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# Night Vision Monocular

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## User Manual



# SAFETY SUMMARY

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## **CAUTIONS**

- The NIGHT VISION MONOCULAR is precision optical instruments and must be handled carefully at all times to prevent damage.
- Do not scratch the external lens surfaces or touch them with your fingers.
- Wiping demisting shield with lens paper while wet or with wet lens paper can damage the coating.
- To protect the image intensifier, keep the lens cap on the objective lens when the monocular is not in use or when checked out in daylight conditions.
- The IR illuminator is the light that is invisible to the unaided eye for use during conditions of extreme darkness. However, the light from the illuminator can be detected by others when using night vision devices.
- If you use the rubber eyecups for a long period of time, you may suffer skin inflammation. If you develop any symptoms, consult a doctor immediately.

## **WARNING**

Do not carry batteries in pockets containing metal objects such as coins, keys, etc. Metal objects can cause the batteries to short circuit and become very hot.

This product contains natural rubber latex which may cause allergic reactions.

## **WARNING**

### **Toxic Material**

The image intensifier's phosphor screen contains toxic materials.

- If an image intensifier breaks, be extremely careful to avoid inhaling the phosphor screen material. Do not allow the material to come in contact with the mouth or open wounds on the skin.
- If the phosphor screen material contacts your skin, wash it off immediately with soap and water.
- If you inhale/swallow any phosphor screen material, drink a lot of water, induce vomiting, and seek medical attention as soon as possible.

## **WARNING**

The monocular will not be turned off automatically when flipped up. The monocular must be turned off by the power switch.

## **WARNING**

Do not use contaminated eyecup or eyeguard. they must be replaced.

## **WARNING**

When installing the head mount over the protective mask, be careful not to break the protective mask seal around your face.

## Equipment limitations

To avoid physical and equipment damage when using the NIGHT VISION MONOCULAR, carefully read and understand the following safety precautions.

- The equipment requires some night light (moonlight, starlight, etc.) to operate. The level of performance depends upon the level of light.
- Night light is reduced by passing cloud cover, while operating under trees, in building shadows, etc.
- The equipment is less effective viewing into shadows and other darkened areas.
- The equipment is less effective through rain, fog, sleet, snow or smoke.
- The equipment will not “see” through dense smoke.

### NOTES

- At operating temperatures below -20°C (-4°F), alkaline batteries are not recommended, as operating life will be severely reduced. Lithium-ion disulfide 1.5V AA batteries or equivalent should be used below -20°C (-4°F).
- The purpose of the illuminator is to view at close distance up to 3 meters when additional illumination is needed.

### CAUTION

- The NIGHT VISION MONOCULAR is a precision optical instrument and must be handled carefully at all times to prevent damage.
- Be careful when leaving the helmet mount in the flipped up position or removing the helmet mount from the helmet, damage can result.



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# CHAPTER 1

## INTRODUCTION

### 1.1. General information

#### 1.1.1. SCOPE

This manual provides operation and maintenance instructions for the Night Vision Monocular (NVM) hereinafter referred to as the NVM. The NVM is a self-contained night vision device that enables improved night vision using ambient light from the night sky (moon, stars, skyglow, etc.).

#### **Model Number and basic description**

Night Vision Monocular

#### 1.1.2. WARRANTY INFORMATION

This item shall conform to design, manufacturing, and performance requirements and be free from defects in material and workmanship for a period of \_\_\_\_\_ from the date of acceptance. If item is defective, notify seller or point of purchase contact.

#### 1.1.3. TECHNICAL INFORMATION

For technical information contact directly at your point of purchase contact.

#### 1.1.4. NOMENCLATURE CROSS-REFERENCE LIST

Table 1.1. Provides a cross reference of common names and official terms. except in the appendices, the common names will be used. The official names are used in the appendices because they reflect the provisioning nomenclature.

**TABLE 1.1. NOMENCLATURE CROSS-REFERENCE LIST**

Battery	Battery no rechargeable
Battery Cap	Cover Battery retainer
Carrying Case	Case, Infrared equipment
Carrying Case Strap	Strapping
Demist Shield	lens, Infrared receiver
eyeguard	eyeguard, optical
eyepiece lens Cap	Cap, protective, Dust
Head mount	Headset assembly
Head mount/Helmet Mount adapter	adapter, Headset
Helmet Mount	Mount, Viewer
LIF	Filter, Infrared light
Medium Browpad	Browpad assy, Medium
Monocular	Monocular assy
neck Cord	Cord, Fibrous
objective lens Cap	Cap, protective, Dust
Sacrificial Window	Window, Sacrificial
Shipping and Storage Case	Case, Shipping /Storage
tethering Cord	Clip, retaining
thick Browpad	Browpad assy, thick
thin Browpad	Browpad assy, thin
3X Magnifier	Magnifier lens assembly
Weapon Mount	Bracket, Mounting

### 1.1.5. Glossary

**Black Spots** - These are cosmetic blemishes in the image intensifier of the NVM or dirt or debris between the lenses.

**Bright Spots** - These defects can appear in the image area of the NVM. this condition is caused by a flaw in the film on the micro channel plate. a bright spot is a small, nonuniform, bright area that may flicker or appear constant. Bright spots usually go away when the

light is blocked out and are cosmetic blemishes that are signal induced.

Browpads - Three hook-and-pile browpads are provided to adjust the head mount to fit different head sizes. The thin browpad (large head) comes attached to the head mount and the thick (small head) or medium browpads are stored in the carrying case.

Caution - Condition, practices, or procedures that must be observed to avoid damage to equipment, destruction of equipment, or a long-term health hazard.

Chicken wire - An irregular pattern of dark thin lines in the field-of-view either throughout the image area or in parts of the image area. Under the worst case condition, these lines will form hexagonal or square-wave shaped lines.

Dark (or Dark area) - A place in which there is very little light. It does not mean total darkness. Generally, this means conditions similar to a quarter-moon or starlit night.

Dark adapted - Having ones eye adjusted to the Mon ocular's output under low light conditions.

Diopter - A unit of measure used to define eye correction. adjustments to the diopter adjustment will provide a clearer image in each eye.

Edge glow - This is a defect in the image area of the monocular. edge glow is a bright area (sometimes sparkling) in the outer portion of the viewing area.

Emission point - a steady or fluctuating pinpoint of bright light in the image area and does not go away when all light is blocked from the objective lens of the monocular. The position of an emission point within the image area of the monocular does not move. An emission point should not be confused with a point light source in the distance.

Fixed-pattern noise - this is a cosmetic blemish in the image area characterized by a faint hexagonal (honeycomb) pattern throughout the viewing area that most often occurs at high light levels or when viewing very bright lights. Fixed-pattern noise is in-herent in the structure of the fiber optics and can be seen in every image intensifier if the light level is high enough.

Flashing - this is a defect in the image area of the monocular. The image appears to flicker or flash.

Flickering - See “Flashing”

Gain - this is the number of times a night vision device amplifies light input.

Image Intensifier - an electro-optical device that detects and amplifies ambient light to produce a visual image.

Infinity focus - adjustment of the objective lens so that a distant object, such as a star or the point light on a distant tower, forms the sharpest image.

Intermittent operation - this is a defect in the image area of the monocular. See “flashing”.

IR source - This is an IR Light Emitting Diode (LED). When turned on, the IR source provides additional illumination to enhance existing light conditions used only for performing nearby tasks.

Micro channel plate - a current-multiplying optical disk that intensifies the electron image produced by the photocathode.

Photocathode - the input optic of an image intensifier that absorbs light energy and in turn releases electrical energy in the form of an electron image.

