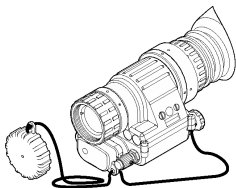


OPERATOR'S MANUAL



MONOCULAR NIGHT VISION DEVICE (MNVD)

AN/PVS-14

**(NSN 5855-01-432-0524)
(EIC: N/A)**

**Equipment Description
Page 1-9**

**PMCS Table
Page 2-6**

**Image Intensifier
Inspection Criteria
Page 2-28**

**Operation
Page 2-57**

DISTRIBUTION STATEMENT C - Distribution authorized to U.S. Government agencies and their contractors. This publication is required for administration and operational purposes, as determined 16 August 1991. Other requests for this document shall be referred to either: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-E-ED-P, Fort Monmouth, NJ 07703-5000; or Commandant of the Marine Corps (ARD), Washington, DC 20380-0001.

DESTRUCTION NOTICE - For unclassified, limited documents, destroy by any method that will prevent disclosure of contents or reconstruction of the document.

**DEPARTMENT OF THE ARMY
AND HEADQUARTERS, MARINE CORPS
1 June 2000**

PCN 18410271000

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.

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 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.

WARNING

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

WARNING

EQUIPMENT LIMITATIONS

To avoid personal injury and property damage when using the MNVD carefully read and understand the following safety precautions.

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

WARNING

The compass illuminator can be seen by others using night vision devices.

WARNING

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

WARNING

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

FIRST AID

For first aid or artificial respiration, see FM 21-11, First Aid for Soldiers.

TECHNICAL MANUAL
No. 11-5855-306-10*
TECHNICAL MANUAL
No. 10271A-10/1A

DEPARTMENT OF THE ARMY
AND HEADQUARTERS,
MARINE CORPS
Washington, DC
1 June 2000

**OPERATOR'S MANUAL
MONOCULAR NIGHT VISION DEVICE (MNVD)
AN/PVS-14
(NSN 5855-01-432-0524)
(EIC: N/A)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-D-CS-CFO, Fort Monmouth, NJ 07703-5000. Marine Corps personnel send NAVMC 10772 (Recommended Changes to Publications/-Logistics-Maintenance Data Coding) to: Commander Marine Corps Logistics Base (Code 826) 814 Radford Blvd., Albany, GA 31704-1128.

*This manual supersedes TM 11-5855-306-10, dated 1 December 1997 and all changes thereto.

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
CHAPTER 1	INTRODUCTION	1-1
Section I	General Information	1-1
1-1	Scope	1-1
1-2	Maintenance Forms and Procedures	1-1
1-3	Corrosion Prevention and Control (CPC)	1-2
1-4	Destruction of Electronic Materiel to Prevent Enemy Use	1-2
1-5	Reporting Equipment Improvement Recommendations (EIR)	1-3
1-6	Warranty Information	1-3
1-7	Nomenclature Cross-Reference List	1-3
1-8	List of Abbreviations and Acronyms	1-5
1-9	Glossary	1-6
Section II	Equipment Description	1-9
1-10	Equipment Characteristics, Capabilities, and Features	1-9
1-11	Location and Description of Major Components	1-10
1-12	Equipment Data	1-16
Section III	Principles of Operation	1-19
1-13	Mechanical Functions	1-19
1-14	Optical Functions	1-20
1-15	Electronic Circuit Function	1-20

TABLE OF CONTENTS - Continued.

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
CHAPTER 2	OPERATING INSTRUCTIONS	2-1
Section I	Description and Use of Operator's Controls and Indicators	2-1
2-1	Operator Controls and Indicators	2-1
Section II	Preventive Maintenance Checks and Services (PMCS)	2-6
2-2	Preventive Maintenance Checks and Services Table	2-6
2-3	Resolution Check Using the TS-4348/UV Test Set	2-23
2-4	Inspection Criteria for Proper Image Intensifier Operation	2-28
Section III	Assembly and Preparation for Use	2-35
2-5	Unpacking	2-35
2-6	Installation of Batteries	2-36
2-7	Installation of Eyecup or Eyeguard	2-38
2-8	Installation of Demist Shield	2-38
2-9	Installation of Sacrificial Window	2-39
2-10	Installation of LIF	2-39
2-11	Installation and Adjustment of Headmount	2-41
2-12	Installation of Headmount/Helmet Mount Adapter	2-44

TABLE OF CONTENTS - Continued.

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
2-13	Installation of Helmet Mount to Helmet	2-45
2-14	Installation of Headmount with Protective Mask	2-50
2-15	Installation of Weapon Mount	2-51
2-16	Installation of Compass	2-53
2-17	Installation of 3X Magnifier	2-55
Section IV	Operating Procedures	2-57
2-18	Hand-Held Operation	2-57
2-19	Head Mounted Operation	2-58
2-20	Helmet Mounted Operation	2-60
2-21	Weapon Mounted Operation	2-64
2-22	IR Source Operations	2-65
2-23	Operation with Compass	2-65
2-24	Operation with 3X Magnifier	2-68
2-25	Operation with Gain Control	2-68
2-26	Preparation for Storage	2-69
Section V	Operation Under Unusual Conditions	2-70
2-27	Operation in Dusty or Sandy Areas	2-70
2-28	Operation in Rainy or Humid Conditions	2-71
2-29	Operation in Salt Water Areas	2-71
2-30	Operation in Nuclear, Biological and Chemical (NBC) Environments	2-72
2-31	Operation in Laser Threat Environments	2-72

TABLE OF CONTENTS - Continued.

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
CHAPTER 3	MAINTENANCE INSTRUCTIONS	3-1
Section I	Lubrication Instructions	3-1
Section II	Troubleshooting Procedures	3-1
3-1	Troubleshooting	3-1
Section III	Operator's Maintenance Procedures	3-7
3-2	Cleaning the MNVD	3-7
3-3	Headmount Maintenance	3-7
3-4	Neck Cord Maintenance	3-10
APPENDIX A	REFERENCES	A-1
APPENDIX B	COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS	B-1
APPENDIX C	ADDITIONAL AUTHORIZATION LIST (AAL)	C-1
APPENDIX D	EXPENDABLE AND DURABLE ITEMS LIST	D-1
SUBJECT INDEX		Index

HOW TO USE THIS MANUAL

- **Usage**

You must familiarize yourself with the entire manual before operating the equipment. Read and follow all warning notices.

- **Manual Overview**

The table of contents includes the paragraph number, paragraph title, and page number for each chapter. An index provides additional references to the subject contents.

- **Special Features**

A locator is provided on the right hand border of the front cover. This gives the location of the information most frequently used. To find the topic Operation, open the manual to the correct page by using the black tab on the side of the manual that lines up with the topic Operation.

CHAPTER 1 INTRODUCTION

Section I. General Information

1-1 SCOPE

This manual provides operation and maintenance instructions for the Monocular Night Vision Device (MNVD), AN/PVS-14 hereinafter referred to as the MNVD. The MNVD is a self-contained night vision device that enables improved night vision using ambient light from the night sky (moon, stars, skyglow, etc.).

1-2 MAINTENANCE FORMS AND PROCEDURES

Department of the Army forms and procedures used for equipment maintenance will be those prescribed in DA Pam 738-750, as contained in Maintenance Management Update.

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes or additional publications or forms pertaining to this equipment.

Marine Corps personnel refer to the on-line MCPDS Marine Corps Publication Distribution System.

Marine Corps Ground Record Procedures. Marine Corps personnel refer to TM 4700-15/1 for disposition of forms and records required for Marine Corps equipment.

1-3 CORROSION PREVENTION AND CONTROL (CPC)

Corrosion prevention and control of Army materiel is a continuing concern. It is important that any problems with this equipment be reported so that the problem can be corrected and improvements made to prevent the problem in future equipment.

While corrosion is typically associated with rusting metal, it can also include deterioration of other materials such as contacts, injection-molded plastic, and foam inserts in the case. Unusual cracking, softening, swelling, or breaking of these other materials may be a corrosion problem.

If a corrosion problem is identified, report it using Standard Form 368, Product Quality Deficiency Report. Use keywords such as "corrosion," "rust," "deterioration," or "cracking" to ensure that the information is identified as a CPC problem. Submit the form to the address specified in DA Pam 738-750.

1-4 DESTRUCTION OF ELECTRONIC MATERIEL TO PREVENT ENEMY USE

For procedures to destroy this equipment to prevent its use by the enemy, refer to TM 750-244-2, Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command). **Marine users**, render the MNVD inoperable by smashing, scattering or burying disassembled pieces, burning, or destroying by weapons fire.

1-5 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368, Product Quality Deficiency Report. Mail it to Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-D-CS-CFO, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

Marine Corps personnel are encouraged to submit SF 368 in accordance with MCO 4855.10 (Quality Deficiency Report).

1-6 WARRANTY INFORMATION

Some MNVD systems are under warranty. The warranty expiration date label is affixed to the front (objective lens end) of the monocular on the opposite side from the power switch. Report all defects in material or workmanship to your maintainer, who will take the appropriate action.

1-7 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.

