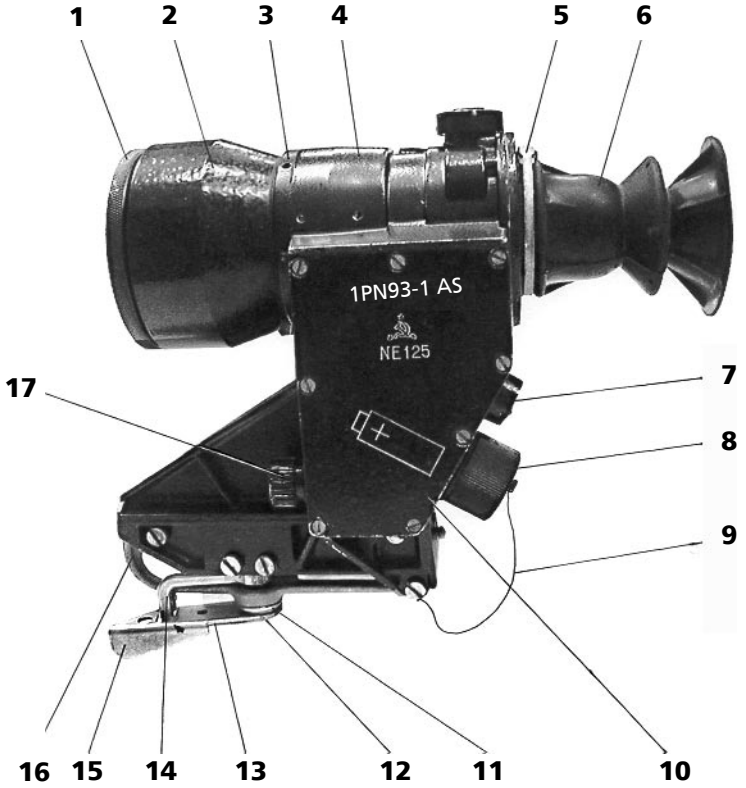
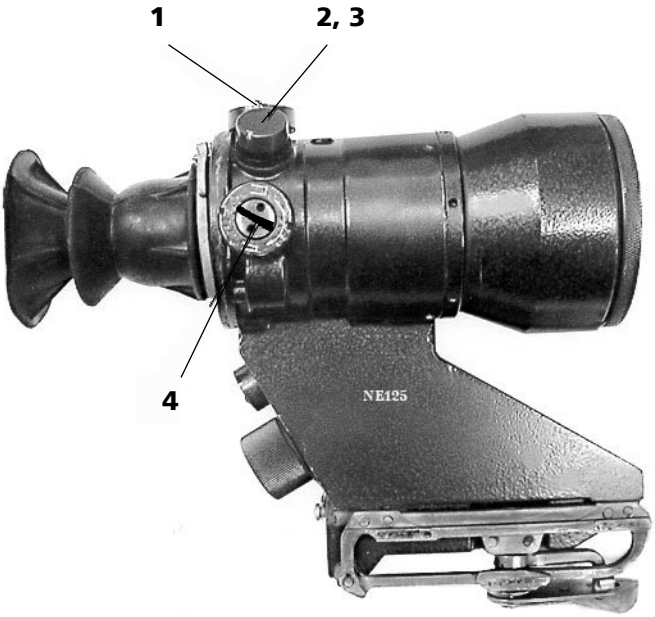


Figure A.5 Aiming reticule for 1PN93-1AK-74 version



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.6 Sight with Light Filter attached