Scintillation - a faint, random, sparkling effect throughout the image area. Scintillation is a normal characteristic of the image intensifier and should not be confused with emission points. Scintillation is more pronounced under low light conditions. Also called “video noise”.

Shading - the viewed image should be a full circle. If shading is present, you will not see a fully circular image. Shading is indicative of a dying photocathode and is caused by a defective vacuum seal of the image intensifier. Shading is very dark and you cannot see an image through it.

Warning - Conditions, practices, or procedures that must be observed to avoid personal injury or loss of life.

## **1.2 Equipment Description**

### **1.2.1. Equipment characteristics, capabilities, and features**

The NVM is a hand-held, head mounted, helmet mounted, or weapon mounted night vision system that enables walking, weapon firing, short-range surveillance, map reading, vehicle maintenance, and administering first aid in both moonlight and starlight. Each unit allows for vertical adjustment (by using head strap), fore-and-aft adjustment, objective lens focus and eyepiece focus. The monocular is also equipped with an IR source and a low battery indicator. The NIGHT VISION MONOCULAR model equipped with a manual gain control.

### **1.2.2. Location and description of major components**

The NVM can include the items shown in Figures 1.1., 1.2.; the major components are the head mount, helmet mount, monocular, carrying case, and the shipping and storage case.

#### **a. Monocular**

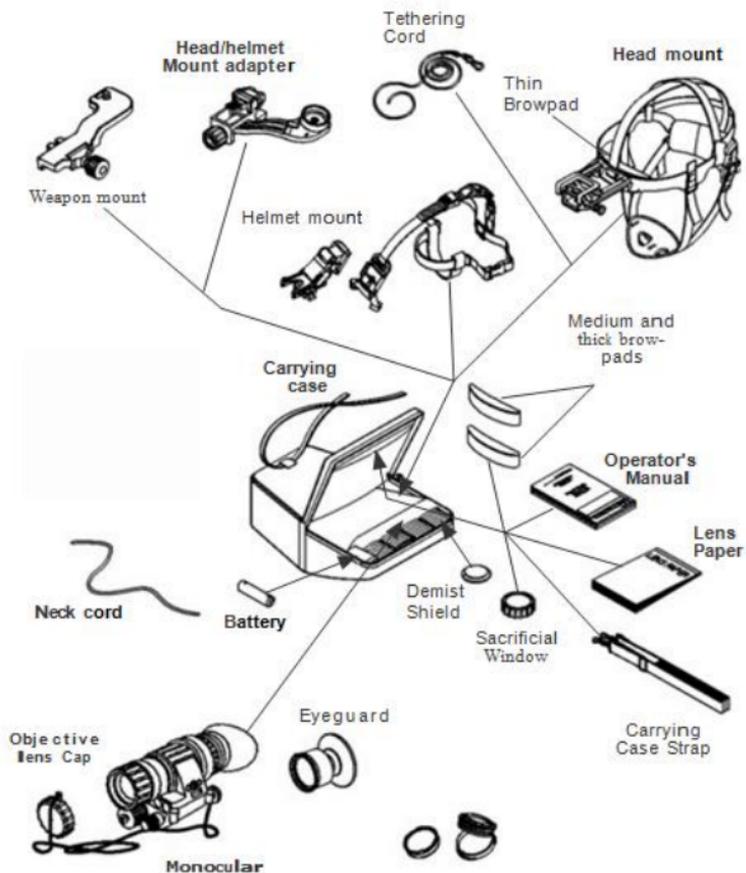
The monocular (see Figure 1.4.) consists of various components such as an objective lens, an image intensifier (not shown), an eyepiece lens and a battery cap.

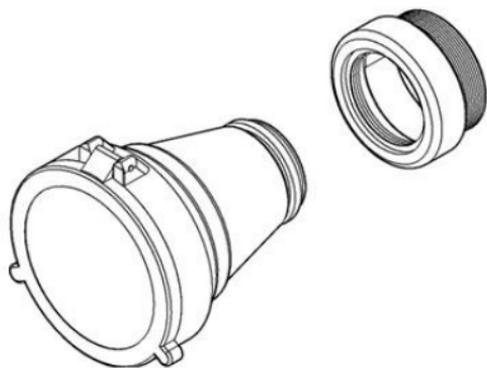
The monocular also uses the accessories listed below:

Demist Shield – the demist shield (Figure 1.1.) is used to prevent the eyepiece lenses from becoming fogged.

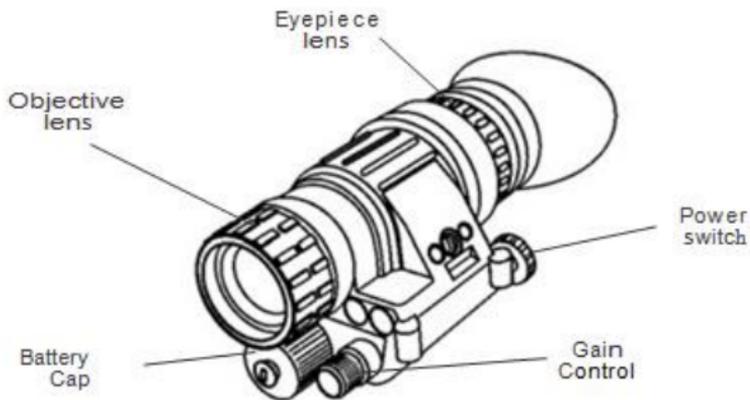
Sacrificial Window – Are place able sacrificial window (Figure 1.1.) is supplied to protect the objective lens during operation in adverse conditions.

**FIGURE 1.1. COMPONENTS OF NVM**





**FIGURE 1.2. 3X Magnifier for NIGHT VISION MONOCULAR**  
(Optional Item)



**FIGURE 1.4. MULTI-USE NIGHT VISION MONOCULAR**

## **b. Head mount**

The head mount (Figure 1.1.) secures the monocular to the operator's head for night viewing and provides freehand support for use with a weapon, protective mask or other purposes. It is adjustable and cushioned. The thin browpad used for large heads, comes attached to the head mount; the thick and medium browpads, used for smaller heads are stored in the carrying case.

## **c. Helmet Mount (optional item)**

This item (Figure 1.1.), secures the monocular to the Personal Armor System Ground Troops (PASGT) helmet allowing freehand support for use with a weapon, protective mask and /or other purposes. The new helmet mount is made of a ruggedized metal. The old one is made of plastic

## **d. Head mount / Helmet Mount Adapter**

This item (Figure 1.1.) is attached to the monocular to allow its use with the head mount or helmet mount. It allows mounting in front of the left or right eye.

## **e. Weapon Mount (optional item)**

The weapon mount (Figure 1.1.) adapts the monocular to the receiver rail as configured for the modular weapon system kit.

## **f. Carrying Case**

The carrying case is provided for transportation and protection of the monocular, head mount, battery and accessories.

### 1.2.3. Equipment data

The following tables provide information pertaining to the operational, electrical, mechanical, optical, and environmental characteristics for the monocular.

TABLE 1.2. OPERATOR ADJUSTMENT LIMITS

ITEM	LIMITS
Diopter Focus	+2 to -6 diopters
objective Focus	25 cm to infinity

TABLE 1.3. ELECTRICAL DATA

ITEM	DATA
power Source	Battery (1.5 V max ea.)
Battery requirements	1 AA alkaline or 1 AA 1.5 V Lithium L91

TABLE 1.4. MECHANICAL DATA

ITEM	CHARACTERISTICS
Monocular (see note)	Weight: 350 g.

#### **NOTE**

Weight of the monocular does not include accessories.