COMMON NAME	OFFICIAL NOMENCLATURE
Batteries	Battery, Nonrechargeable
Battery Cartridge	Cover, Battery Retainer
Carrying Case	Case, Infrared Equipment
Carrying Case Strap	Strapping
Compass	Compass Assembly
Demist Shield	Lens, Infrared Receiver
Eyeguard	Eyeguard, Optical
Eyepiece Lens Cap	Cap, Protective, Dust
Headmount	Headset Assembly
Headmount/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

1-8 LIST OF ABBREVIATIONS AND ACRONYMS

AAL	Additional Authorization List
BII	Basic Issue Items
CAGEC	Commercial and Government Entity Code
cm	Centimeters
COEI	Components of End Item
CPC	Corrosion Prevention and Control
CTA	Common Table of Allowances
DA	Department of the Army
EIC	End Item Code
EIR	Equipment Improvement Recommendation
FM	Field Manual
Hrs	Hours
IR	Infrared
JTA	Joint Table of Allowances
lbs	Pounds
LED	Light Emitting Diode
LIF	Light Interference Filter
MCPDS	Marine Corp Publication Distribution System
MNVD	Monocular Night Vision Device
MTOE	Modified Table of Organization and Equipment
N/A	Not Applicable
NBC	Nuclear, Biological, and Chemical
NSN	National Stock Number
Pam	Pamphlet
PASGT	Personal Armor System Ground Troops
PMCS	Preventive Maintenance Checks and Services
Qty	Quantity
Recm	Recommended
Rqr	Required
SF	Standard Form
TAMMS	The Army Maintenance Management System
TDA	Table of Distribution and Allowances
TM	Technical Manual
TOE	Table of Organization and Equipment
U/M	Unit of Measure
Vdc	Volts, direct current

1-9 GLOSSARY

BLACK SPOTS. These are cosmetic blemishes in the image intensifier of the MNVD or dirt or debris between the lenses.

BRIGHT SPOTS. These defects can appear in the image area of the MNVD. This condition is caused by a flaw in the film on the microchannel 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 headmount to fit different head sizes. The thin browpad (large head) comes attached to the headmount 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 monocular'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 inherent 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.

LIGHT INTERFERENCE FILTER (LIF). This is a light protection filter for the monocular. Use of this filter will result in a slight reduction in system gain.

MICROCHANNEL PLATE. A current-multiplying optical disk that intensifies the electron image produced by the photocathode.

NOTE. Essential information of special importance, interest, or aid in job performance.

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.

Section II. Equipment Description

1-10 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

WARNING

EQUIPMENT LIMITATIONS

To avoid personal injury and property damage when using the MNVD carefully read and understand the following safety precautions.

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

CAUTION

- The MNVD 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.

The MNVD is a hand-held, headmounted, 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, a low-battery indicator and a gain control.

1-11 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The MNVD includes the items shown in Figure 1-1. The major components are the headmount, helmet mount, monocular, carrying case, and the shipping and storage case.

a. Monocular . The monocular (see Figure 1-2) consists of various components such as an objective lens, an image intensifier (not shown), an eyepiece lens and a battery cartridge.

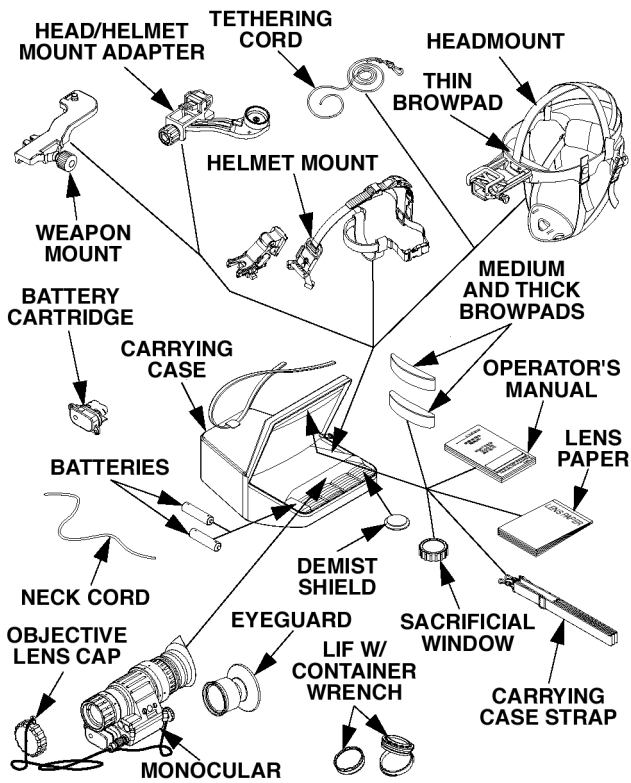
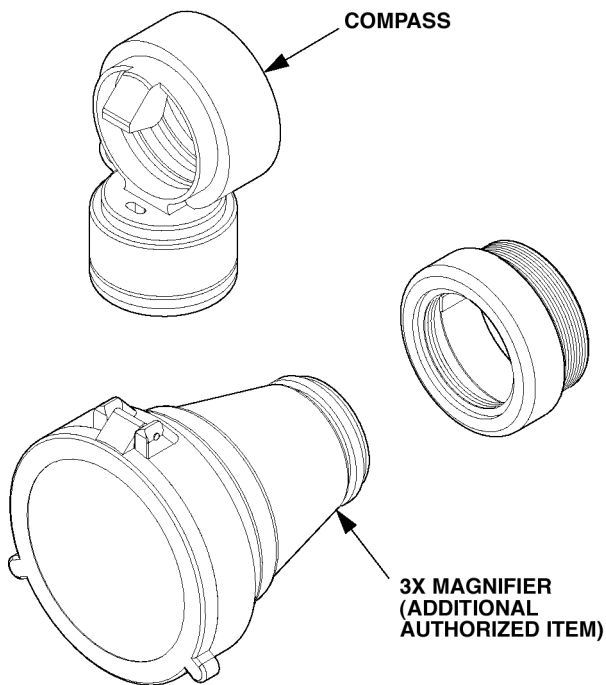
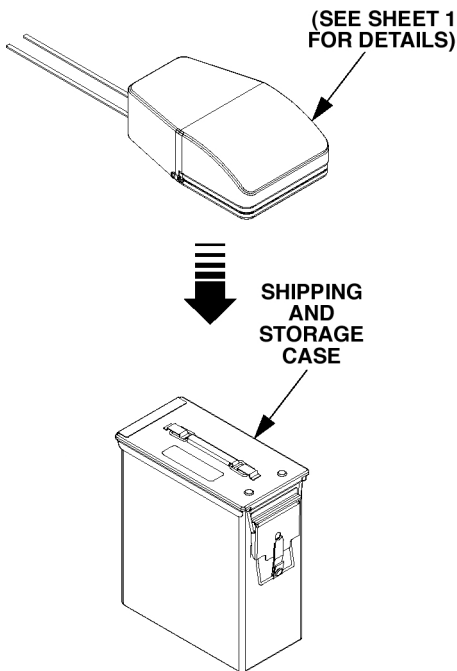


Figure 1-1. Monocular Night Vision Device (MNVD), AN/PVS-14 (Sheet 1 of 3).



**Figure 1-1. Monocular Night Vision Device (MNVD),
AN/PVS-14
(Sheet 2 of 3).**



**Figure 1-1. Monocular Night Vision Device (MNVD),
AN/PVS-14
(Sheet 3 of 3).**

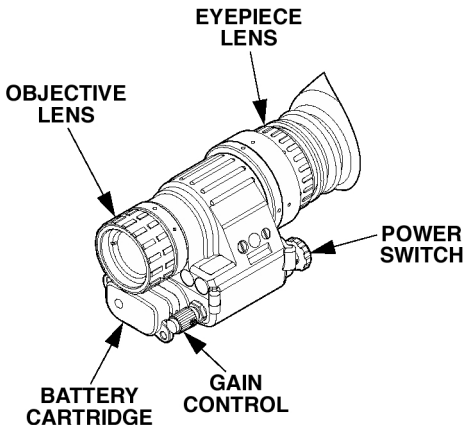


Figure 1-2. Monocular Night Vision Device.

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.

LIF – The LIF (Figure 1-1) is to be used at all times. For replacing the filter the container is also the wrench. The container/wrench is used to remove and replace the LIF from the objective lens.

Sacrificial Window – A replaceable sacrificial window (Figure 1-1) is supplied to protect the objective lens during operation in adverse conditions.

Compass – The compass (Figure 1-1) enables the operator to see azimuth readings in the monocular.

Tethering Cord – The tethering cord (Figure 1-1) enables the user to attach the compass or 3X magnifier to a button hole or belt loop to guard against dropping or losing these items.

3X Magnifier – (Additional Authorized Item) The 3X magnifier (Figure 1-1) is a lens assembly which can be added to the monocular to extend the operator's observation ranges.

b. Headmount. The headmount (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 headmount; the thick and medium browpads, used for smaller heads are stored in the carrying case.

c. Helmet Mount. 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. Headmount/Helmet Mount Adapter. This item (Figure 1-1) is attached to the monocular to allow its use with the headmount or helmet mount. It allows mounting in front of the left or right eye.

e. Weapon Mount. 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 (Figure 1-1) is provided for transportation and protection of the monocular, headmount, batteries and accessories. Two slide keepers are provided for belt attachment and three D-rings for shoulder and leg strap attachment. A carrying case strap is also provided which can be attached to the two D-rings on the back of the carrying case.

g. Shipping and Storage Case. The MNVD is supplied in a shipping and storage case (Figure 1-1).

1-12 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 Vdc max ea.)
Battery Requirements	2 AA Alkaline or 2 AA 1.5 Vdc Lithium L91

Table 1-4. Mechanical Data.

ITEM	CHARACTERISTICS
Shipping and Storage Case	Size: Approx. 14" X 9.5" X 8" Weight: 2.4 lbs.
Carrying Case Monocular (see Note)	Size: Approx. 14" X 8" Weight: 14 ounces

NOTE: Weight of the monocular does not include accessories.

Table 1-5. Optical Data.

ITEM	DATA
Magnification	1.0X (3X with 3X magnifier)
Field-of-View	40° (13° with 3X magnifier)
Diopter Focus	+2 to -6 diopters
Objective Focus	25cm (9.8") 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
Illumination Required	Overcast starlight to moonlight

Section III. Principles of Operation

1-13 MECHANICAL FUNCTIONS

The mechanical functions of the MNVD 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 1-3.

