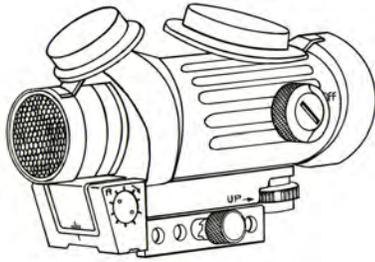


**OPERATOR AND USER MAINTENANCE MANUAL
FOR
M145C TELESCOPE**



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Section I. Equipment Description

ELCAN M145 Straight Telescope Characteristics, Capabilities, and Features

The M145 Telescope is a fixed 3.4 power, 28mm optical sight that has been designed to engage targets accurately out to 1200m range. The optical sight weighs 24 oz. (681 gr) and is extremely rugged for rough field conditions. The sight has an 8.2mm diameter exit pupil, which provides excellent vision in low light levels, i.e. dawn and dusk, and also for rapid target acquisition.

The zeroing adjustment increments in both windage and elevation are 2.5 mm at 10 meters range for each detent (click of movement) and 5 inches at 500 meter range.

The mount is designed to fit to the Picatinny rail MIL.Std. 1913. The optical sight has an eye relief of approximately 3 inches (70mm). Eye relief is the distance between the eye and the sight's rear eyepiece lens.

1-2

The reticle pattern has a built-in trajectory compensation from 300m to 1200m range.

The reticle is illuminated, by a battery and will last, at maximum brightness, for approximately 7 days under continuous operation.

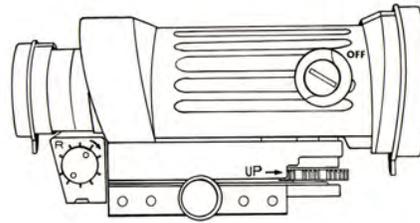
The optical housing of the telescope is purged with dry nitrogen to prevent moisture fogging the internal optics.

The front objective lens is fitted with a Signature Reduction Device (SRD).

These parts are removed by rotating counter-clockwise direction.

ELCAN M145 Machine Gun Optic

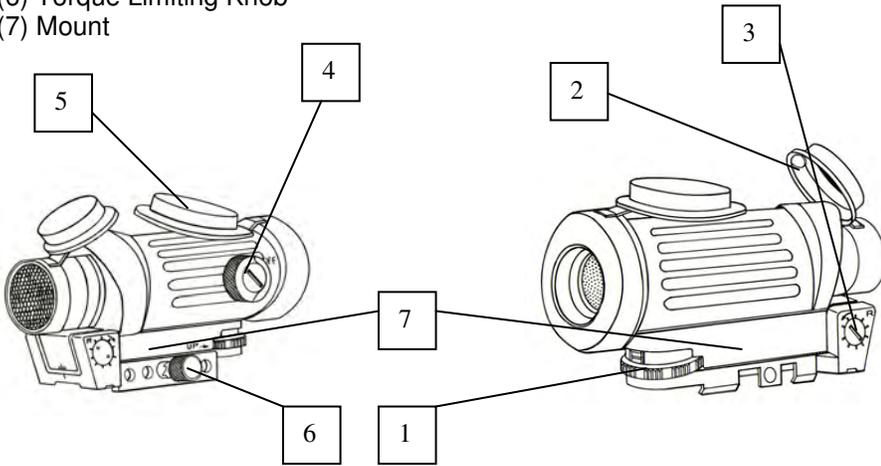
**FRONT-
Signature
Reduction Device
(SRD) and
LASER Filter**



**BACK-
Eyepiece and
firers
viewing end**

Location and Description of Major Components

- (1) Elevation Adjustment Dial
- (2) Front Lens Cover
- (3) Windage Adjustment Knob
- (4) Rotary Reticule Illumination Switch
- (5) Rear Lens Cover
- (6) Torque Limiting Knob
- (7) Mount



Equipment Data

- a. Optics: anti-reflective coated lens system, (28mm) clear objective, x3.4 magnification.
- b. Overall Length: 7 inches (175mm)
- c. Weight (M145) 24.0oz. (681 gr)
- d. Battery Life: 175 hr average (fresh battery). Sight is packed with a new battery from the factory.

Section III. Principles of Operation

The M145 Straight Telescope is a telescopic sight. The telescope magnifies targets by 3 ½ times or it appears to bring the shooter 3 ½ times closer to the target. The telescope will show more clearly the strike of the round and allows more accurate shooting. In low light conditions, the sight will enhance target detection far better than that visible to the naked eye.

Lens covers protect the lenses when the sight is being transported or stored. The lens covers should always be kept closed when the sight is not in use.

The battery cap has an O-ring that keeps out moisture.
With practice you may be able to keep both eyes open. With both eyes open you will be more aware of your surroundings and feel less strain on your eyes.