TABLE 1.5. OPTICAL DATA

ITEM	DATA
Magnification	X1
Field-of-View	40°
Diopter Focus	+2 to - 6 diopters
objective Focus	25 cm to infinity

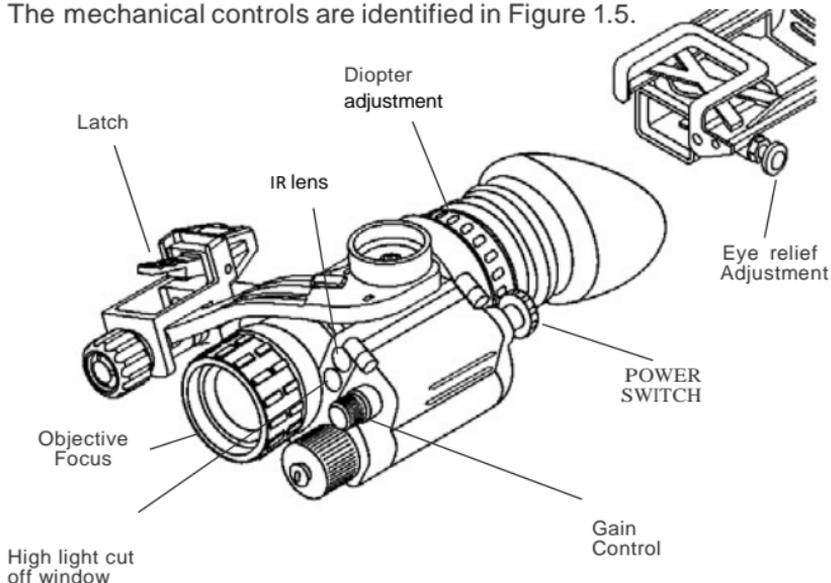
TABLE 1.6. ENVIRONMENTAL DATA

ITEM	DATA
Monocular operating temperature	-51°C to +49°C
Monocular Storage temperature	-51°C to +85°C

## 1.3. Principles of operation

### 1.3.1. Mechanical functions

The mechanical functions of the NVM allow for differences in the physical features of individual operators and provide for operating the system. These functions include the power switch, eye relief adjustment, diopter adjustment, gain control, and objective focus. The mechanical controls are identified in Figure 1.5.



**FIGURE 1.5. MECHANICAL FUNCTIONS FOR THE NVM**

# CHAPTER 2

## OPERATING INSTRUCTIONS

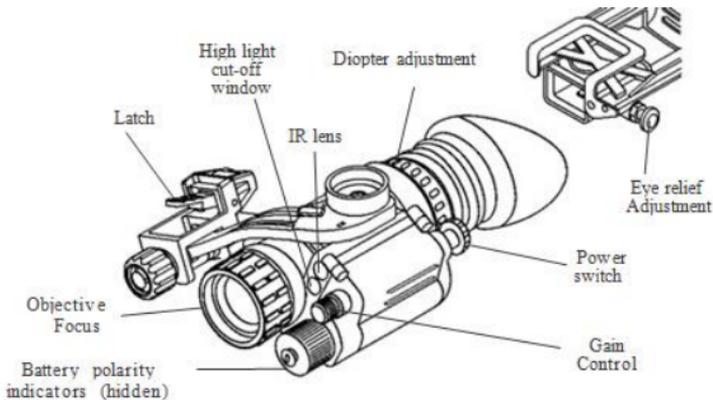
### 2.1. Description and use of operator's controls and indicators

#### **NOTE**

The NVM is a precision electro-optical instrument, so handle it carefully. If the equipment fails to operate, refer to the Troubleshooting Procedures in Chapter 3.

#### **2.1.1. Operator controls and indicators**

The NVM is designed to adjust for different users and corrects for most differences in eyesight. The controls and indicators for the NVM are shown in Figure 2.1., which are described in table 2.1.



**Figure 2.1. Monocular Controls and Indicators**

#### **NOTE**

Low battery and IR indicators are visible in eyepiece lens.

**TABLE 2.1. Monocular controls and indicators**

<b>CONTROLS AND INDICATORS</b>		<b>FUNCTIONS</b>
power Switch	Controls monocular and IR source, on or off	
	reset/ off	Same as system off. also resets monocular after high light cut-off.
	On	Monocular activated.
	IR/ pull	Turn the knob clockwise to momentarily activate the IR source. Pull and turn the knob clockwise from the on position to continuously activate their source.
<b>CAUTION</b>		
<b>Do not use excessive force to place the power switch into the momentary IR position.</b>		
low Battery Indicator	When blinking it indicates a low battery condition with less than 30 minutes of battery life remaining. It is visible through the eyepiece just outside the intensified field-of-view.	
IR Source on Indicator	When red, it indicates that IR is turned on. It is visible through the eyepiece just outside the intensified field-of-view.	
Gain Control	adjusts the system gain from a minimum value of approximately 25 to a maximum value greater than 3,000.	
Objective Focus	Focuses objective lens. Adjusts for sharpest image of viewed object.	
Diopter adjustment	Focuses eyepiece lens for use without the need for glasses. Adjust for sharpest image of intensifier screen.	
eye relief adjustment	Adjusts the distance between your eye and the monocular.	
latch	Latch used for separation of monocular from head- mount/helmet mount adapter.	
Battery polarity Indicators	This feature, molded into the battery housing, shows the proper orientation of the battery. Some versions have a bubble molded into the top of the battery house, to show the + for proper orientation.	

## **2.2. Preventive maintenance checks and services**

### **2.2.1. Preventive maintenance checks and services table**

#### **a. General**

To ensure the readiness of the NVM, perform the preventive maintenance procedures in accordance with table 2.2., prior to each mission. Preventive maintenance procedures include inspection, cleaning, and performance of the checkout procedures.

#### **b. Warnings and Cautions**

Always observe the WARNINGS and CAUTIONS appearing in the table. Warnings and cautions appear before applicable procedures. You must observe the warnings and cautions to prevent serious injury to yourself and others, or to prevent your equipment from being damaged.

#### **NOTE**

Damaged accessory items (sacrificial window, demist shield, compass) do not cause the entire end item to be “not fully mission capable”. However, the damaged item should be replaced as soon as practical to restore full capability of the system.

**TABLE 2.2. Preventive maintenance checks and services for the NVM.**

ITEM NO.	INTER - VAL	LOCATION CHECKS/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
1	Before		open carrying case and check the inventory items	
2	Before/ after	<u>MONOCULAR</u> optical Surfaces	Inspect all lenses (objective, eyepiece, IR lens and high light cut-off window) for dirt, fingerprint residue, chips, or cracks. If necessary, clean and dry lenses with water and lens tissue.	Scratches or heavy scratches that hinder vision with monocular turned on, or if cracks are present.
3	Before/ after	Battery Cap Housing	Inspect external surfaces for cracks or damage. Scratches, cracks, and gouges are OK if operation is not affected. Inspect battery compartment. Check to make sure battery cap is present. Remove battery cap and inspect for moisture, cracks, corroded or defective spring contacts, and O-ring present in cap.	Cracks or damage in the battery housing.  Cap is missing, contacts damaged, or corroded, o-ring is missing.