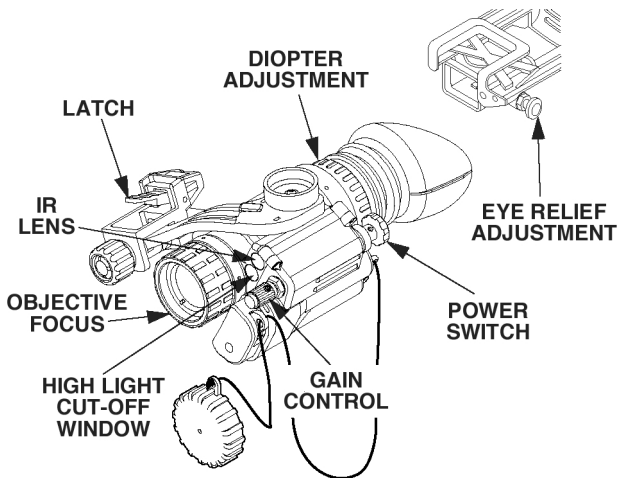


Figure 1-3. Mechanical Functions for the MNVD.

1-14 OPTICAL FUNCTIONS

The optical functions include an objective lens, image intensifier and eyepiece lens (Figure 1-4). The objective lens collects light reflected from the night scene by the moon, stars, or night sky, inverts the image and focuses that image on the image intensifier. The image intensifier converts the captured light into a visible image and reinverts the image which can then be viewed through the eyepiece lens.

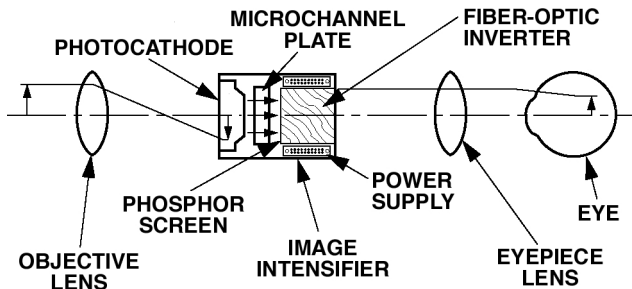


Figure 1-4. Optical Function Diagram.

1-15 ELECTRONIC CIRCUIT FUNCTION

The electronic circuit regulates the direct current voltage from the batteries to the image intensifier and IR source as required. It also monitors the output voltage of the batteries and turns on a low-battery indicator when the available battery voltage is 1.9 – 2.1 Vdc.

a. Power Source. The electronic circuit is powered by two batteries.

b. High Light Cut-Off. The monocular will automatically cut off after 70 ± 30 seconds of operation in daylight or bright room light. Individual bright lights (headlights, flashlights, or other concentrated light sources) will not actuate the high light detector located on the front of the monocular. To turn the monocular back ON, turn the power switch to RESET/OFF position and then to ON again.

CHAPTER 2

OPERATING INSTRUCTIONS

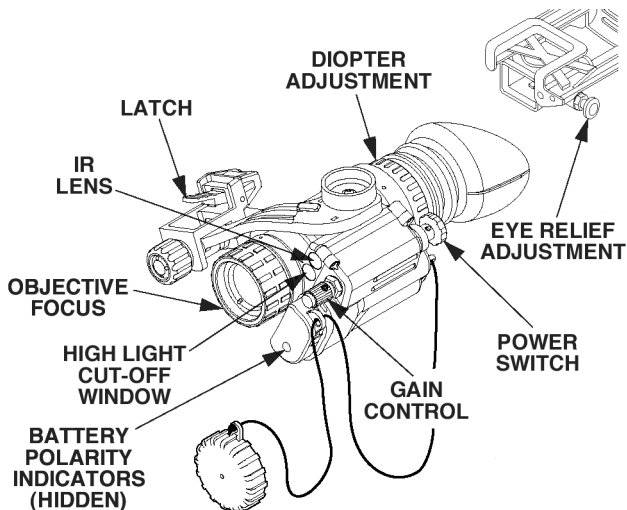
Section I. Description and Use of Operator's Controls and Indicators

NOTE

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

2-1 OPERATOR CONTROLS AND INDICATORS

The MNVD is designed to adjust for different users and corrects for most differences in eyesight. The controls and indicators for the MNVD are shown in Figures 1-3 and 2-1, which are described in Table 2-1.



NOTE - LOW BATTERY INDICATOR AND IR SOURCE "ON" INDICATOR ARE VISIBLE IN EYEPiece LENS

Figure 2-1. Monocular Controls and Indicators.

Table 2-1. Monocular Controls and Indicators.

CONTROLS AND INDICATORS	FUNCTIONS
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 the IR source.

CAUTION

Do not use excessive force to place the power switch into the momentary IR position.

Table 2-1. Monocular Controls and Indicators - Continued.

CONTROLS AND INDICATORS	FUNCTIONS
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 illuminated it indicates that the IR source is 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.

Table 2-1. Monocular Controls and Indicator - Continued.

CONTROLS AND INDICATORS	FUNCTIONS
Latch	Latch used for separation of monocular from head-mount/helmet mount adapter.
Battery Polarity Indicators	This feature, molded into the battery cartridge, shows the proper orientation of the batteries. Some versions have a bubble molded into the top of the battery cartridge, to show the + for proper orientation.

Section II. Preventive Maintenance Checks and Services (PMCS)

2-2 PREVENTIVE MAINTENANCE CHECKS AND SERVICES TABLE

NOTE

The unit maintenance tracks the system for when the 180 day service is due or any maintenance that is performed by either hard copy or automated. If using an automated system such as SAMS or ULLS, use the equivalent electronic form, to track using the same procedure as for the hard copy DA Form 2404, 2407 or DD Form 314 etc.

- a. General.** To ensure the readiness of the MNVD, 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.

c. Explanation of Table Entries.

(1) Item Number Column. Numbers in this column are for reference. When completing Equipment Inspection and Maintenance Worksheet, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

(2) Interval Column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating or using the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment.

(3) Location, Check/Service Column. This column provides the location and the item to be checked or serviced. The item location is underlined.

(4) Procedure Column. This column gives the procedure you must do to check or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or operation. You must do the procedure at the time stated in the interval column.

(5) Not Fully Mission Capable If: Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you make check and service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

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.

d. Other Table Entries. Be sure to observe all special information and notes that appear in your table.

Table 2-2. Preventive Maintenance Checks and Services for the MNVD.

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
1.	Before	Maintenance Forms and Records	Open carrying case, inventory items and check for: <ul style="list-style-type: none"> Previously recorded faults on maintenance records, DA Form 2404. 	Fault not corrected.
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.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
3.	Before/ After	Battery Cartridge/ Housing	<p>Inspect external surfaces for cracks or damage. Scratches, cracks, and gouges are OK if operation is not affected.</p> <p>Inspect battery compartment. Check to make sure battery cartridge is present. Remove battery cartridge and inspect for moisture, cracks, corroded or defective spring contacts, and o-ring present in cartridge.</p>	<p>Cracks or damage in the battery housing.</p> <p>Cartridge is missing, contacts damaged, or corroded, o-ring is missing.</p>

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
3. Cont.	Before/ After	Battery Cartridge/ Housing Cont.	<p>Remove any batteries 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 batteries 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 day-light 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 70 ± 30 seconds.</p>	<p>Power switch has no definite stopping points or knob is broken or missing.</p> <p>IR source does not work.</p> <p>If damaged, refer to higher level of maintenance.</p>

Table 2-2. Preventive Maintenance Checks and Services for the MNVD
 - **Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
3. Cont.	Before/ After	Battery Cartridge/ Housing Cont.	<p>Turn monocular OFF and then ON to reenergize monocular.</p> <p>NOTE</p> <p>If the monocular fails this high-light 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.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
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 eyecup. Inspect for bent, broken, or improperly fitting eyepiece lens. If necessary, clean with water.	Chips and cracks are permitted on the eyecup retaining rings as long as they do not interfere with installation of eyecup.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
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	Rotate focus ring to ensure free movement (range is approximately 1/3 turn). Check objective lens for chips, cracks and dents.	Focus ring is binding or not able to move.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
8. Cont.	Before/ After	Objective Lens Cont.		Chips, cracks, or dents prevent full field-of-view, installation of LIF or the ability to focus.
9.	Before/ After	Neck Cord and Objective Lens Cap	Check the infinity focus locking ring for tightness. Check for cracks. Inspect for cracked, torn, or missing objective lens cap. Inspect neck cord for cut, damage, or loose ends. Re-tie ends if necessary.	Cracked or loose. Damaged.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/ Service		
10.	Before/ After	Viewed Image	<p>NOTE</p> <p>Operator may use the TS-4348/UV to check resolution (paragraph 2-3).</p> <p>Refer to paragraph 2-4 to inspect for operational defects.</p> <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>	Flickering, flashing, edge glow, or shading is observed.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
		<u>HEADMOUNT</u>		
11.	Before/ After	Straps/Pads	Inspect for cuts, tears, fraying, holes, cracks, or defective fasteners.	Damage causes straps or pads to be unserviceable.
12.	Before/ After	Socket	Inspect for dirt, dust, or corrosion. Insert monocular latch into socket to verify secure attachment of monocular to headmount. If necessary, clean socket with water.	Damaged, latch won't lock or is too loose.
13.	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.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
		<u>HELMET MOUNT</u>		
14.	Before/ After	Straps	Inspect for cuts, tears, fraying, holes, cracks, or defective fasteners.	Damage causes straps to be unserviceable.
15.	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.
16.	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.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
		<u>MOUNTING ADAPTERS</u>		
17.	Before/ After	Headmount/ Helmet Mount Adapter	Inspect for dirt, dust or corrosion. Insert into headmount or helmet mount socket to verify secure attachment.	Damaged, will not latch securely.
18.	Before/ After	Weapon Mount	Inspect for dust, dirt or corrosion.	Damaged, will not mount to monocular or will not mount to rail.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
19.	Before/ After	<u>ACCESSORIES</u>	<p style="text-align: center;"><u>CAUTION</u></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>	Damage or scratches hinder vision with monocular on.
		Demist Shield		
			Inspect for dirt, dust, scratches or damage. If necessary, clean when shield is dry and with dry lens tissue only.	