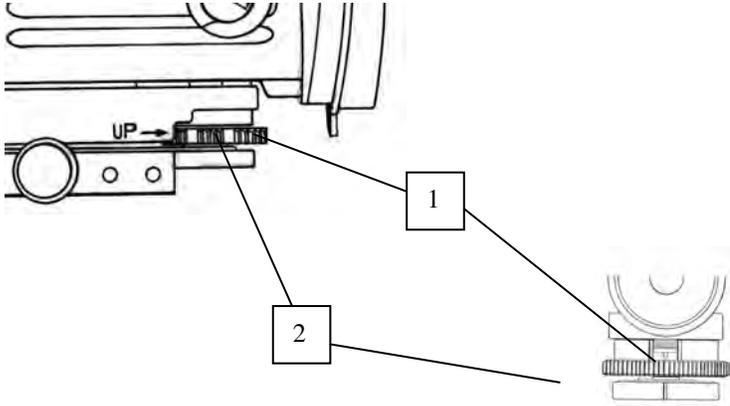
The M145 Straight Telescope must remain matched with the same weapon, attached at the same slot in the rail system, or be re-zeroed.

CHAPTER 2
Operating Instructions

Section I. Description and Use of Operation's Controls and Indications.

2-1. Elevation Adjustment Dial

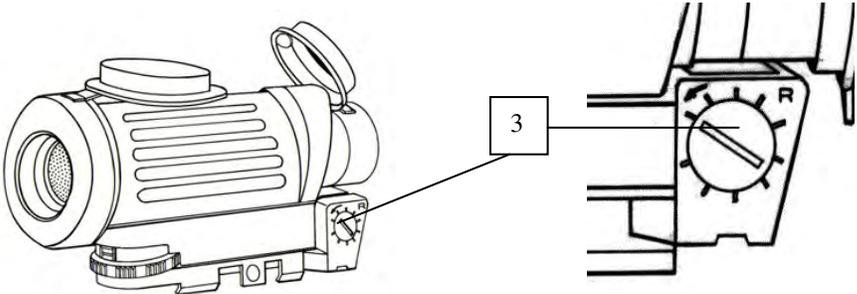
Used for zeroing the telescope to the weapon. The dial can only be rotated when the silver lock (1) is moved to the UP position. Turning the elevation adjustment dial (2) counter clockwise in the direction of the arrows one click moves the point of impact up 2.5mm at 10 meters.



Turning the elevation adjustment dial (2) clockwise (opposite direction to the arrow) one click moves the point of impact down 2.5mm at 10 meters. Ensure that the silver lock (1) is moved down to prevent any further movement of the elevation adjustment dial.

2-2. Windage Adjustment Screw

Used when zeroing weapon. Turning windage adjustment screw (3) clockwise one click moves the point of impact left 2.5mm at 10 meters. Turning windage adjustment screw (3) counter-clockwise one click moves the point of impact right 2.5mm at 10 meters.



Section II. Preventive Maintenance Checks and Services (PMCS).

2-3. General

- a. **Before Operation.** Perform your Before PMCS.
- b. **During Operation.** Perform your During PMCS.
- c. **After Operation.** Perform your After PMCS.
- d. **If your Equipment Fails to Operate.** Troubleshoot. Report any deficiencies using the proper form, see DA PAM 738-750. If you cannot correct it yourself, notify your armorer.

2-4. PMCS Procedures

The PMCS table 2-1 lists those required checks and services to be performed by personnel who use the M145 Straight Telescope.

- a. **Item No. Column.** Checks and services are numbered in disassembly sequence. This column shall be used as a source of item numbers for the "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.
- b. **Interval Column.** This column gives the designated interval when each check is to be performed.
- c. **Item to be Checked or Serviced Column.** This column lists the items to be checked or serviced.

- d. **Procedure Column.** This column contains a brief description of the procedure by which the check is to be performed. It contains all the information required to accomplish the checks and services.
- e. **Not Fully Mission Capable If:** Column. This column contains a brief statement of the condition (e.g. malfunction, shortage) that would cause the covered equipment to be less than fully ready to perform its assigned mission.

Table 2-1. Preventive Maintenance Checks and Services (PMCS)

Item No.	Interval	Item to be Checked Or Serviced	Procedure	Not Fully Mission Capable if:
1	Before After	Sight	Look through the sight. Inspect for visual obstruction of target image, dust, dirt, pits, or moisture on optical surfaces, loose or broken optical elements and fogging/condensation.	These conditions are present and cannot be corrected by cleaning.
2	Before After	Sight	Ensure that battery cap is present and that battery cap's threads are clean and undamaged. Inspect for O-ring and spring in battery cap.	Battery cap, spring, or O-ring missing Unable to install battery cap.