ITEM NO.	INTERVAL	LOCATION CHECKS/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
3. Cont.	Before/ after	Battery Cap/ Housing Cont.	<p>Remove battery and turn the power switch from reset/off to on to IR/pull. Each position should have a definite stopping point. Inspect for broken or missing knob.</p> <p>Install battery per paragraph 2.6. And check IR source (and momentary IR source, if so equipped) functions by following the operating instructions in paragraph 2.22.</p> <p>Check the high light cut-off with daylight or bright room light (not fluorescent light) by placing the lens cap on the objective lens. Turn monocular on and observe that the system cuts off within <math>70 \pm 30</math> seconds.</p>	<p>Power switch has no definite stopping points or knob is broken or missing. IR source does not work.</p> <p>If damaged, refer to higher level of maintenance.</p>

ITEM NO.	INTERVAL	LOCATION Checks/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
3 cont.	Before/ after	Battery Cap/ Housing Cont.	<p>Turn monocular off and then on to reenergize monocular.</p> <p>NOTE If the monocular fails this highlight cut-off test, it does not cause the end item to be non-mission capable. However, it should be sent to higher level of maintenance as soon as possible.</p> <p>Check gain control for free movement and operation per paragraph 2.25.</p>	Knob is not free moving or does not vary gain.
4	Before/ after	Monocular	Inspect for cracks or damage. Scratches, cracks, chips and gouges are OK if operation is not affected.	Cracks or damage in the monocular.
5	Before/ after	eyepiece lens	Rotate diopter adjustment to make sure the eyepiece lens moves freely and is not loose. range is approximately ½ turn.	Binding, not moving freely or too loose.
6	Before/ after	eyecup	Inspect for dirt, dust, cracked or torn eye- cup. Inspect for bent, broken, or improperly fitting eyepiece lens. If necessary, clean with water.	Chips and cracks are permitted on the eye- cup retaining rings as long as they do not interfere with installation of eyecup.

ITEM NO.	INTERVAL	LOCATION CHECKS/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
7	Before/ after	eyeguard	Inspect for dirt, dust, cracked or torn eyeguard. Inspect for bent, broken, or improperly fitting eyeguard. If necessary, clean with water.	Chips and cracks are permitted on the eyeguard retaining rings as long as they do not interfere with installation of eyeguard.
8	Before/ after	objective lens	<p>Rotate focus ring to ensure free movement (range is approximately 1/ 3 turn). Check objective lens for chips, cracks and dents.</p> <p>Check the infinity focus locking ring for tightness. Check for cracks.</p>	<p>Focus ring is binding or not able to move.</p> <p>Chips, cracks, or dents prevent full field-of-view, installation of or the ability to focus. Cracked or loose.</p>
9	Before/ after	neck Cord and objective lens Cap	Inspect for cracked, torn, or missing objective lens cap. Inspect neck cord for cut, damage, or loose ends. Retie ends if necessary.	Damaged.

ITEM NO.	INTERVAL	LOCATION CHECKS/ SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
10	Before/ after	HEADMOUNT Straps/pads	<p>NOTE</p> <p>If any of the following items are damaged it does not cause the entire end item to be "not fully mission capable". However, the damaged item should be replaced as soon as practical to restore full capability of the system.</p> <p>Inspect for cuts, tears, fraying, holes, cracks, or defective fasteners.</p>	Damage causes straps or pads to be unserviceable
11	Before/ after	Socket	<p>Inspect for dirt, dust, or corrosion.</p> <p>Insert monocular latch into socket to verify secure attachment of monocular to head-mount. If necessary, clean socket with water.</p>	Damaged, latch won't lock or is too loose.

ITEM NO.	INTERVAL	LOCATION CHECK / SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
12	Before/ after	eye relief adjustment	Press the eye relief adjustment and check for free motion. Inspect for damage.	Binding, damaged or non-operational slide mechanism.
13	Before/ after	HELMET MOUNT Straps	Inspect for cuts, tears, fraying, holes, cracks, or defective fasteners.	Damage causes straps to be unserviceable.
14	Before/ after	Socket	Inspect for dirt, dust, or corrosion. Insert monocular latch into socket to verify secure attachment of monocular to helmet mount. If necessary, clean socket with water.	Damaged, latch won't lock or is too loose.
15	Before/ after	Fore -and-aft adjustment	Press the 2 side buttons on plastic mount or depress side lever on metal mount and check for free motion. Inspect for damage.	Binding, damaged or non-operational slide mechanism.
16	Before/ after	MOUNTING ADAPTERS Head mount/ Helmet Mount adapter	Inspect for dirt, dust or corrosion. Insert into head mount or helmet mount socket to verify secure attachment.	Damaged, will not latch securely.

ITEM NO.	INTERVAL	LOCATION Checks / SERVICE	PROCEDURE	NOT FULLY MISSION CAPABLE IF:
17	Before/ after	Weapon Mount	Inspect for dust, dirt or corrosion.	Damaged will not mount to monocular or will not mount to rail.
18	Before/ after	ACCESSORIES	<p>CAUTION</p> <p>The coating on the demist shield can be damaged if cleaned while wet or if cleaned with wet lens paper. Clean only when the demist shield is dry and only with dry paper.</p> <p>Inspect for dirt, dust, scratches or damage. If necessary, clean when shield is dry and with dry lens tissue only.</p>	Damage or scratches hinder vision with monocular on.
19	Before/ after	LIF	Inspect for dirt, dust, scratches or damage. If necessary, clean per paragraph 3.2.	Damage or scratches hinder vision with monocular on.
20	Before/ after	Sacrificial Window	Inspect for dirt, dust, scratches or damage. If necessary, clean per paragraph 3.2.	Damage or scratches hinder vision with monocular on.
21	Before/ after	CARRYING CASE  Case	Remove all items and shake out loose dirt or foreign material. Inspect for tears, cuts, excess wear, or damage to mounting clips.	
22	Before/ after	Shoulder Strap	Inspect for cuts, tears, or excess wear or damaged clips.	

## 2.3. Assembly and preparation for use

### 2.3.1. Unpacking

The following steps must be accomplished prior to each mission where the NVM is used.

#### **CAUTION**

**Relieve air pressure inside shipping and storage case by pressing in on opposite sides of the case before releasing latches.**

- (1) Release the latch securing top of shipping and storage case and open.
- (2) Check contents for completeness (see Figure 1.1.).
- (3) Remove carrying case. Open carrying case (Figure 1.3.), remove NVM, and check contents for completeness.
- (4) Inspect the monocular for obvious evidence of damage to optical surfaces, body, eyecup, eyeguard, power switch, battery cap, etc. ensure that all optical surfaces are clean and ready for use. Clean with lens paper.

### 2.3.2. Installation of battery

#### **CAUTION**

**To protect the image intensifier, keep the objective lens cap on when the monocular is not in use or when using the monocular in daylight conditions.**

The NVM operates with one AA battery. Battery is not supplied with the NVM and must be obtained separately.

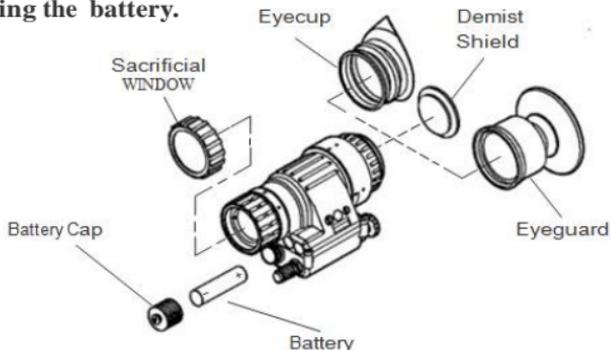
At operating temperatures below  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ), alkaline batteries are not recommended, as operating life will be severely reduced. Lithium-ion disulfide L91 1.5V AA batteries should be used below  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ).