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/ Service		
20.	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.
21.	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.
22.	Before/ After	Compass	Inspect for dirt, dust, scratches, or damage. If necessary, clean with water and dry with lens tissue. Install compass and turn on monocular. When the illumination button is depressed, compass should be visible.	Damaged or compass is not visible.

**Table 2-2. Preventive Maintenance Checks and Services for the MNVD
- Continued.**

Item No.	Interval	Location	Procedure	Not Fully Mission Capable If:
		Check/Service		
23.	Before/ After	3X Magnifier (Additional Authorized Item)	Inspect optical surface for dirt, dust, scratches or cracks.	Damage or scratches hinder vision.
24.	Before/ After	<u>CARRYING CASE</u> Case	Remove all items and shake out loose dirt or foreign material. Inspect for tears, cuts, excess wear, or damage to mounting clips.	
25.	Before/ After During	Shoulder Strap None	Inspect for cuts, tears, or excess wear or damaged clips.	

2-3 RESOLUTION CHECK USING THE TS-4348/UV TEST SET

NOTE

The TS-4348/UV Test Set can be used by the operator to check the resolution of a monocular at any time.

NOTE

The TS-4348/UV Test Set can be used by Direct Support/Intermediate Level to perform the resolution testing 180 Day Service. If a system fails it must be tested on the TS-3895A/UV Test Set.

NOTE

Verify the resolution of the monocular using the TS-4348/UV Test Set at every opportunity. The resolution cannot be accurately measured without the test set.

The following procedures are designed to check the performance of the image intensifier.

- a. Setup.** Before using the TS-4348/UV Test Set, refer to TM 11-5855-299-12&P to set up and familiarize yourself with its operation and the warnings and cautions associated with that test equipment.

NOTE

- The resolution test must be performed in a darkened area. Your eyes must be dark-adapted to perform this test. Review the following test procedure before entering the dark area.
- Expect cosmetic blemishes, such as chicken wire, black spots, and fixed-pattern noise, to stand out while viewing through the TS-4348/UV Test Set when it is on the high light level. This is acceptable.
- The rejection of any MNVD for cosmetic defects must be based on an outdoor evaluation and not the TS-4348/UV Test Set.

b. Low Light and High Light Resolution Test Procedure.

Test the monocular for low light and high light resolution performance according to the following steps.

- (1) Place the HIGH/LOW switch on the test set to the LOW position.
- (2) Install the LIF per paragraph 2-10.
- (3) Turn off the room light and let your eyes adjust to the dark.
- (4) Turn on the test set by setting the “II/OFF/III” switch to the “III” position.
- (5) Turn on the monocular and insert it into the test port on the test set.

(6) Look through the monocular and view the projected pattern (see Figure 2-2). If necessary, focus the eyepiece lens and then the objective lens to obtain the sharpest image.

(7) The MNVD monocular must be able to resolve Group 2, Element 2, under low light conditions to pass the test. If the MNVD does not pass the test, return it to maintenance for repair. The operator must document resolution failures on the maintenance record.

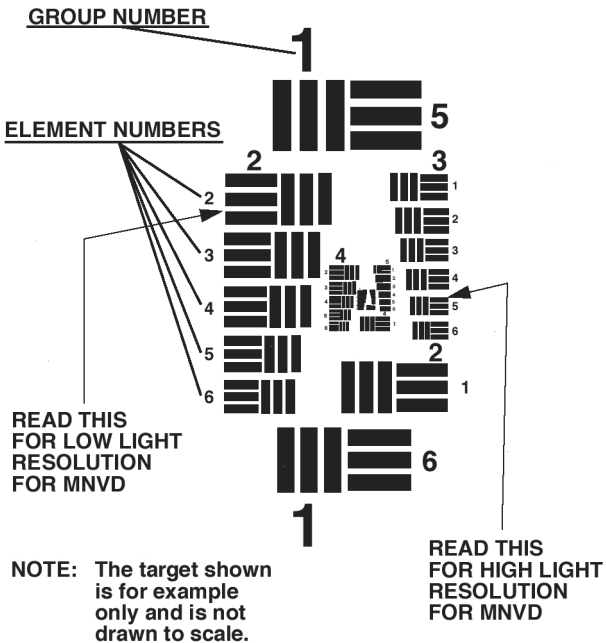


Figure 2-2. TS-4348/UV Test Set Pattern.

NOTE

For a pattern to be resolvable, three vertical bars and three horizontal bars must be visible.

(8) Flip the HIGH/LOW switch to the HIGH position.

(9) Again, look through the monocular and view the projected pattern (see Figure 2-2). If necessary, refocus the objective lens and then the eyepiece lens to obtain the sharpest image.

(10) The MNVD must be able to resolve Group 3, Element 5, under high light conditions to pass the test. If the monocular does not pass the test, send it to a higher level of maintenance for repair.

NOTE

When using the TS-4348/UV Test Set, you are not viewing the entire image intensifier. Therefore, operational and cosmetic inspections must be done without the test set as specified in paragraph 2-4.

(11) Look for flashing, flickering, or other nonstable behavior of the image intensifier. Also check the image intensifier for other operational defects described in paragraph 2-4. To view the image intensifier under low light conditions, flip the HIGH/LOW switch to the LOW position and allow your eyes to become accustomed to the dark. If any unacceptable conditions are noted, send to a higher level of maintenance for repair.

2-4 INSPECTION CRITERIA FOR PROPER IMAGE INTENSIFIER OPERATION

a. General. As directed in the Preventive Maintenance Checks and Services table, image intensifier operation must be checked before each mission. This section provides information for the operator concerning what to look for, how to look for it, and how to determine if the MNVD should be returned to the maintainer. **The operator (Army only) must record all conditions on the appropriate maintenance forms and describe the specific defects and sign it so the maintainer can take corrective action.**

CAUTION

Perform the following inspection in the dark.

To perform this inspection, attach the monocular to the headmount as described in paragraph 2-6a and turn the power switch to the ON position. Look through the monocular and view the image.

There are two groups of “defects” you may encounter – operational defects and cosmetic blemishes. Operational defects are an immediate cause to reject the MNVD. Cosmetic blemishes are not a cause for rejection unless they become severe enough to interfere with the ability to perform the mission. **The rejection of any MNVD for cosmetic defects must be based on an outdoor evaluation and not the TS-4348/UV Test Set.**

b. Operational Defects. These defects relate to the reliability of the image intensifier and are an indication of instability. If identified, they are an immediate cause for rejecting the MNVD. They include shading, edge glow, flashing, flickering, and intermittent operation.

(1) Shading. If shading is present, you will not see a fully circular image (see Figure 2-3). Shading is very dark and you cannot see an image through it. Shading always begins on the edge and migrates inward eventually across the entire image area. Shading is a high contrast area with a distinct line of demarcation. Return the MNVD to the maintainer.

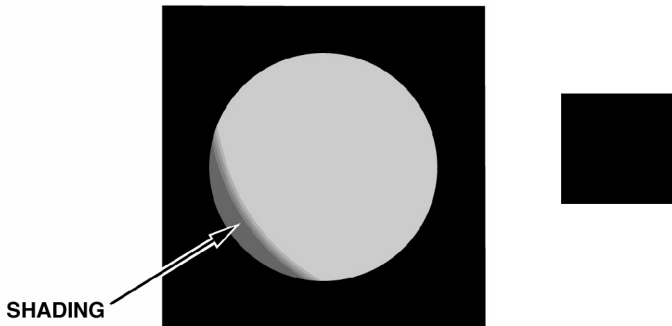


Figure 2-3. Shading.

NOTE

Make sure the shading is not the result of improper eye-relief adjustment (refer to paragraph 2-19).

(2) Edge Glow. Edge glow is a bright area (sometimes sparkling) in the outer portion of the viewing area (see Figure 2-4). To check for edge glow, block out all light by cupping a hand over the objective lens. If the image intensifier is displaying edge glow the bright area will still show up. Return the MNVD to the maintainer.

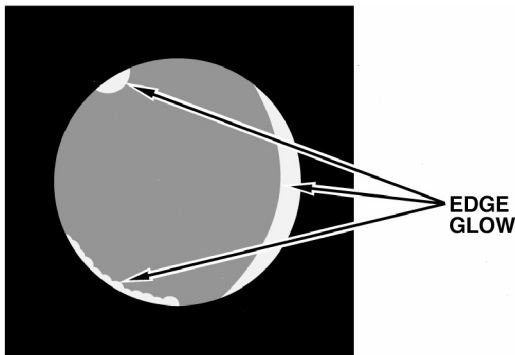


Figure 2-4. Edge Glow.

(3) Flashing, Flickering, or Intermittent Operation. The image may appear to flicker or flash. If there is more than one flicker, check for loose battery cartridge or weak batteries. If weak or loose batteries are not the problem return the MNVD to the maintainer.

c. Cosmetic Blemishes. These are usually the result of manufacturing imperfections that do not affect intensifier reliability and are not normally a cause for rejecting an MNVD. However, some types of blemishes can get worse over time and interfere with the ability to perform the mission. If you believe a blemish is cause for rejection, record the specific nature of the problem on the maintenance forms and identify the position of the blemish by using the clock method and approximate distance from the center (e.g., 5 o'clock toward the outside, 2:30 near the center, or 1:00 midway). The following are cosmetic blemishes:

(1) **Bright Spots.** A bright spot is a small, nonuniform, bright area that may flicker or appear constant (Figure 2-5). Not all bright spots make the MNVD rejectable. Cup your hand over the objective lens to block out all light. If the bright spot remains, return the MNVD to the maintainer. Bright spots usually go away when the light is blocked out. Make sure any bright spot is not simply a bright area in the scene you are viewing. **Bright spots are acceptable if they do not interfere with the operator's ability to view the image or to perform the mission.**

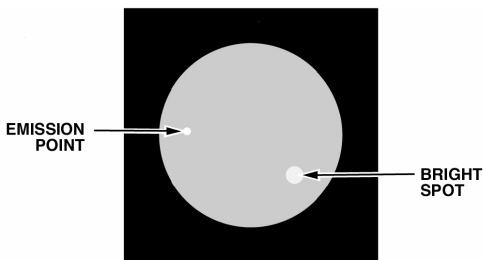


Figure 2-5. Bright Spots and Emission Points.