**Table 2-1. Preventive Maintenance Checks and Services (PMCS)
con't**

Item No.	Interval	Item to be Checked Or Serviced	Procedure	Not Fully Mission Capable if:
3	Before	Sight	Ensure that the 300m, 500m, 700m & 800m marks in the reticle are visible when rotary switch is set to one of the operating positions. If necessary, replace battery (para 2-5) and check again.	300m, 500m, 700m & 800 m marks are not visible.
4	Before After	Mount	Check mount for damage that will prevent sight from being installed.	Mount damaged in such a way that sight cannot be installed.

**Table 2-1. Preventive Maintenance Checks and Services (PMCS)
con't**

Item No.	Interval	Item to be Checked Or Serviced	Procedure	Not Fully Mission Capable if:
5	Before After	Sight	Ensure that both lens covers are present and can be snapped in place.	N/A
6	Before During After	Torque Limiting Knob	Ensure Torque Limiting Knob is torqued and tight. Firing every 200 rds, ensure torque limiting knob is tight by turning until you hear two clicks.	Sight is not properly attached and Torqued to The Rail.

**Table 2-1. Preventive Maintenance Checks and Services (PMCS)
con't**

Item No.	Interval	Item to be Checked Or Serviced	Procedure	Not Fully Mission Capable if:
7	Before After	Torque Limiting Shaft	Ensure torque limiting shaft is not loose or bent	Threads not functional and torque limiting shaft loose or bent.
8.	Before After	Sight	Check entire sight for loose or missing Hardware	Hardware not present or secured.
9	Before After	SRD and laser filter	Check that both are present	Hardware not present.
10	Before After	SRD and laser filter	Check for corrosion	Corrosion cannot be cleaned off.

Section III. Operation Usual Conditions

2-5. Assembly And Preparation for Use

- a. Unpacking.
 - (1) Remove M145 Straight Telescope and Technical Manual from shipping carton.
 - (2) Save carton for M145 Straight Telescope storage. Record serial number and warranty expiration date as per Unit SOP.

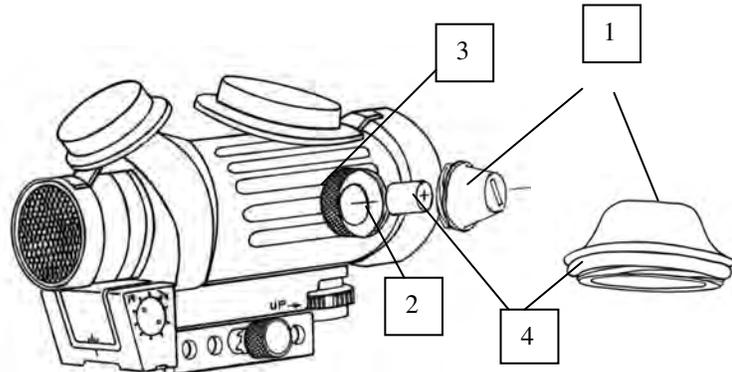
b. Installing and Checking Battery.

- (1) Remove battery cap (1) by turning it counter-clockwise and holding the Rotary Reticle Illumination Switch (3) stationary.

CAUTION

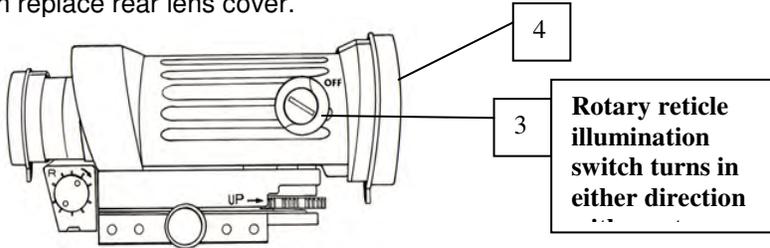
Before installing battery cap, inspect threads on battery housing and battery cap to ensure that they are free of moisture and dirt and that the O-ring (4) in the battery cap (1) is present. Failure to do so could result in loss of electrical power and shorten battery life.

- (2) Insert battery (2) (item 2, Appendix D) with positive (+) end to cap.



CAUTION

- **Before installing battery cap, inspect threads on battery housing and battery cap to ensure that they are free of moisture and dirt and that the O-ring in the battery cap is present. Failure to do so could result in loss of electrical power and shorten battery life.**
 - **Hand tighten battery cap. Using tools to tighten battery cap could damage equipment.**
- (3) Re-install battery cap (1) by holding the Rotary Reticle Illumination Switch (3) stationary turning clockwise until snug. Hand tighten only.
- (4) Open rear lens cover (4). Turn rotary reticle illumination switch (3) and look through rear lens. Verify that the reticle is illuminated. If not, replace battery. When finished, turn rotary switch to OFF position, then replace rear lens cover.