**TABLE 2.3. Estimated battery life**

BATTERY TYPE	Temperature	NEGLIGIBLE IR SOURCE USAGE	IR SOURCE USAGE 10% OF THE TIME
AA alkaline	21°C(70°F)	60 Hrs	55 Hrs
AA Lithium L91	21°C(70°F)	70 Hrs	65 Hrs
AA alkaline	-20°C(-4°F)	12 Hrs	10 Hrs
AA lithium L91	-20°C(-4°F)	60 Hrs	55 Hrs

**CAUTION**

- **Make certain the power switch is in the OFF position before installing the battery.**



**FIGURE 2.8. Battery, eyecup and eyeguard installation**

Install the AA battery into NVM as follows.

- (1) Unscrew the battery cap.
- (2) Observe polarity, as indicated on the side of the battery compartment and insert the battery.
- (3) Replace the battery cap and screw cap hand tight.

### **2.3.3. Installation of demist shield**

Perform the following procedures to install the demist shield on the eyepiece lens. refer to Figure 2.8.

#### **CAUTION**

**If the demist shield needs to be cleaned, refer to paragraph 3.3.1. for cleaning. If the demist shield is wiped while wet or with wet lens paper, you will damage the coating.**

#### **NOTE**

**If inclement operating conditions are expected to exist (e.g. significant temperature change and high humidity), install demist shield to minimize eyepiece lens fog prior to execution of mission.**

- (1) Carefully remove the eyecup or eyeguard.
- (2) Carefully press the demist shield onto the eyepiece. Be careful not to smudge the eyepiece lens or demist shield.
- (3) replace the eyecup or eyeguard (see paragraph 2.3.3.).

### **2.3.4. Installation of sacrificial window**

Perform the following procedure to install the sacrificial window. Refer to Figure 2.8.

#### **CAUTION**

**If adverse operating conditions (dust or sand) are expected to exist, attach the sacrificial window to protect the objective lens from scratches or other damage.**

- (1) If the objective lens cap is in place, remove it.
- (2) Carefully push the sacrificial window onto the objective lens until it stops. Turn the sacrificial window clockwise until it snaps into place.

### 2.3.5. Installation and adjustment of head mount

Perform the following procedures for donning the head mount.

#### **NOTE**

**Do not don the head mount while the monocular is attached.**

(1) Prior to donning the head mount, loosen the four ends of the chinstrap approximately five cm. from the sliding bar buckles (Figure 2.10.).

(2) Snap the front and rear snaps (Figure 2.10.) in place.

#### **NOTE**

**If the head mount is too loose, remove the attached thin brow-pad (Figure 3.3.) and replace with either the medium or thick browpad stored in the carrying case. Refer to paragraph 3.3.2. for removal and replacement of the browpad.**

(3) With both hands grasp the neck pad (Figure 2.10.) and pull the harness over your head and the neck pad down to the back of your neck.

(4) Holding the chin cup in position on chin, adjust both sides of the chinstrap until you feel light pressure against your chin. (Do not tighten.)

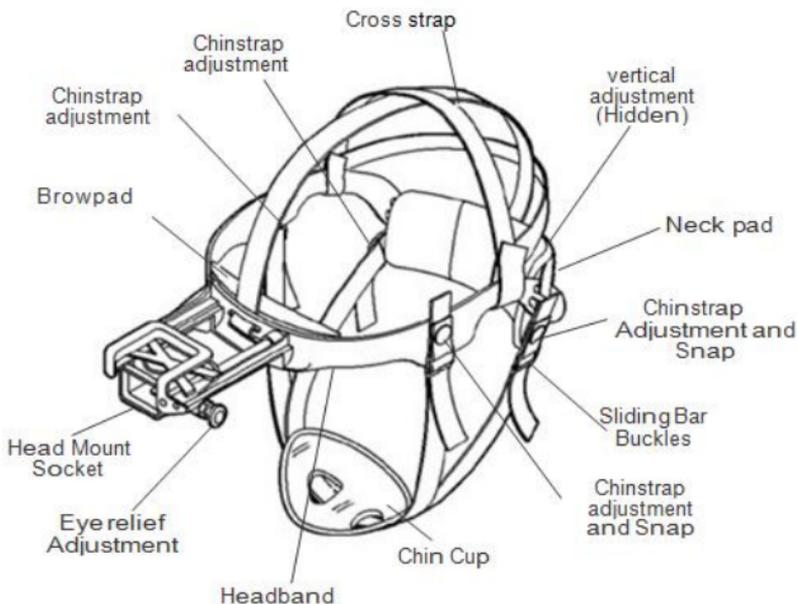
(5) Maintain the position of the chin cup and remove any slack from the chinstrap. (Do not tighten.)

(6) Ensure that the cross-strap is not twisted and remove slack by adjusting the vertical adjustment at the neck pad.

(7) Adjust chinstrap and vertical adjustment until the chin cup and headband are in a comfortable but firm position.

#### **NOTE**

**After installing the monocular, minor strap adjustments may be necessary to achieve comfort.**



**Figure 2.10. NVM Head mount adjustments**

- (8) Install the head mount/helmet mount adapter (refer to paragraph 2.3.8).
- (9) Refer to paragraph 2.4.2. for operating procedures.

### 2.3.6. Installation of head mount/ helmet mount adapter

Install the head mount/helmet mount adapter (Figure 1.1.) into the monocular by aligning thumbscrew to hole and tightening as shown in Figure 2.11. There is an alignment boss on the head mount/helmet mount adapter that fits into a groove on the monocular. Make sure the boss on the adapter fits into the groove on the monocular.

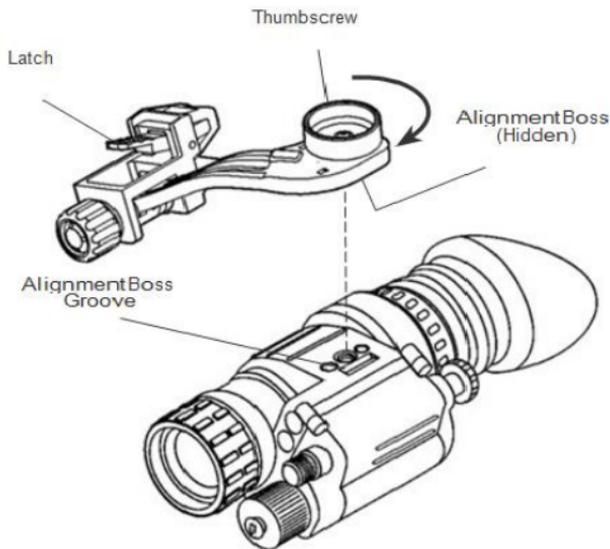
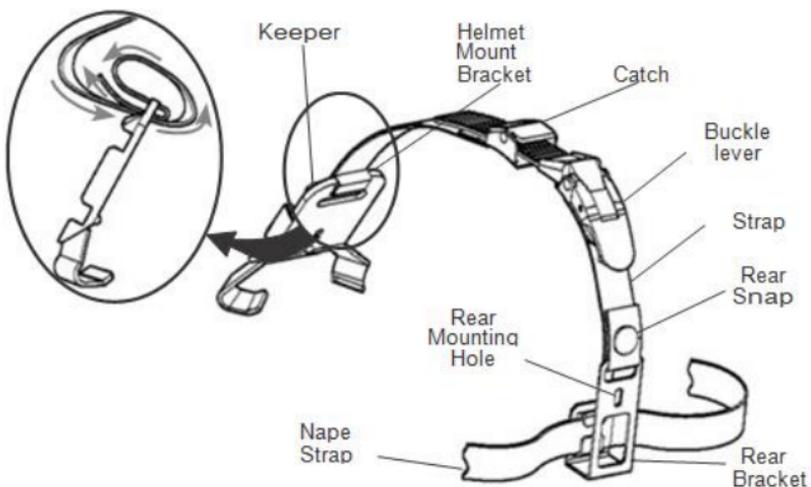