1 – Elevation Screw; 2 – Cap; 3 – rubber gasket; 4 – Windage Screw

Figure A.7 Night Vision Sight

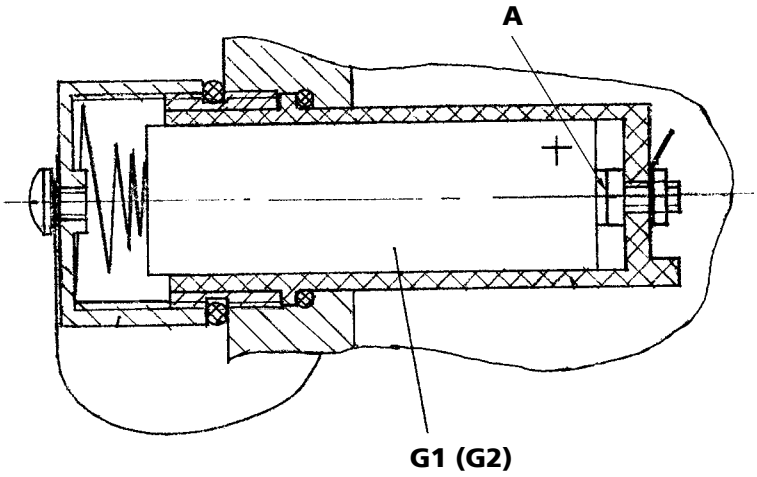


Figure A.8 Battery Compartment

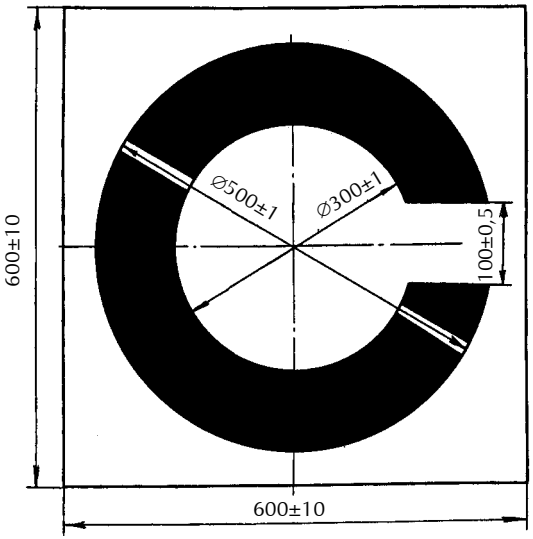


Figure A.9 Landolt Ring for estimation of ambient illumination