(2) Emission Points. A steady or fluctuating pinpoint of bright light in image area that does not go away when all light is blocked from the objective lens of the monocular (Figure 2-5). The position of an emission point within the image area does not move. Not all emission points make the MNVD rejectable. Make sure any emission point is not simply a point light source in the scene you are viewing. **Emission points are acceptable if they do not interfere with the operator's ability to view the image or to perform the mission.**

(3) Black Spots. These are cosmetic blemishes in the image intensifier or dirt or debris between the lenses. Black spots are acceptable as long as they do not interfere with viewing the image. **No action is required if this condition is present unless the spots interfere with the operator's ability to view the image or to perform the mission.**

(4) Fixed-Pattern Noise. This is usually a cosmetic blemish 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 (see Figure 2-6). This pattern can be seen in every image intensifier if the light level is high enough. **This condition is acceptable as long as the pattern does not interfere with the operator's ability to view the image or to perform the mission.**

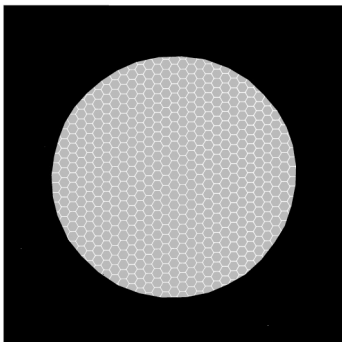


Figure 2-6. Fixed-Pattern Noise.

(5) Chicken Wire. An irregular pattern of dark thin lines in the field-of-view either throughout the image or in parts of the image area (see Figure 2-7). Under the worst case condition, these lines will form hexagonal or square-wave shaped lines. **No action is required if this condition is present unless it interferes with the operator's ability to view the image or to perform the mission.**

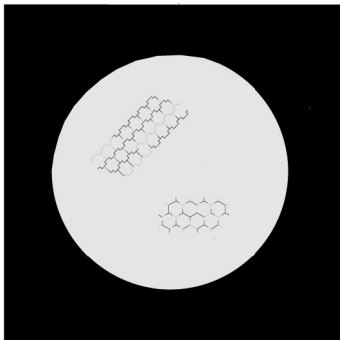


Figure 2-7. Chicken Wire.

Section III. Assembly and Preparation for Use

This chapter contains the information necessary to prepare the monocular for operation. This includes unpacking (2-5), battery installation (2-6), eyecup and eyeguard installation (2-7), demist shield installation (2-8), sacrificial window installation (2-9), LIF installation (2-10), headmount installation and adjustment (2-11), headmount/helmet mount adapter installation (2-12), helmet mount installation to helmet (2-13), alternate helmet mount installation to helmet (2-13b), headmount installation with protective mask (2-14), weapon mount installation (2-15), compass installation (2-16) and 3X magnifier installation (2-17).

2-5 UNPACKING

The following steps must be accomplished prior to each mission where the MNVD 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 1-1), remove MNVD, and check contents for completeness.
- (4) Inspect the monocular for obvious evidence of damage to optical surfaces, body, eyecup, eyeguard, power switch, battery cartridge, etc. Ensure that all optical surfaces are clean and ready for use. Clean with lens paper.

2-6 INSTALLATION OF BATTERIES

CAUTION

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

The MNVD operates with two AA batteries. Batteries are not supplied with the MNVD and must be obtained separately.

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

At operating temperatures below -20°C (-4°F), Alkaline batteries are not recommended, as operating life will be severely reduced. Lithium-iron disulfide L91 1.5V AA batteries should be used below -20°C (-4°F).

CAUTION

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

- Do not mix battery types (i.e., Alkaline and Lithium).

Install the AA batteries as follows.

(1) Remove the battery cartridge by squeezing the two tabs together and pulling out.

(2) Observe polarity, as indicated on the inside of the battery cartridge, and insert the batteries into battery cartridge (Figure 2-8). In addition, some battery cartridges have a bubble molded into the top to show the + for proper orientation of the batteries.

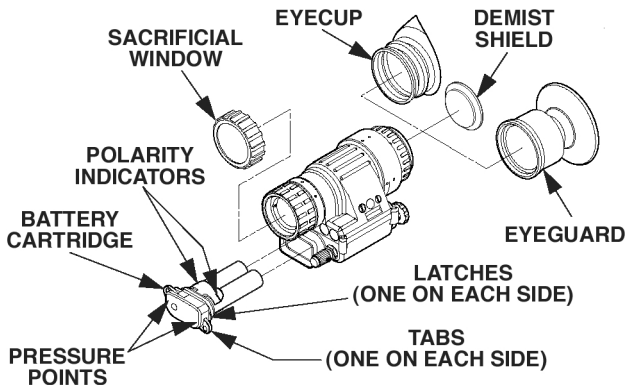


Figure 2-8. Battery, Eyecup and Eyeguard Installation.

(3) Replace battery cartridge by pushing cartridge at pressure points into the housing as shown, making sure both latches on either side are engaged. You will feel them click into place.

2-7 INSTALLATION OF EYECUP OR EYEGUARD

Perform the following procedure to install eyecup or eyeguard onto the monocular. Refer to Figure 2-8.

- (1) Carefully press the eyecup or eyeguard over the end of the eyepiece lens.
- (2) Rotate the eyecup or eyeguard into proper viewing position. Adjust for best fit. The eyecup must seal around your eye and prevent the green glow from escaping.

2-8 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 3-2 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 2-7).

2-9 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.

2-10 INSTALLATION OF LIF

Perform the following procedure to install the LIF onto the objective lens.

- (1) Remove the container/wrench (Figure 1-1) from the carrying case pouch.

CAUTION

Be careful not to touch glass surfaces. If you get fingerprints or contamination on glass surfaces, use lens paper to clean the LIF. If moisture is needed, use your breath to mist the surface of the glass.

(2) If the objective lens cap or sacrificial window is on the objective lens of the monocular, remove it.

(3) Carefully open the container/wrench and remove the LIF. Refer to Figure 2-9.

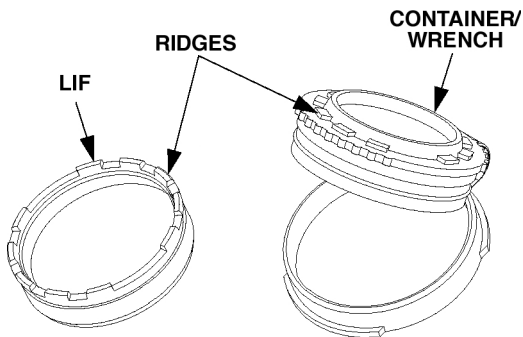


Figure 2-9. LIF.

(4) Hold the LIF by the ridged end (see Figure 2-11) and thread it clockwise, into the end of the objective lens.

Do not overtighten the LIF into the objective lens.

CAUTION

(5) Using the ridged side of the container/wrench as a wrench, engage the ridges on the container with the ridges on the LIF and tighten the LIF handtight.

(6) Place the empty container/wrench back into the carrying case pouch.

(7) Install the objective lens cap or the sacrificial window onto the end of the objective lens and cover the LIF.

NOTE

The LIF must be used at all times unless directed by the unit commander, to remove the LIF, based upon his/her assessment of the laser threat in the theater of operations.

2-11 INSTALLATION AND ADJUSTMENT OF HEADMOUNT

Perform the following procedures for donning the headmount.

NOTE

Do not don the headmount while the monocular is attached.

(1) Prior to donning the headmount, loosen the four ends of the chinstrap approximately two inches from the sliding bar buckles (Figure 2-10).

(2) Snap the front and rear snaps (Figure 2-10) in place.

NOTE

If the headmount is too loose, remove the attached thin browpad (Figure 2-10) and replace with either the medium or thick browpad stored in the carrying case. Refer to paragraph 3-3a for removal and replacement of the browpads.

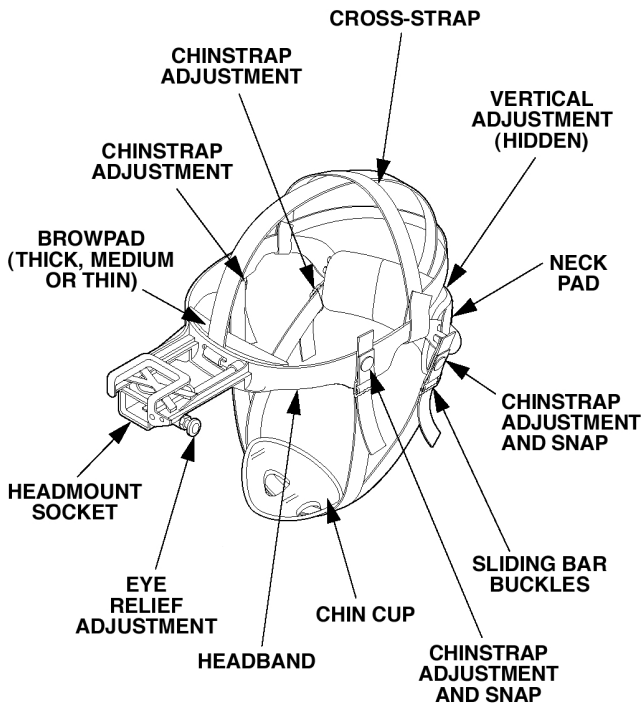


Figure 2-10. MNVD Headmount Adjustments.