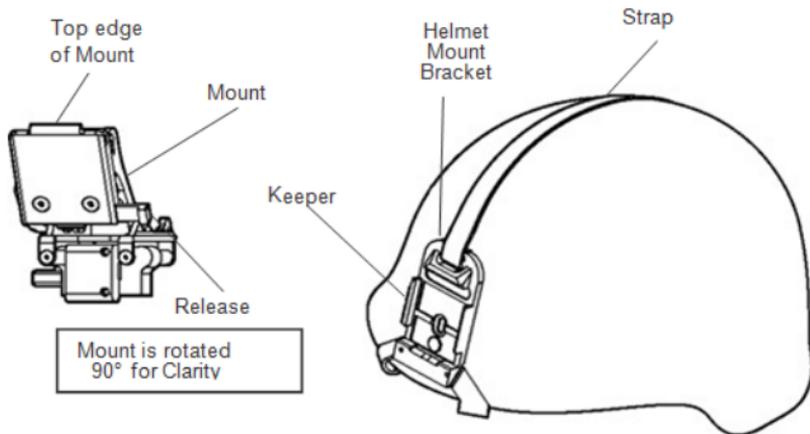
Figure 2.11. Head mount/helmet mount adapter installation

### 2.3.7. Installation of helmet mount to helmet

- (1) Remove the helmet mount from the carrying case. Refer to Figure 2.12. for helmet mount features.
- (2) Press the release (Figure 2.13.) to remove the mount from the helmet mount bracket.
- (3) Make sure the strap is laced onto the helmet mount bracket as shown in Figure 2.13.
- (4) With catch (see Figure 2.13.) in forward most position, place the strap over the top of the helmet center (see Figure 2.14).



**Figure 2.12.** Installation of helmet mount



**Figure 2.13.** Helmet mount

(5) Hook the rear bracket (see Figure 2.13.) on the center of the back of the helmet and lay the strap with helmet mount bracket over the top of the helmet.

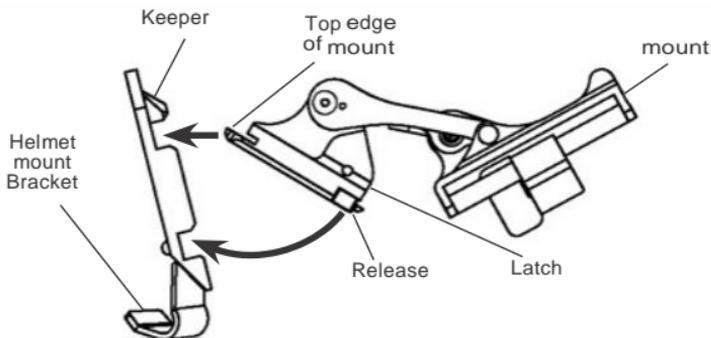
(6) Hook the helmet mount bracket in the center of the front lip of the helmet and hold it in place (see Figure 2.14.).

(7) With the buckle lever open, take up the slack in the strap using the catch. Close the buckle lever.

(8) Disengage the nape strap latch on the left side of nape strap. (9) Don the helmet. Do not fasten the helmet chinstrap.

(10) Engage the nape strap at the nape strap latch. Tension the nape strap for a stable fit, then install and tension the helmet chinstrap. The brow of the helmet should be parallel to the ground and the helmet stable on the head.

(11) Insert the top edge of the mount under the keeper on the helmet mount bracket and rotate downward until the latch engages (see Figure 2.14.). to release the mount from the helmet bracket, press the release and pull forward and down.



**Figure 2.14.** Reassembly of helmet mount

### **2.3.8. Installation of head mount with protective mask**

Perform the following procedures for donning head mount with protective mask.

(1) Place protective mask on your head per the instructions provided with the protective mask.

#### **WARNING**

**When installing the head mount over the protective mask, be careful not to break the protective mask seal around your face.**

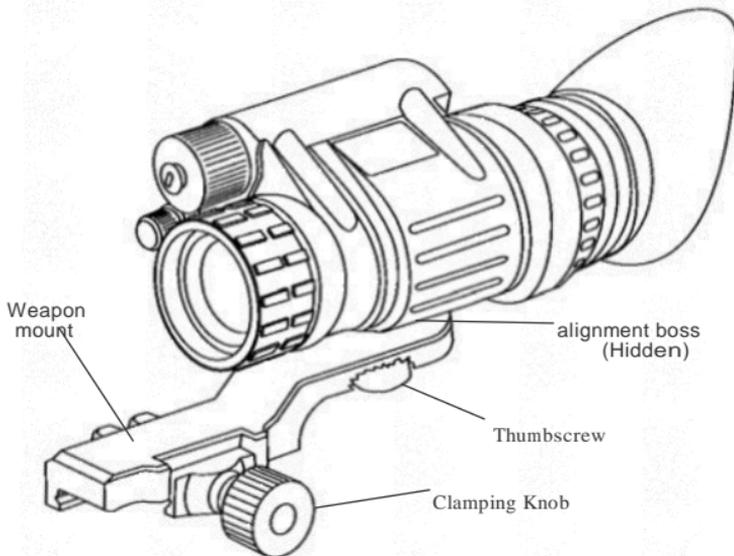
(2) Install the head mount per the instructions in paragraph 2.3.7.

**NOTE**

It may be necessary to remove the browpad (Figure 2.10.) when wearing the head mount over a protective mask.

### 2.3.9. Installation of weapon mount

Perform the following procedure to install the weapon mount.



**Figure 2.15.** Weapon mount usage

### **CAUTION**

The NVM is not a weapon sight, however, it can be used in conjunction with a collimated dot sight or laser aiming device.

### **NOTE**

**It is recommended that the eyecup be replaced with the eyeguard during weapon mounted use.**

(1) Orient the monocular and weapon mount as shown in Figure 2.15. Be sure to align the alignment boss on the weapon mount with the alignment groove in the monocular.

(2) Screw in the thumbscrew to secure the monocular to the weapon mount.

(3) Loosen the clamping knob on the weapon mount. position the weapon mount with the monocular onto the weapon's mounting rail. Tighten by turning the clamping knob.

### **NOTE**

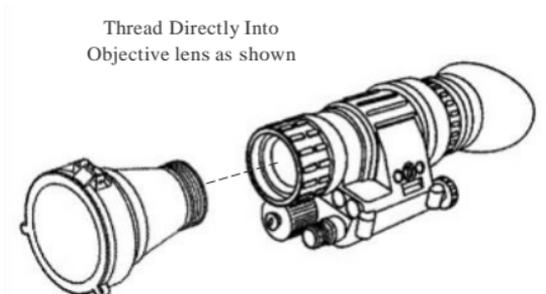
**There is a ratchet in the weapon mount that prevents overtightening of the clamp. Turn until the knob clicks.**

(4) Check the position of the monocular by holding the weapon in your normal firing position. adjust the fore/aft position of the monocular as necessary by loosening the clamping knob and repositioning the weapon mount on the weapon's mounting rail.