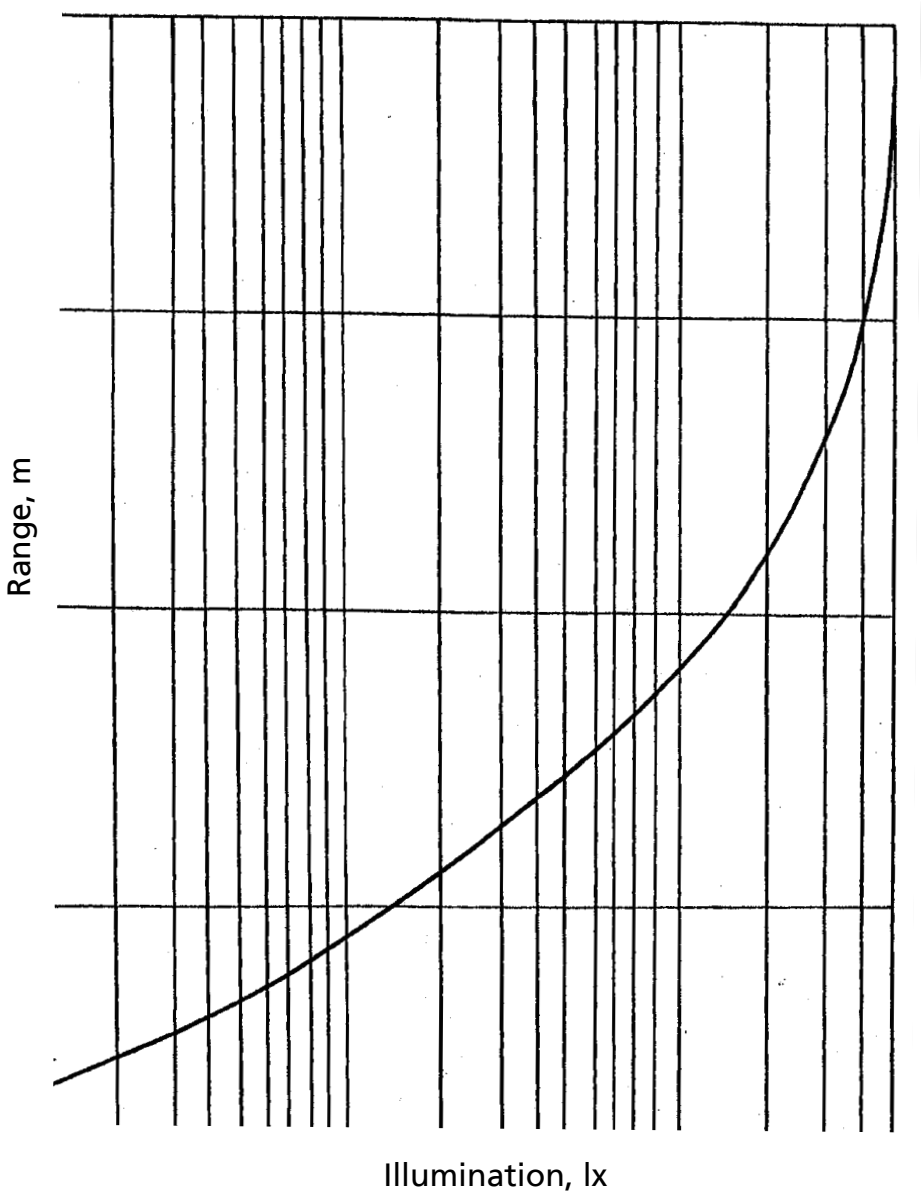
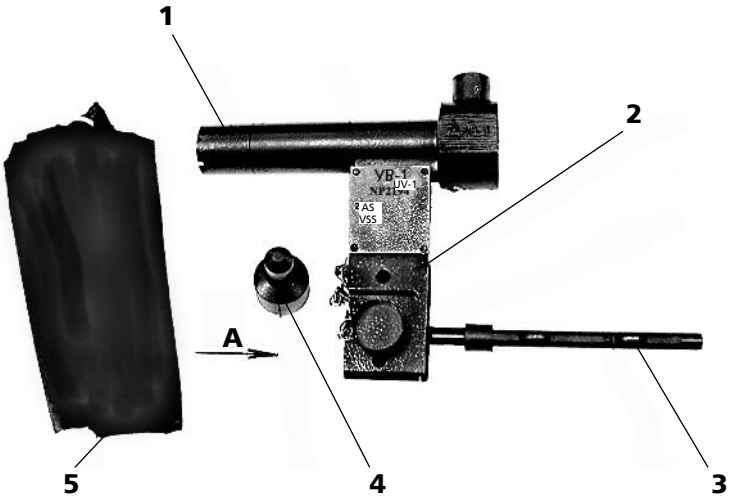
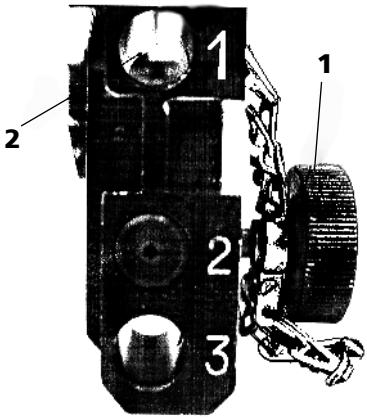


Figure A.10 Diagram for estimation of ambient illumination



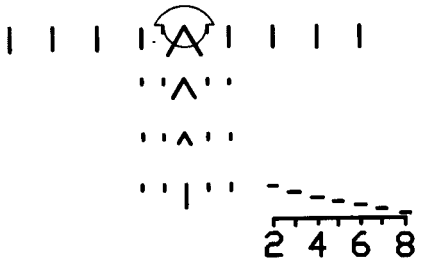
1 – Protective Glass; 2 – Holder; 3 –Shank; 4 – Light Cell; 5 – Fabric Hose.