Installing M145 on M249, M240B, & M4

CAUTION

Hand tighten torque limiting knob until you hear two clicks. Using tools to tighten mounting hardware could damage equipment.

NOTE

The M145 Straight Telescope mounts directly to the accessory mounting rail (Picatinny rail) on the M249, and M240B machine guns and M4 Carbine.

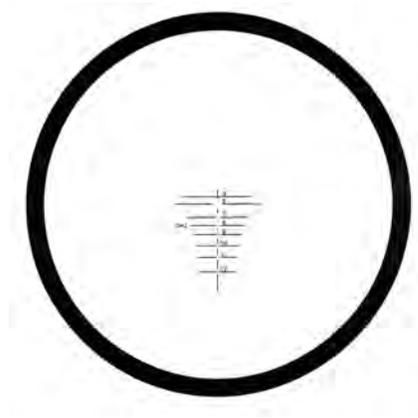
It will be necessary to adjust the position of the M145 Telescope either backwards or forward on the Picatinny Rail in order to achieve the correct eye relief (distance of the eye from the back of the Telescope).

If the same sight is installed in the same position slot on the rail on the same weapon, re-zeroing is not required.

Step 1.

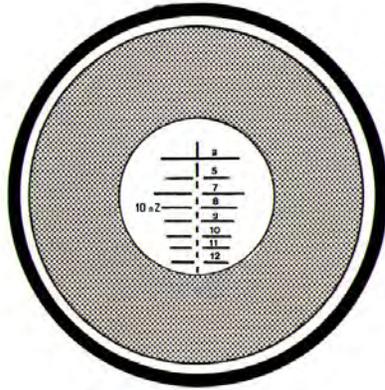
The torque limiting knob should be backed off just enough for the rail grabber to go over the rail. Do not force the torque limiting knob past its intended stop. Mount the M145 straight telescope firmly over the rail. Ensure that the mount is seated squarely over the rail. Tighten the Torque Limiting Knob (clockwise) until it rotates with two clicks. Ensure that the mount is securely fastened before commencing eye relief adjustment. The sight is now mounted to the weapon approx. 3" (70mm) in front of the firing eye. Assume a comfortable firing position and achieve a good stockweld (at trigger pull length) with both eyes closed. Open the sighting eye and compare the view through the scope with the following examples:

If the target scene fills the scope to provide the maximum field of view, the correct eye relief has been attained. See Example 1, below. No further repositioning of the M145 on the Picatinny rail is required.



Example 1.

If the target scene does not fill the sight's field of view, the optical sight must be repositioned on the rail either forwards or backwards (see example 2 – Limited Field of View, Incorrect Eye Relief).



Example 2.

Step 2.

The optical sight must be repositioned for correct eye relief.

Loosen the torque limiting knob and move the optical sight in the appropriate direction (forward or backward) which provides the full field of view.

Repeat Step 1 until the correct sight picture is obtained as shown in Example 1.

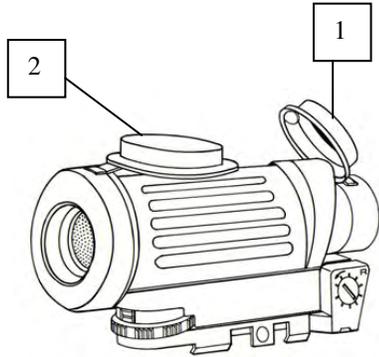
2-6. Operating Procedures

- a. Zeroing the M145 Straight Telescope on the M240B, M249 & M4.

Zeroing the M145 Straight Telescope aligns the sight to the barrel of the machine gun so that point of aim equals point of impact.

NOTE

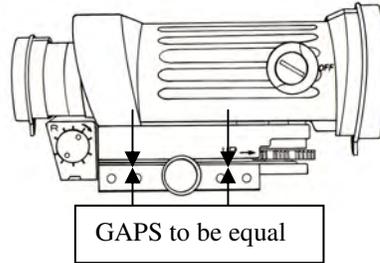
- Adjustment of the M145 Straight Telescope is centered at the factory.
- (1) Open front (1) and rear (2) lens covers. Turn each cover inside out to stow the lens covers while the sight is being used.



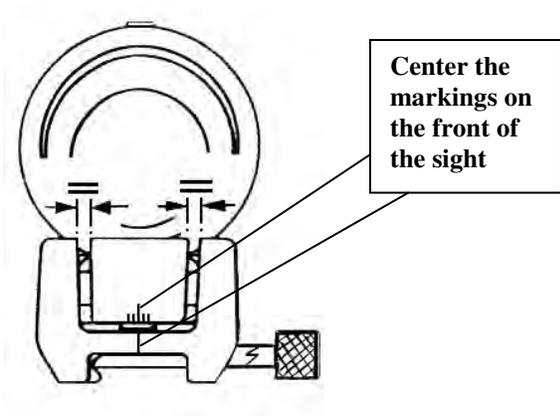
Set the M145 Straight Telescope to Mechanical Zero

(1) Adjust the Straight Telescope so that the weapon's barrel and optical sighting axis are in approximate alignment. The sighting axis will be approx. 2-3 inches above the machine gun barrel and therefore the strike of the bullet at 10m range will also be approx. 2-3 inches low without further zeroing adjustment.