(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.

(8) Install the headmount/helmet mount adapter (refer to paragraph 2-12).

(9) Refer to paragraph 2-19 for operating procedures.

2-12 INSTALLATION OF HEADMOUNT/HELMET MOUNT ADAPTER

Install the headmount/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 headmount/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.

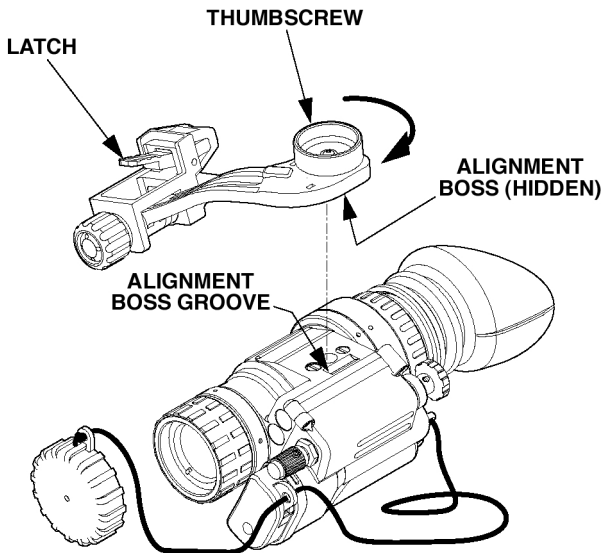


Figure 2-11. Headmount/Helmet Mount Adapter Installation.

2-13 INSTALLATION OF HELMET MOUNT TO HELMET

a. Using Helmet Mount Strap.

(1) Remove the helmet mount from the carrying case. Refer to Figure 2-12 for helmet mount features.

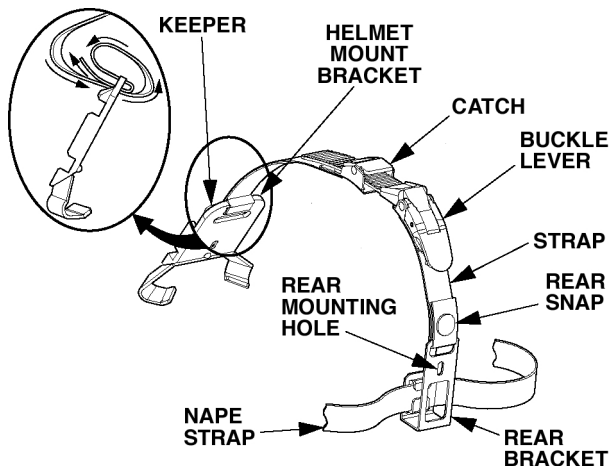


Figure 2-12. Installation of Helmet Mount.

(2) Press the release (Figure 2-13) to remove the mount from the helmet mount bracket.

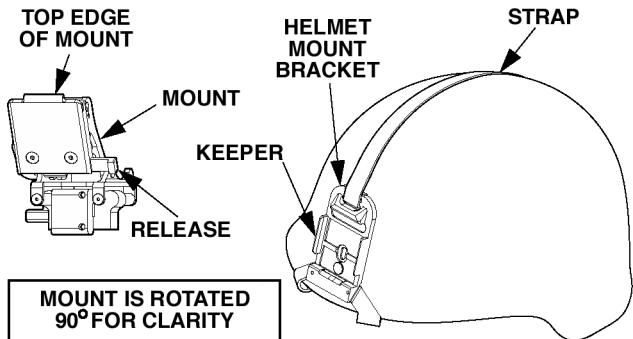


Figure 2-13. Helmet Mount.

(3) Make sure the strap is laced onto the helmet mount bracket as shown in Figure 2-12.

(4) With catch (see Figure 2-12) in forward most position, place the strap over the top of the helmet center (see Figure 2-13).

(5) Hook the rear bracket (see Figure 2-12) 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 2-13).

(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.

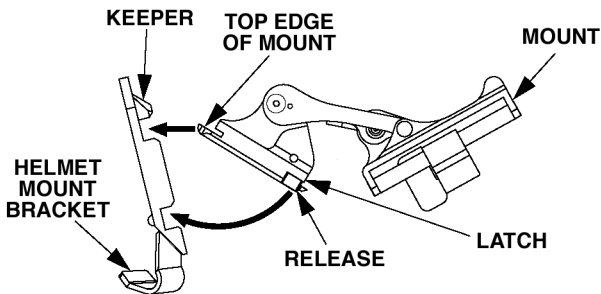


Figure 2-14. Reassembly of Helmet Mount.

b. Marine Corps Only – Using Existing Helmet Screw (no strap).

NOTE

Refer to Figures 2-14 and 2-15 for reference and definition of terms.

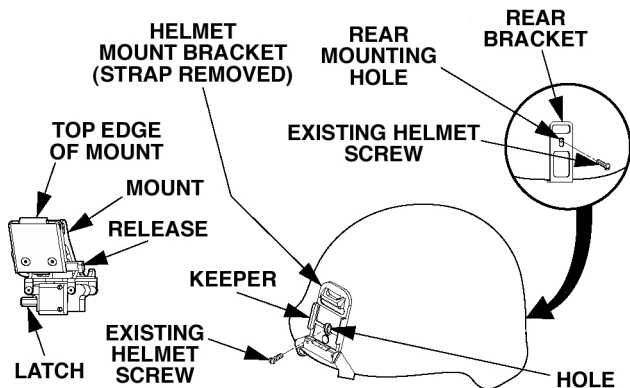


Figure 2-15. Helmet Mount.

- (1) Remove the helmet mount from the carrying case.
- (2) Press the release to remove the mount from the helmet mount bracket.

(3) Unthread the strap from the helmet mount bracket. Unsnap the rear snap and remove the rear bracket from the strap. The nape strap should remain attached to the rear bracket.

NOTE

Place the strap in the carrying case – it is not used for this mounting method.

(4) Find the screw located in the front, center of the helmet. Using a flat tip screwdriver, remove the screw. Hook the helmet mount bracket on the front of the helmet and center it over the hole where the screw was removed.

(5) Insert the screw removed in step 4 through the hole in the helmet mount bracket and through the helmet (see Figure 2-15).

(6) Align the nut on the helmet's interior strapping to the hole and tighten the screw with a flat tip screwdriver.

(7) Attach the mount to the helmet mount bracket. 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.

(8) Find the screw located in the lower rear, center of the helmet. Using a flat tip screwdriver, remove the screw. Hook the rear bracket on the lower rear of the helmet and center it over the hole where the screw was removed.

(9) Insert the screw removed in step 8 through the hole on the rear bracket and through the helmet.

(10) Align the nut to the hole and tighten the screw with the flat tip screwdriver.

(11) Disengage the nape strap latch on left side of nape strap.

(12) Don the helmet. Do not fasten the helmet chinstrap.

(13) 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.

(14) Insert the top edge of the mount under the keeper on the helmet mount bracket and rotate downward until the latch engages. To release the mount from the helmet bracket, press the release and pull forward and down.

2-14 INSTALLATION OF HEADMOUNT WITH PROTECTIVE MASK

Perform the following procedures for donning headmount with protective mask.

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

WARNING

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

(2) Install the headmount per the instructions in paragraph 2-11.

NOTE

It may be necessary to remove the browpad (Figure 2-10) when wearing the headmount over a protective mask.

2-15 INSTALLATION OF WEAPON MOUNT

Perform the following procedure to install the weapon mount.

CAUTION

The MNVD 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 2-16, 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.

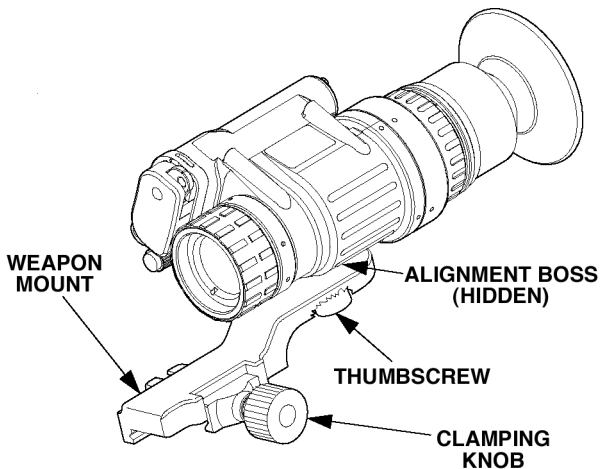


Figure 2-16. Weapon Mount Usage.

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.

2-16 INSTALLATION OF COMPASS

CAUTION

- Use of the compass with the plastic headmount or the plastic helmet mount will result in inaccurate compass readings. The magnet cannot be removed from these mounts.
- The magnet must be removed from the ruggedized metal helmet mount before installation of the compass. Failure to do so will result in inaccurate compass readings.
- If the magnet is not removed, turn the ruggedized metal helmet mount in to unit maintenance for removal. See Figure 2-17 for location of magnet.

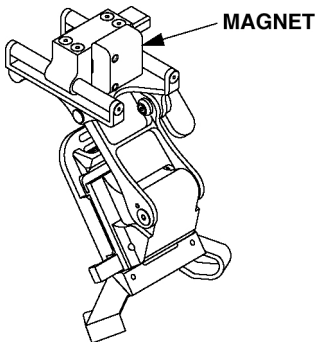


Figure 2-17. Locating the Magnet.

NOTE

- Prepare the monocular for operation.
- Leave LIF in place when installing the compass.

(1) If the sacrificial window or objective lens cap is in place, remove it.

(2) Turn monocular on.