Figure A.11 UV-1 Dry Zeroing Collimator

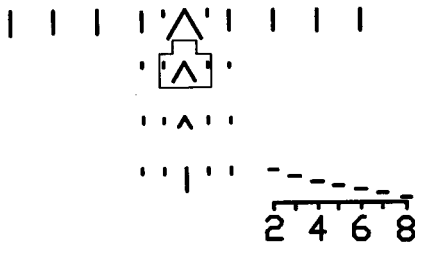


1 – Thumbscrew; 2 – Hole N1

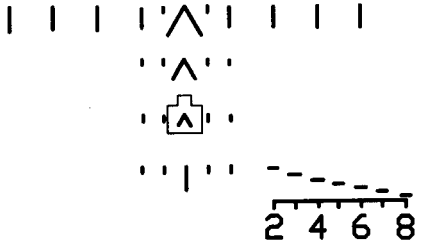
Figure A.12 UV Dry Zeroing Collimator , rear view



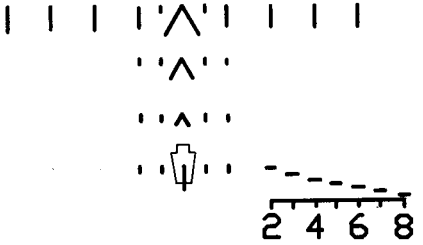
range = 100m
prone target



range = 200m
half silhouette target

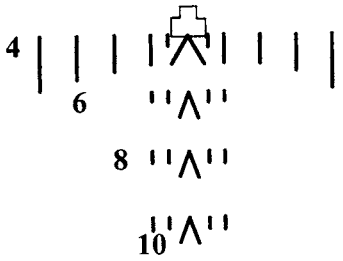


range = 300m
half silhouette target

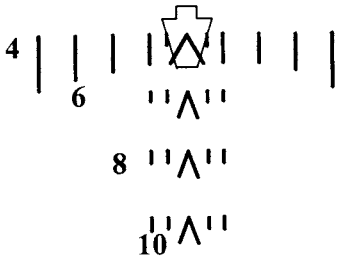


range = 400m
running target

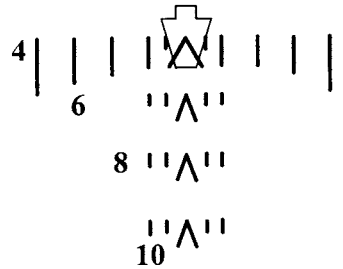
Figure A.13 Examples of aiming for AS and VSS rifles



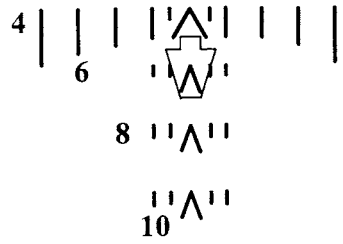
range = up to 400m
half silhouette target



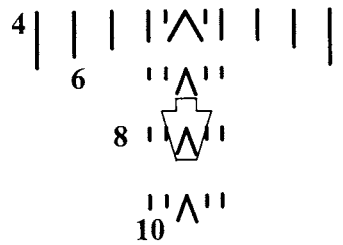
range = up to 400m
running target



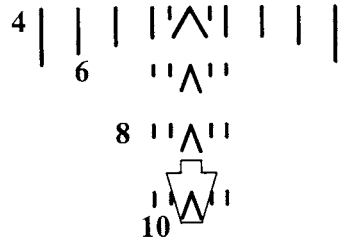
range = 400m
running target



range = 600m
running target

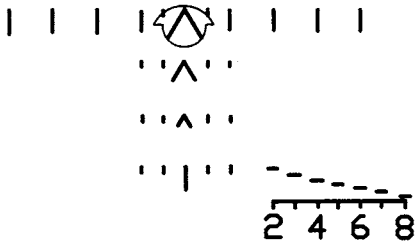


range = 800m
running target

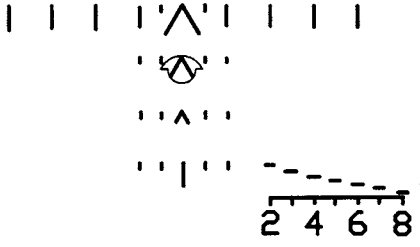


range = 1000m
running target

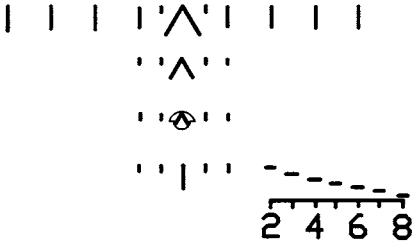
Figure A.14 Examples of aiming for AK-74M and AN-94 rifles