GAPS equal
then the sight
is in approx.
alignment



To bring the strike of the bullet up, lift the silver lock and rotate the elevation adjustment dial counter clockwise (to the right) approximately one full turn.

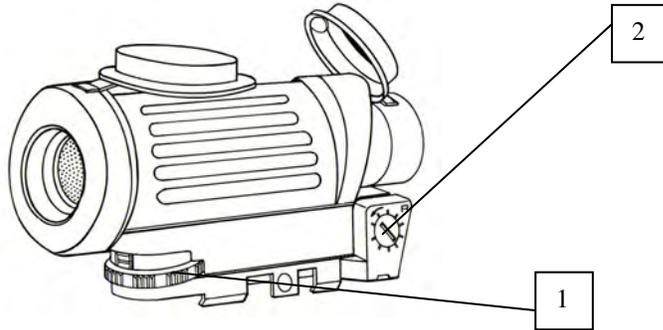


(2) Adjust the Windage Dial to center the markings on the front of the sight. This will bring the bullets point of impact to the middle of the point of aim.

NOTE

Each click of the zeroing adjustments makes a 2.5mm movement of the point of impact at 10 m.

- (a) To move the point of impact to the right, turn windage adjustment screw (2) counterclockwise with the arrow marked on the dial.
- (b) To move the point of impact to the left, turn windage adjustment screw (2) clockwise opposite to the arrow.
- (c) To move point of impact up, turn elevation adjustment screw (1) counterclockwise (right) with the direction of the arrow marked and "UP".
- (d) To move the point of impact down, turn elevation adjustment screw (1) clockwise (left) opposite to the arrow.

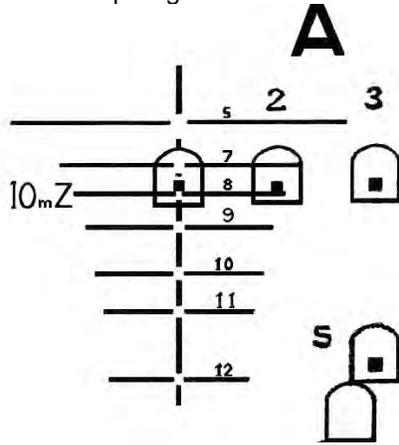


2-20

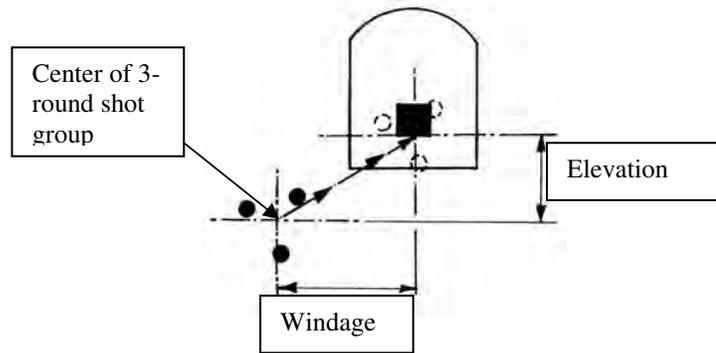
For M240B/M249 Reticles: 10m Range Zeroing

In the zeroing process, groups of three single shot rounds are fired at a target. After each three rounds, the center of the group has to be determined.

1. Look through the telescope and align the reticle's **10mZ zeroing** mark on the center base of the aiming points on the basic machine gun marksmanship target.



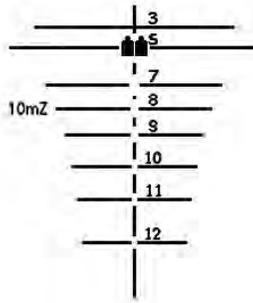
2. Fire three single rounds loaded individually without making any sight adjustments.
3. The three round shot group should be within a 4cm circle to establish the center of shot group in relation to the center base of the aiming paster.
4. Measure the amount of movement required left or right (windage) and either up or down (elevation) to move the three round-shot group onto the center of the aiming paster.
5. Windage correction: upon completion, return to the firing line to make corrections to the weapon and re-fire a three round-shot group to confirm zero.



Repeat the above steps 1-5 until the strike of the round is coincident with the center of the target. Close the silver lock down to prevent any further movement of the elevation zeroing adjustment dial. The M145 Straight Telescope is now 10m zeroed.