(3) Rotate the objective lens focus completely counterclockwise (while looking through the monocular).

NOTE

The o-ring must be in place in the compass in order for the compass to fit properly.

(4) Press the compass onto the objective lens at an angle using your left hand. Slowly turn the compass counterclockwise until it is in the vertical position (with compass illumination button pointing down). See Figure 2-18.

(5) Ensure that the compass fits tightly to the objective lens.

(6) Refer to paragraph 2-23 for operation of the compass.

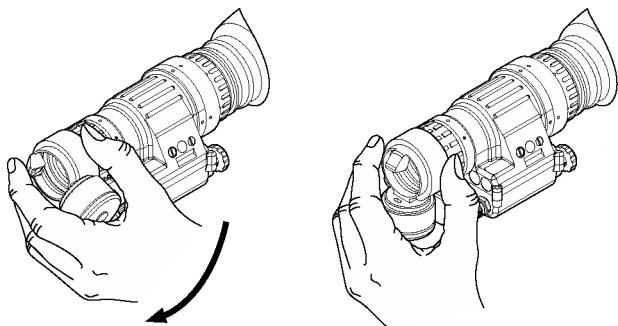


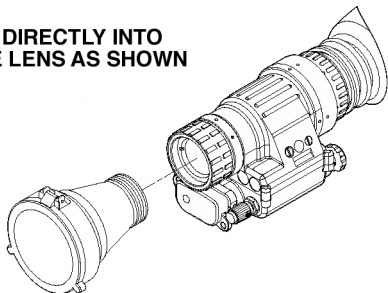
Figure 2-18. Compass Installation.

2-17 INSTALLATION OF 3X MAGNIFIER

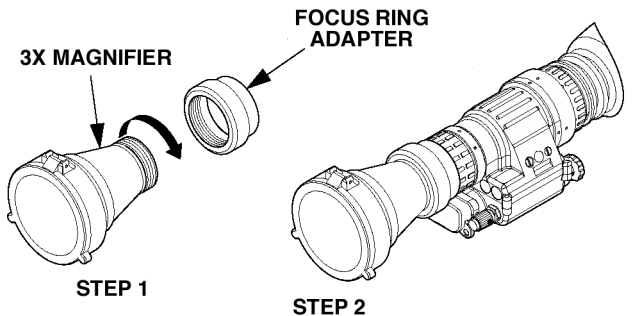
The 3X magnifier can be threaded directly into the objective lens, with the LIF removed. It can also be threaded into the focus ring adapter and slipped on over the end of the objective lens with the LIF installed.

Figures 2-19 and 2-20 illustrate these installation procedures.

**THREAD DIRECTLY INTO
OBJECTIVE LENS AS SHOWN**



**Figure 2-19. 3X Magnifier Installation
without LIF.**



**THREAD 3X MAGNIFIER
INTO FOCUS RING ADAPTER**

**Figure 2-20. 3X Magnifier Installation
with LIF.**

Section IV. Operating Procedures

This section contains operating procedures for using the MNVD as hand-held, head mounted or helmet mounted monocular. Prior to operating the monocular, make certain that all the steps in Section III, Assembly and Preparation for Use, have been read and performed.

2-18 HAND-HELD OPERATION

CAUTION

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 batteries are installed per paragraph 2-6.
- (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.

2-19 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 batteries are installed per paragraph 2-6.
- (2) Don the headmount per instructions in paragraph 2-11.

NOTE

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

(3) Align the headmount/helmet mount adapter's latch to the headmount socket (Figure 2-21). Press and hold down the latch lever while installing the monocular into the headmount socket. Release the latch when the monocular fully engages the socket.

(4) Set your eye relief by depressing the eye relief adjustment (Figure 2-21) and move the monocular back toward your non-dominate eye until the eyecup comfortably seals around the eye.

(5) Turn the monocular ON.

(6) Readjust the vertical adjustment (Figure 2-10) of the headmount until the monocular is properly aligned with your eye.

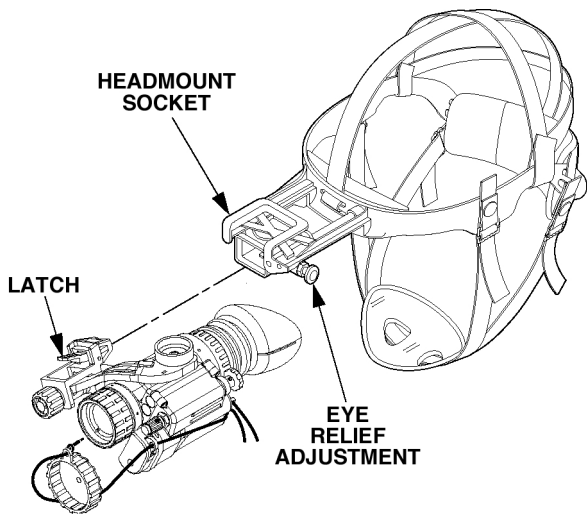


Figure 2-21. Headmount/Helmet Mount Adapter Operation.

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.

2-20 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 MNVD. Excessive force can break the headmount/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.
- **Marine Corps Only** – Use the helmet screws to mount the helmet mount bracket directly to the helmet per paragraph 2-13b.
- **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 MNVD. The flipped down position allows the user to position the MNVD directly in front of the eyes. The helmet mount also allows the user to rotate the MNVD to a flipped up position when the MNVD 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 MNVD is in the correct position.

NOTE

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

- (1) Ensure that the batteries are installed per paragraph 2-6.
- (2) Don the helmet mount per instructions in paragraph 2-13.
- (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 2-22) 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.

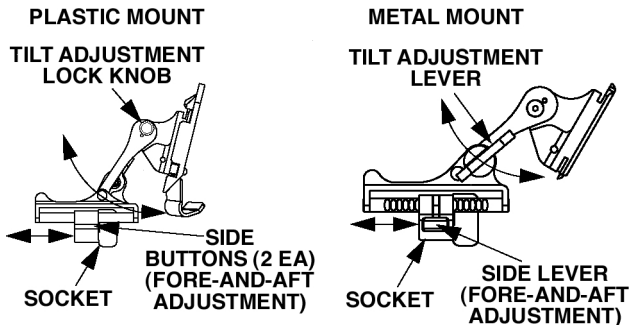


Figure 2-22. Tilt and Flip-up Assembly Mechanisms.

(4) Turn power switch to ON. Adjust the tilt by using the tilt adjustment lock knob (or tilt adjustment lever on metal mount) (Figure 2-22) 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 2-22) (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.

2-21 WEAPON MOUNTED OPERATION

NOTE

The MNVD 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 batteries are installed per paragraph 2-6.
- (2) Assemble the weapon mount to the monocular per paragraph 2-15, steps 1 and 2.
- (3) Mount the monocular with adapter onto the M16/M4 receiver rail per paragraph 2-15, 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.

2-22 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.

2-23 OPERATION WITH COMPASS

WARNING

The compass illuminator can be seen by others using night vision devices.

CAUTION

You will get inaccurate readings, when using the compass on any head or helmet mount with the magnet still installed. Only the magnet on the metal mount can be removed without causing damage to the equipment, see paragraph 2-16.

NOTE

- The compass reading is the magnetic North, not true North.
- The compass reading is within 2° of correct absolute magnetic bearing. Compass readings with mounted monocular (head mount or helmet mount) can be up to 15° of correct absolute magnetic bearing. This occurs mostly in the East (90°) to West (270°) and less in the North (360°) to South (180°) reading. If the compass is inadvertently magnetized this could cause an additional 15° error.
- The objective lens focus can be fine tuned after installation, but in order to obtain an accurate reading, the compass must be vertical. (The compass image must be level.)

(1) Install per paragraph 2-16.

(2) If necessary to more clearly view your distant object, adjust the objective lens focus slightly by gripping the compass and turning clockwise.

NOTE

- Increase brightness slowly. Excessive brightness may burn a temporary image into the image intensifier. Do not increase brightness any more than is necessary to clearly read the compass heading.
- The monocular must be focused at or near infinity for proper compass operation.

(3) To view the compass through the monocular, grip the compass with index finger on top and thumb on illumination button on bottom. Press button slowly with thumb until proper brightness is obtained. The image should appear as shown in Figure 2-23.

(4) The compass readings should change when you move your head from side to side. Rotate or tap compass slightly to ensure compass is operating correctly. Hold the monocular in a level position to assure free rotation of the compass scale.

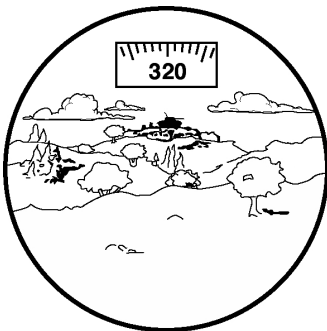


Figure 2-23. View Through Installed Compass.

(5) The tick mark closest to the center of the lighted display is the compass bearing. The tick marks are in degrees, with longer tick marks every five degrees and bearing labels every 10 degrees.

2-24 OPERATION WITH 3X MAGNIFIER

- (1) Install per paragraph 2-17.

NOTE

The mated 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.

2-25 OPERATION WITH GAIN CONTROL

Turn the gain control (Figure 2-24) to balance the illumination input to the eye.

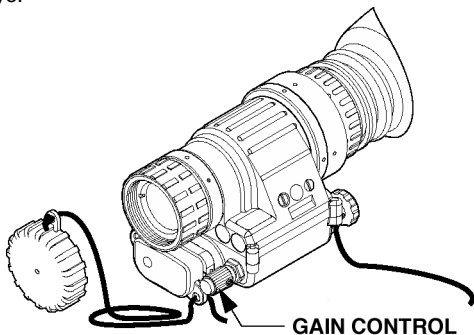


Figure 2-24. Gain Control.

2-26 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 headmount, 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 cartridge and remove batteries.