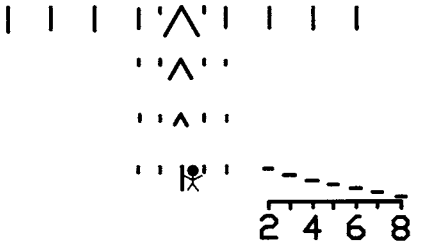
range = 100m prone target



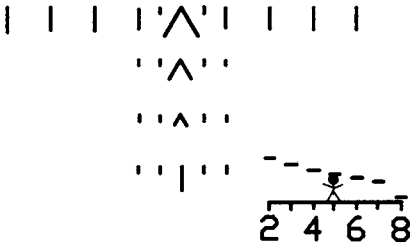
range = 200m prone target



range = 300m prone target



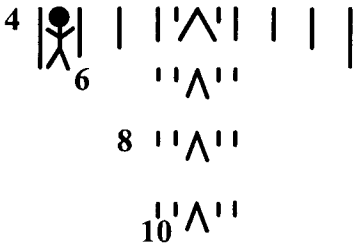
range = 400m running target



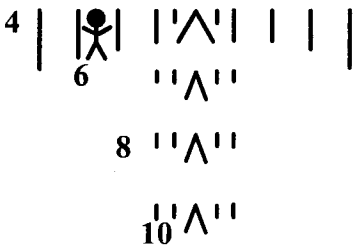
range = 500m running target

Figure A.15 Examples of ranging with aiming reticule for AS and VSS rifles

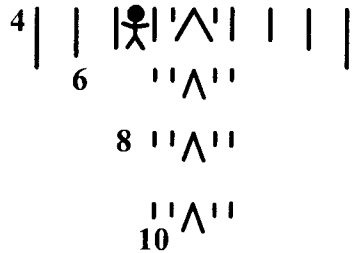
Running target 1.5m



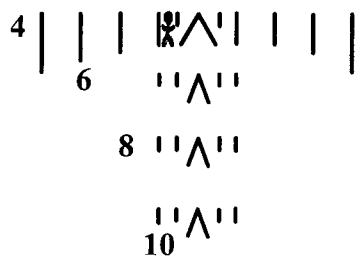
range = 400m



range = 600m

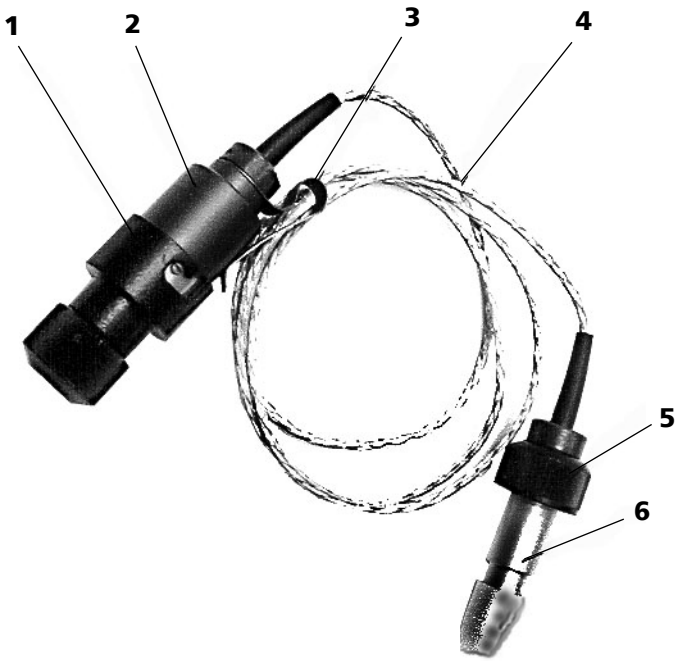


range = 800m



range = 1000m

Figure A.16 Examples of ranging with aiming reticule for AK-74M and AN-94 rifles



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

Figure A.17 External Battery Compartment