Field zero at 500m Range

1. Look through the telescope and align the reticle's **500m** mark on the center of mass of the double "E" silhouette target:



2. a) M240B weapon = Fire a 6 to 9 round burst.
b) M249 weapon = Fire a 5-7-round burst.
3. Observe impact of rounds
4. Determine direction of impact to be moved (up or down, left or right).
5. Estimate or measure the amount of movement required to move the strike of the round to the center of the target (at 500 meters; five inches equals one click of adjustment in both windage and elevations).

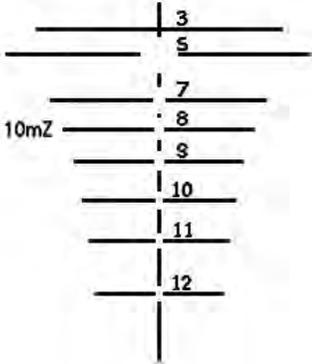
2-24

Repeat the above steps 1-5 until the strike of the round is coincident with the center of the target. NOTE: Close the silver lock down to prevent any further movement of the elevation zeroing adjustment dial.

The M145 Straight Telescope is now zeroed and ready for operational shooting.

Reticle

The vertical gap in the stadia lines is for estimating ranges. The height of gaps in the stadia lines represents a 60" high target at the range noted i.e. 5, 7, 8, 9, 10, 11, or 1200 meters.



Reticle Illumination.

For low light operations, the reticle can be illuminated to show the 300m, 500m, 700m & 800m aiming marks.



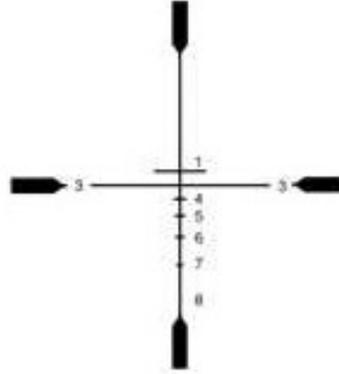
NOTE

Sight is equipped with variable intensity LED illumination of the reticle. It has 10 positions: one OFF position and 9 positions for different reticle intensity settings.

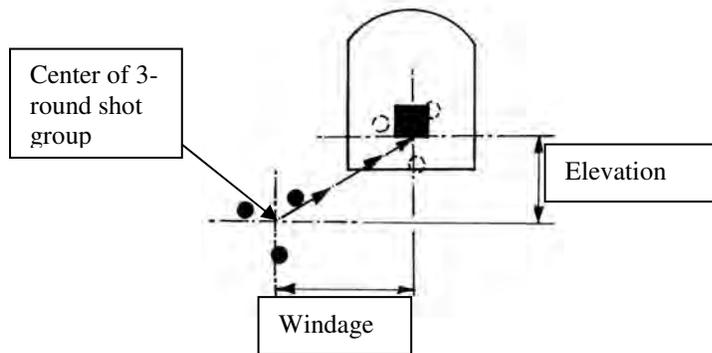
For M4 Reticles: 100m Range Zeroing

In the zeroing process, groups of three single shot rounds are fired at a target. After each three rounds, the center of the group has to be determined.

1. Look through the telescope and align the reticle's **100m zeroing** mark on the center base of the aiming points on the basic rifle marksmanship target.



2. Fire three single rounds carefully without making any sight adjustments.
3. The three round shot group should be within a 4cm circle to establish the center of shot group in relation to the center base of the aiming paster.
4. Measure the amount of movement required left or right (windage) and either up or down (elevation) to move the three round-shot group onto the center of the aiming paster.
5. Windage correction: upon completion, return to the firing line to make corrections to the weapon and re-fire a three round-shot group to confirm zero.



Repeat the above steps 1-5 until the strike of the round is coincident with the center of the target. Close the silver lock down to prevent any further movement of the elevation zeroing adjustment dial. The M145 Straight Telescope is now 100m zeroed.

Field zero at 300m Range

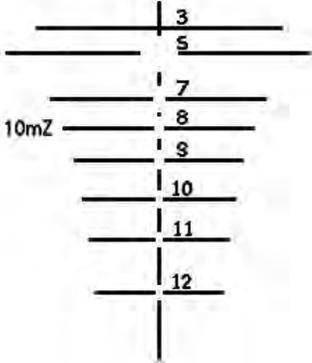
1. Look through the telescope and align the reticle's **300m** mark on the center of mass of the "E" silhouette target:
2. Fire a 6 to 9 round group.
3. Observe impact of rounds.
4. Determine direction of impact to be moved (up or down, left or right).
5. Estimate or measure the amount of movement required to move the strike of the round to the center of the target (at 300 meters; three inches equals one click of adjustment in both windage and elevations).