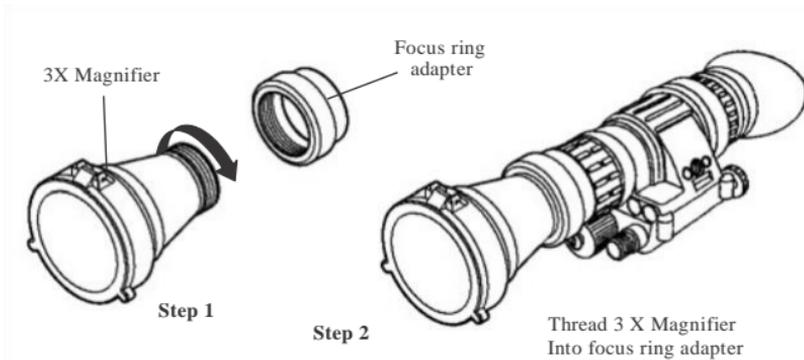
### 2.3.10. INSTALLATION OF 3X MAGNIFIER

The 3X magnifier can be threaded directly into the objective lens, with the IIF removed. It can also be threaded into the focus ring adapter and slipped on over the end of the objective lens with the IIF installed.

Figures 2.18. and 2.19. illustrate these installation procedures.



**Figure 2.18.** 3X Magnifier installation without LIF



**Figure 2.19.** 3X Magnifier installation with LIF

## 2.4. Operating procedures

This section contains operating procedures for using the NVM as hand-held, head mounted, helmet mounted or weapon mounted monocular. Prior to operating the monocular, make certain that all the steps in 2.3.3., assembly and preparation for Use, have been read and performed.

### 2.4.1. HAND - HELD OPERATION

Operate the monocular only under darkened conditions or use the objective lens cap to cover the objective lens for daylight conditions.

#### **NOTE**

**When using the monocular without a mounting device, make sure to place the neck cord around your neck.**

(1) Ensure that the battery is installed per paragraph 2.3.2. (2)

Turn the power switch to on.

#### **NOTE**

**The sharpest image will be observed only when the objective lens and eyepiece lens are properly focused.**

(3) Rotate the diopter adjustment for the clearest view of the image intensifier screen.

(4) Focus the objective lens while observing an object until the sharpest image is obtained.

### 2.4.2. HEAD MOUNTED OPERATION

Perform the following procedures for head mounted operation.

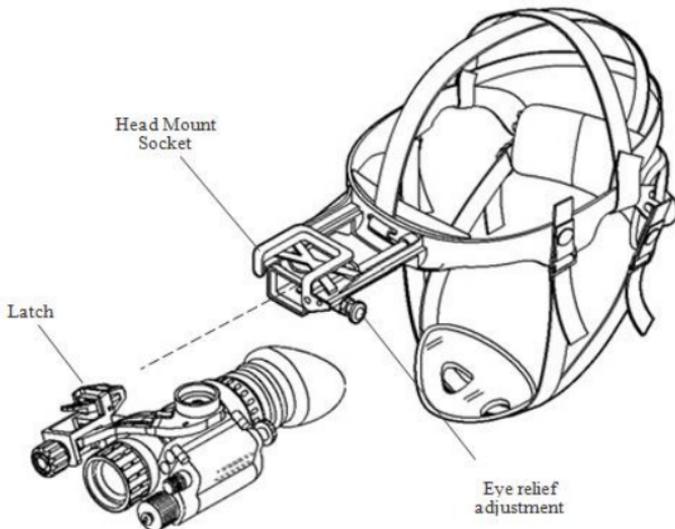
#### **CAUTION**

**Operate the monocular only under darkened conditions or use the lens cap to cover the objective lens for daylight conditions.**

(1) Ensure that battery is installed per paragraph 2.3.2. (2) Don the head mount per instructions in paragraph 2.3.7.

## NOTE

To make it easier to align the monocular, eyecup, and eyepiece lens to the eye, depress the eye relief adjustment and slide the head mount socket all the way forward before attaching the monocular.



**Figure 2.20.** Head mount/ Helmet mount adapter operation

(3) Align the head mount/helmet mount adapter's latch to the head-mount socket (Figure 2.20.). press and hold down the latch lever while installing the monocular into the head mount socket.

Release the latch when the monocular fully engages the socket.

(4) Set your eye relief by depressing the eye relief adjustment (Figure 2.20.) and move the monocular back toward your non-dominant eye until the eyecup comfortably seals around the eye.

(5) Turn the monocular on.

(6) Readjust the vertical adjustment (Figure 2.10.) of the head-mount until the monocular is properly aligned with your eye.

## **NOTE**

The sharpest image will be observed only when the objective lens and eyepiece lens are properly focused.

(7) Rotate the diopter adjustment for the clearest view of the image intensifier screen.

## **NOTE**

Any readjustment of eye relief requires readjustment of the diopter.

(8) adjust the eye relief distance by pressing the eye relief adjustment and sliding monocular fore or aft to obtain a full field-of-view

of the image. Reset the diopter adjustment for best image.

(9) Adjust the objective lens focus (Figure 2.1.) while observing an object until the sharpest image is obtained.

### **2.4.3. Helmet mounted operation**

#### **CAUTION**

Take some precaution when using/handling the helmet mount. Most damage occurs when the helmet mount is left on the helmet when not needed for immediate use. Observe the following cautions to significantly extend the useful life of the helmet mount.

#### **CAUTION**

- Do not use excessive force when changing the up/down position of the NVM. Excessive force can break the head mount/ helmet mount adapter.
- Do not drop or throw the helmet with the helmet mount attached to it.
- With the monocular in the flipped up position, do not flick the monocular down by shaking the helmet. This places significant stress on the helmet mount.
- All Other Services – Return the helmet and the helmet mount to unit maintenance for direct mounting of the bracket via the helmet screws.

Perform the following procedures for helmet mounted operation.

## **NOTE**

The helmet mount provides two positions for the user to position the NVM. The flipped down position allows the user to position the NVM directly in front of the eyes. The helmet mount also allows the user to rotate the NVM to a flipped up position when the NVM is not needed for immediate use. Both the flipped down and the flipped up positions have a positive stop which assures the user that the NVM is in the correct position.

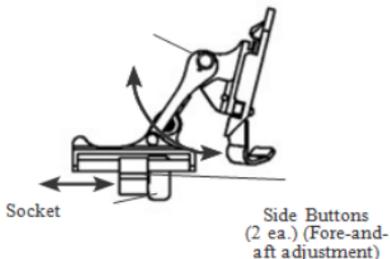
## **NOTE**

The head mount/helmet mount adapter allows the NVM to be rotated from the left to the right eye or vice versa. The NVM can be moved to the flipped up position with the helmet mount adapter positioned to either the left or the right.

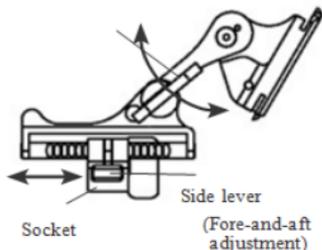
- (1) Ensure that the battery is installed per paragraph 2.3.2.
- (2) Don the helmet mount per instructions in paragraph 2.3.9.
- (3) Place the monocular in the socket of the helmet mount.

Set your eye relief by depressing the side buttons (or press down on side lever on metal mount) (see Figure 2.21.) and carefully move the monocular fore or aft until the eyecup comfortably seals around the eye. readjust the helmet straps as required for vertical adjustment.

Plastic mount tilt  
adjustments lock Knob



Metal mount tilt  
adjustment lever



**Figure 2.21.** Tilt and flip-up assembly mechanisms

(4) Turn power switch to on. Adjust the tilt by using the tilt adjustment lock knob (or tilt adjustment lever on metal mount) (Figure 2.21.) until you obtain a comfortable viewing angle.

#### **NOTE**

**The sharpest image will be observed only when the objective lens and eyepiece lens are properly focused.**

(5) Rotate the diopter adjustment for the clearest view of the image intensifier screen.