Repeat the above steps 1-5 until the strike of the round is coincident with the center of the target. NOTE: Close the silver lock down to prevent any further movement of the elevation zeroing adjustment dial.

The M145 Straight Telescope is now zeroed and ready for operational shooting.

M240B/M249 Reticle

The vertical gap in the stadia lines is for estimating ranges. The height of gaps in the stadia lines represents a 60" high target at the range noted i.e. 5, 7, 8, 9, 10, 11, or 1200 meters.



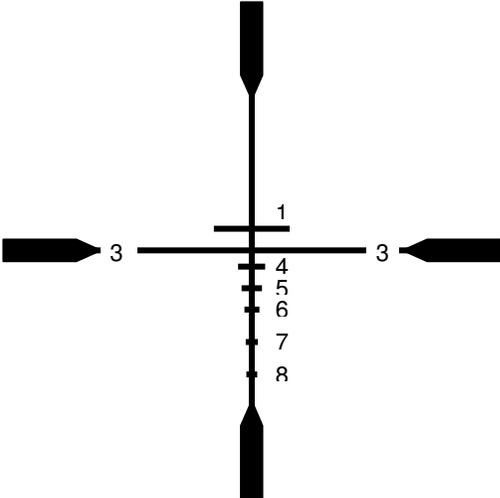
M240B/M249 Reticle Illumination.

For low light operations, the reticle can be illuminated to show the 300m, 500m, 700m & 800m aiming marks.



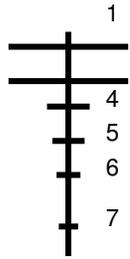
M4 Reticle

The horizontal width of the stadia lines is for estimating ranges. The width of horizontal hash mark in the stadia lines represents a 19" wide target at the range noted i.e. 1, 4, 5, 6, 7, or 800 meters.



M4 Reticle Illumination.

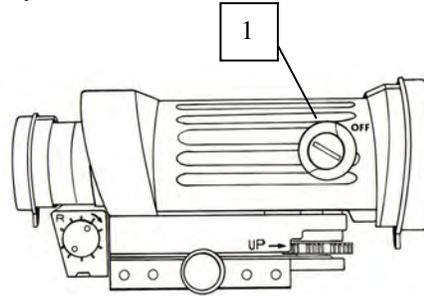
For low light operations, the reticle can be illuminated to show the 100m, 300m, 400m, 500m, 600m & 700m aiming marks.



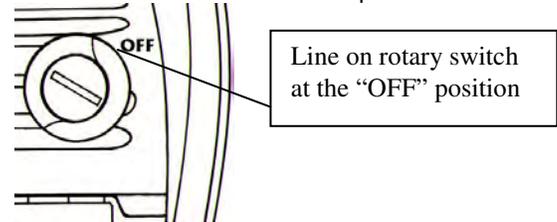
NOTE

Sight is equipped with variable intensity LED illumination of the reticle. It has 10 positions: one OFF position and 9 positions for different reticle intensity settings.

- (1) To make reticle illumination adjustments, turn rotary switch (1) clockwise. The intensity of the illumination increases the further the switch is turned.



- (2) Turn rotary switch to OFF position when the telescope is being used during normal daylight or when illumination is not required.



NOTE

Ensure the reticle illumination switch is turned to the **OFF** position when not required.

2-7. Lens Cleaning Procedures

- a. Remove large particles from exposed lens surfaces by first blowing on the surfaces. Blow as much dust and dirt as possible from the exposed lens surfaces. Gather the center of a sheet of lens paper (item 3, Appendix D), and use the edges to brush dust from the front and back lens.
- b. Remove mud using Optical Lens Cleaning Compound (item 1, Appendix D) or by splashing water onto the lens.
- c. When all visible particles of dust and dirt have been removed, moisten a piece of lens paper, then gently wipe over the lens surface. Dry with clean lens paper (item 3, Appendix D).

Section IV. Operation Under Unusual Conditions

2-8. Unusual Environments and Weather

WARNING

Two or more batteries stored together, without individual packaging, can short out and lose all their power.

- a. Extreme Cold. Extreme cold will shorten battery life. Keep spare batteries in a non-conductive container in your inner pockets to keep them warm. If the M145 Straight Telescope is brought from cold to warm, wipe off condensation after it has warmed up.
- b. Extreme Heat (Moist and Dry). No special procedures required.
- c. Salt Air. No special procedures required.
- d. Sea Spray. Ensure that battery cap is tight before exposing the sight to water or sea spray. Hand tighten only. Keep lens caps closed when sight is not being used. Clean lens (Para 2-7) with lens paper (Item 4, Appendix D) and dry sight with a cloth as soon as possible after being exposed to water or sea spray.
- e. Dust Storms and Sandstorms. Keep lens caps closed when sight is not being used.
- f. High Altitudes. No special procedures required.

Section IV. Operation Under Unusual Conditions (con't)

- g. Mud and Snow. Ensure that battery cap is tight before exposing the sight to mud or snow. Hand tighten only. Keep lens caps closed when sight is not being used. Clean lens (Para 2-7) with lens paper (Item 4, Appendix D) and dry sight with a cloth as soon as possible after being exposed to mud or snow. Try to acclimatize the MGO to the environment prior to mission usage to minimize fogging of external surfaces.
- h. Water. Ensure that battery cap is tight before immersing the sight in water. Hand tighten only. Keep lens caps closed when sight is not being used. Clean lens (Para 2-7) with lens paper (Item 3, Appendix D) and dry sight with a cloth as soon as possible after being immersed in water.

2-39/(2-40 blank)

CHAPTER 3
Maintenance Instructions

Section I. Lubrication Instructions

No lubrication is required.

Section II. Troubleshooting Procedures

3-1. General

Table 3-1 lists common malfunctions that you may find with your sight. Perform the tests, inspections, and corrective actions in the order they appear in the table.

Table 3-1 cannot list all of the malfunctions that may occur, all of the tests and inspections needed to find the fault, or all of the corrective actions needed to correct the fault. If the equipment malfunction is not listed or the actions listed do not correct the fault, notify your armorer.

NOTE:

The M145 Straight Telescope uses lithium-manganese dioxide batteries which, when depleted, are to be disposed of in accordance local regulation. Certain states identify lithium-manganese dioxide batteries as hazardous waste, these states are currently Alaska, California, Minnesota, Rhode Island, and Washington.

Table 3-1. Troubleshooting

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Reticle does not illuminate.

Battery installed incorrectly.

- Remove and reinstall battery (para 3-2).

2. Wrong type of battery

Replace battery (para 3-2).

3. Dead battery

Replace battery (para 3-2).

4. Battery not making good contact.

Remove battery cap and battery. Clean threads on battery cap and battery housing, then reinstall battery (para 3-2).

5. Battery cap spring missing.

Notify dealer.

6. Defective rotary switch.

Notify dealer.

7. View through the sight is not clear
 - Remove SRD and check for dirt or condensation on the objective lens.

8. Elevation or Windage Adjustment inoperable.
 - Notify dealer
 -

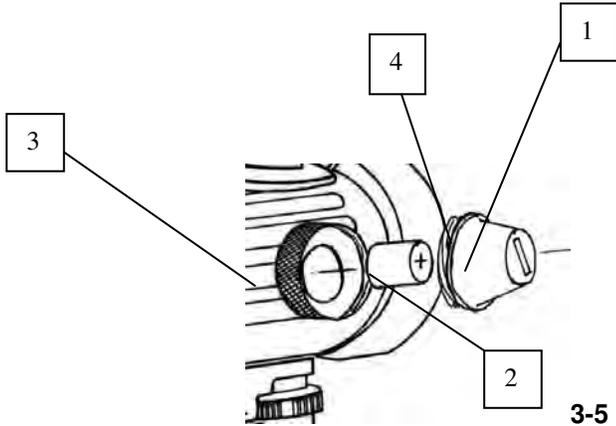
Section III. Maintenance Procedures

3-2. Battery Replacement and Check (Unit Maintenance)

Installing and Checking Battery.

Remove battery cap (1) by turning it counter-clockwise and holding the Rotary Reticle Illumination Switch (3) stationary.

Insert battery (2) with positive (+) end to cap.



3-5

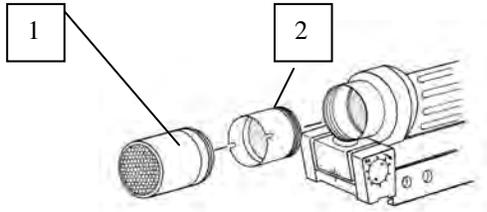
CAUTION

- **Before installing battery cap, inspect threads on battery housing and battery cap to ensure that they are free of moisture dirt and that the O-ring inside battery cap is present and properly seated. Failure to do so could result in loss of electrical power and shorten battery life.**
 - **Tighten battery cap, and hold knurled portion of knob stationary.**
- a. Open rear lens cover (3). Turn rotary switch clockwise and look through rear lens. Verify that reticle is illuminated. If not, replace battery. When finished, turn rotary switch to OFF position, then close rear lens cover.

3-3 Signature Reduction Device Maintenance)

Remove the Signature Reduction Device (SRD) (1) by rotating in a counter clockwise direction. Item (2) in illustration is a laser filter, only available to military users.

The SRD can be cleaned by running water through the honeycomb directly from a faucet. Shake out excess water and leave to dry.



WARNING

Removal of the SRD could lead to your detection by others in your area of operation.