#### **NOTE**

**Any readjustment of eye relief requires readjustment of the diopter.**

(6) Adjust the eye relief distance by depressing the side buttons (Figure 2.21.) (or press down on side lever on metal mount) and sliding monocular fore or aft to obtain a full field-of-view of the image. reset the diopter adjustment for best image.

(7) Adjust the objective lens focus (Figure 2.1.) while observing an object until the sharpest image is obtained.

(8) To flip up, grasp the helmet tilt and flip-up assembly and rotate upward and rearward until the latch is firmly engaged.

**WARNING**

**The monocular will not be turned off automatically when flipped up. The monocular must be turned off by the power switch.**

(9) To flip down, grasp the helmet tilt and flip-up assembly and rotate downward and forward until the latch is firmly engaged.

(10) Turn the power switch to the on position to resume viewing.

## **2.4.4. Weapon mounted operation**

### **NOTE**

**The NVM can be used in conjunction with a collimated dot aiming device mounted on the forward mounting rail. The brightness control for the aiming device should be set at or near it's minimum setting.**

Perform the following procedures for weapon mounted operation:

- (1) Ensure that the battery is installed per paragraph 2.3.2.
- (2) Assemble the weapon mount to the monocular per paragraph 2.3.11., steps 1 and 2.
- (3) Mount the monocular with adapter onto the M16/M4 receiver rail per paragraph 2.3.11., steps 3 and 4.
- (4) Rotate the diopter adjustment for the clearest view of the image intensifier screen.
- (5) Adjust the objective lens focus (Figure 2.1.) while observing an object until the sharpest image is obtained.

## **2.4.5. IR Source operations**

### **WARNING**

**The IR source is a light that is invisible to the unaided eye for use during conditions of extreme darkness. However, the light from the IR source can be detected by the enemy using night vision devices.**

### **NOTE**

**The purpose of the IR source is for viewing at close distances up to 3 meters when additional illumination is needed.**

- (1) Pull the power switch knob out and rotate clockwise to the IR position. With the monocular held to the eye, observe that a red light appears in the eyepiece. This indicates that the IR source is operating.
- (2) For momentary IR, turn the power switch clockwise (without pulling) past the on position. Observe that a red light appears in the eyepiece.

## 2.4.6. Operation with 3x magnifier

(1) Install per paragraph 2.3.13.

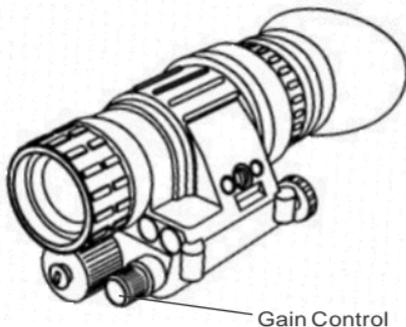
### **NOTE**

**The 3X magnifier and objective lens will turn as a unit to allow focusing.**

(2) Grasp the 3X magnifier and focus while observing an object until the sharpest image is obtained.

## 2.4.7. Operation with gain control

Turn the gain control (Figure 2.23) to balance the illumination in put to the eye.



## 2.4.8. Preparation for storage

(1) Shutdown. Perform the following procedures to shut down the monocular.

- (a) Turn the monocular power switch to the off position.
- (b) Remove the monocular from the head mount, helmet mount or weapon and remove the weapon mount from the monocular.

### **WARNING**

**Do not carry batteries in pockets containing metal objects such as coins, keys, etc. Metal objects can cause the batteries to short circuit and become very hot.**

(2) Packaging after Use.

- (a) Remove battery cap and remove battery.
- (b) Inspect the battery housing for corrosion or moisture. Clean and dry if necessary.
- (c) Replace the battery cap.
- (d) Remove the demist shield or sacrificial window if installed. Install objective lens cap.

### **NOTE**

- **Prior to placing NVM into carrying case, ensure NVM and case are free of dirt, dust, and moisture.**
- **The monocular and helmet mount should not be left on the helmet when the helmet is removed.**

- (e) Refer to Figure 1.1. for proper placement of demist shield, battery, carrying case strap, lens paper, sacrificial window, manual, LIF, browpad, head mount, helmet mount, head mount / helmet mount adapter and weapon mount.
- (f) Place the monocular into the shallow pocket of the carrying case.
- (g) Place the carrying case into the shipping and storage case, close and latch (Figure 1.3.).
- (h) Return to storage area.

## CHAPTER 3

# MAINTENANCE INSTRUCTIONS

### 3.1. Lubrication instructions

No lubrication is required.

### 3.2. Troubleshooting Procedures

#### 3.2.1. Troubleshooting

Table 3.1. lists common malfunctions that you may find with your equipment. perform the tests, inspections and corrective actions in the order they appear in the table.

This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your maintainer.

**TABLE 3.1. Operator's Troubleshooting.**

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
1. Monocular fails to activate.	Visual.  Check for defective, missing or improperly installed battery.	turn power switch to reset/ Off position and then on.  Replace battery or install correctly.
2. IR source fails to activate.	In a dark location with system turned on, activate IR source. Visually check IR source operation; scene should righted.	If IR source still fails to activate, refer to higher level of maintenance.
3. IR source indicator fails to activate.	Visual.	Refer to higher level of maintenance.
4. Poor image quality.	Check objective lens or eyepiece lens focus.  Check for fogging or dirt on objective lens or eyepiece lens.	Refocus.  Clean lens surfaces per paragraph 3.2.
5. Light visible around eyecup.	Check eye relief distance.  Check eyecup for resiliency.	Read just for proper eye relief distance.  If eyecup is defective, refer to higher level of maintenance.
6. Diopter adjustment cannot be made.	Check to see if the diopter adjustment is bent or broken.	If damaged, refer to higher level of maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. Battery cap difficult to open.	Visually inspect for the presence of an O-ring.  Check for damaged battery cap.	If O-ring is missing, refer to higher level of maintenance.  If damaged, refer to higher level of maintenance.
8. Head straps cannot be tightened.	Check for defective buckles, fasteners or straps.	If damaged, refer to higher level of maintenance.
9. Head mount or helmet mount socket and head mount/ helmet mount adapter latch doesn't catch.	Check socket or latch for dirt.  Check socket or latch for damage.	Clean socket and latch.  If damaged, return either head-mount or helmet mount socket and head mount/ helmet mount adapter to higher level of maintenance.
10. Helmet mount will not tighten to helmet.	Inspect mounting hardware for damage.	If damaged, refer to higher level of maintenance.
11. LIF will not thread in or obstruct view.	Check for dirt in threads. Check for damaged LIF.	Clean threads.  If damaged, refer to higher level of maintenance.
12. If damaged, refer to higher level of maintenance.	Visual.	Refer to higher level of maintenance.
13. Monocular does not cut off when exposed to high light.	Visual. Perform the following test under daylight or bright room light (not fluorescent light).  Place the objective lens cap on the objective lens. Turn monocular on and observe that it cuts off within 70 ±30 seconds after energized.  Turn monocular off and then on to reenergize monocular.	If damaged, refer to higher level of maintenance.

## 3.3. Operator's maintenance procedures

### 3.3.1. Cleaning the NVM

#### CAUTION

- The monocular is a precision electro-optical instrument and must be handled carefully.
- Do not scratch the external lens surfaces or touch them with your fingers.
- Wiping demist shield with lens paper while wet or with wet lens paper can damage the coating.

Clean monocular with water if necessary and dry thoroughly. Clean lenses with lens paper (and water if necessary, except for the demist shield).