(b) Inspect the battery housing for corrosion or moisture. Clean and dry if necessary.

(c) Replace the battery cartridge.

(d) Remove the demist shield or sacrificial window if installed. Install objective lens cap.

NOTE

- Prior to placing MNVD into carrying case, ensure MNVD 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, batteries, carrying case strap, lens paper, sacrificial window, manual, LIF, browpads, headmount, helmet mount, headmount/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 1-1).

(h) Return to storage area.

Section V. Operation Under Unusual Conditions

2-27 OPERATION IN DUSTY OR SANDY AREAS

CAUTION

Operation in dusty or sandy areas can pit and scratch the optical elements and damage the mechanical components unless the precautions given below are observed.

(1) Ensure that the sacrificial window is in place over the LIF.

(2) Avoid pointing the monocular into the wind unless necessary for operation.

(3) Keep the carrying case closed unless removing or replacing items.

(4) Ensure that all dust and sand is removed from the MNVD and carrying case after operation.

2-28 OPERATION IN RAINY OR HUMID CONDITIONS

CAUTION

Operation in rainy or humid conditions can cause corrosion and deterioration of the MNVD unless the precautions given below are observed.

- (1) Install the demist shield (paragraph 2-8).
- (2) Keep the carrying case, and shipping and storage case closed unless removing or replacing items.
- (3) Dry the monocular, mounts, and accessories after exposure to rain or high humidity and before storage. This will prevent mildew from forming in the case.
- (4) Do not store monocular in a wet carrying case or a wet shipping and storage case.

2-29 OPERATION IN SALT WATER AREAS

After exposure to salt water, clean the MNVD (paragraph 3-2).

2-30 OPERATION IN NUCLEAR, BIOLOGICAL AND CHEMICAL (NBC) ENVIRONMENTS

WARNING

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

(1) Decontamination – Wear a protective mask while using MNVD after decontamination process.

(2) Hardness – Do not use DS-2 for decontaminating the MNVD. To decontaminate, use 5% sodium hypochlorite and rinse with hot (158° F) soapy water.

2-31 OPERATION IN LASER THREAT ENVIRONMENTS

NOTE

The LIF is a light-protection filter. This filter must be used at all times unless directed by the unit commander, to remove the LIF based upon his/her assessment of the laser threat in the theater of operations. Use of this filter will result in a slight reduction in system gain.

Install the LIF as described in paragraph 2-10.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. Lubrication Instructions

No lubrication is required.

Section II. Troubleshooting Procedures

3-1 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.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<p>1. Monocular fails to activate.</p> <p>2. IR source fails to activate.</p> <p>3. IR source indicator fails to activate.</p> <p>4. Poor image quality.</p>	<p>Visual.</p> <p>Check for defective, missing or improperly installed batteries.</p> <p>In a dark location with system turned on, activate IR source. Visually check IR source operation; scene should brighten.</p> <p>Visual.</p> <p>Check objective lens or eyepiece lens focus.</p> <p>Check for fogging or dirt on objective lens or eyepiece lens.</p>	<p>Turn power switch to RESET/OFF position and then ON.</p> <p>Replace batteries or install correctly.</p> <p>If IR source still fails to activate, refer to higher level of maintenance.</p> <p>Refer to higher level of maintenance.</p> <p>Refocus.</p> <p>Clean lens surfaces per paragraph 3-2.</p>

Table 3-1. Operator's Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. Light visible around eyecup.	Check eye relief distance.	Readjust for proper eye relief distance.
	Check eyecup for resiliency.	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.
7. Battery cartridge difficult to open.	Visually inspect for the presence of an o-ring.	If o-ring is missing, refer to higher level of maintenance.
	Check for damaged battery cartridge.	If damaged, refer to higher level of maintenance.

Table 3-1. Operator's Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
8. Head straps cannot be tightened.	Check for defective buckles, fasteners or straps.	If damaged, refer to higher level of maintenance.
9. Headmount or helmet mount socket and headmount/helmet mount adapter latch does not catch.	Check socket or latch for dirt. Check socket or latch for damage.	Clean socket and latch. If damaged, return either headmount or helmet mount socket and headmount/helmet mount adapter to higher level of maintenance.

Table 3-1. Operator's Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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. Compass does not illuminate.	Visual.	Refer to higher level of maintenance.
13. Compass will not stay on the goggles.	Visual.	Refer to higher level of maintenance.
14. Compass display is not clear.	Visual.	Make sure the monocular is focused for infinity. If so, and compass display is still not clear, refer to higher level of maintenance.

Table 3-1. Operator's Troubleshooting - Continued.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
15. Monocular does not cut off when exposed to high light.	<p>Visual.</p> <p>Perform the following test under daylight or bright room light (not fluorescent light).</p> <p>Place the objective lens cap on the objective lens. Turn monocular ON and observe that it cuts off within 70 ± 30 seconds after energized.</p> <p>Turn monocular OFF and then ON to reenergize monocular.</p>	If damaged, refer to higher level of maintenance.

Section III. Operator's Maintenance Procedures

3-2 CLEANING THE MNVD

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).

3-3 HEADMOUNT MAINTENANCE

a. Browpad Replacement. Replace the browpad when cracked, torn, or contaminated. Perform the following procedures to remove and replace the browpad.

(1) Firmly grasp the headmount and remove the old browpad.

(2) Gently press on the new browpad. Lightly smooth out any wrinkles in the new browpad.

b. Neck Pad Reinstallation. During operation of the MNVD, it is possible for the neck pad to become separated from its position on the headband. Perform the following procedure to reinstall the neck pad.

(1) Lift the upper headband strap retention tab (see Figure 3-1) allowing the neck pad strap to be inserted underneath.

(2) Slip the neck pad strap all the way under the upper strap retention tab and then pull the lower part of the neck pad strap under the lower strap retention tab.

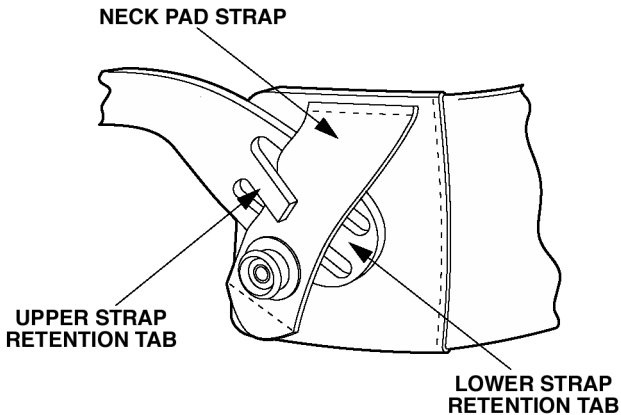


Figure 3-1. Reinstalling the Neck Pad.

(3) Repeat steps 1 and 2 for the other side of the headband and neckband if necessary.

c. Lacing the Sliding Bar Buckles. While donning and adjusting the headmount, it is possible for a strap to slip out of a slide fastener. Perform the following procedure to adjust the strap and sliding bar buckle.

(1) Thread the strap from the inside of the buckle over the moveable sliding bar (see Figure 3-2). Thread the strap back through the buckle but this time under the moveable sliding bar and over the serrated part of the buckle.

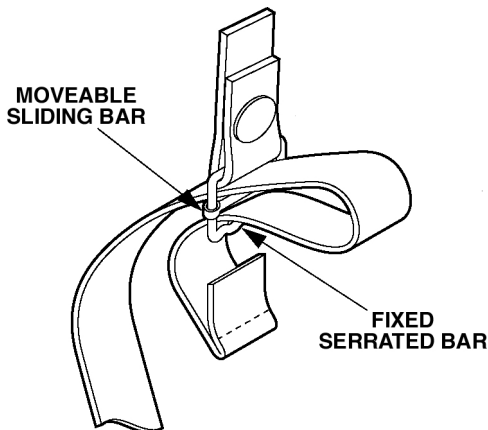


Figure 3-2. Threading the Sliding Bar Buckles.

(2) Pull the strap through the buckle and tighten as necessary.

(3) Repeat steps 1 and 2 for other straps and buckles that may have come undone.

3-4 NECK CORD MAINTENANCE

The neck cord (Figure 1-1) may be broken, frayed, or loose at one or both ends.

If loose, re-tie cord. If broken or severely frayed, install new cord as follows:

- (1) Insert ends through monocular holes from the rear.
- (2) Then through one hole of battery cartridge.
- (3) Thread right cord end through hole in objective lens cap.
- (4) Tie a knot in each end.

APPENDIX A REFERENCES

A-1 SCOPE

This appendix lists all the forms, field manuals, technical manuals, and miscellaneous publications referred to in this manual.

A-2 FORMS

Inspection and Maintenance Record	DA 2404
Product Quality Deficiency Report	SF 368
Recommended Changes to Publications and Blank Forms	DA 2028

A-3 FIELD MANUALS

First Aid for Soldiers	FM 21-11
------------------------	----------

A-4 TECHNICAL MANUALS

Operator's and Unit Maintenance Manual (including Repair Parts and Special Tools List) for Test Set, Electronic Systems, TS-4348/UV	TM 11-5855-299-12&P
Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command)	TM 750-244-2

APPENDIX A

REFERENCES - Continued

A-5 MISCELLANEOUS PUBLICATIONS

Army Medical Department Expendable/Durable Items	CTA 8-100
Consolidated Index of Army Publications and Blank Forms	DA Pam 25-30
Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items)	CTA 50-970
The Army Maintenance Management System (TAMMS)	DA Pam 738-750

A-6 MARINE CORPS USE

Equipment Record Procedures	TM 4700-15/1
Marine Corps Publication Distribution System	MCPDS
Recommended Changes to Publications/Logistics-Maintenance Data Coding	NAVMC 10772

APPENDIX B

COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

INTRODUCTION

B-1 SCOPE

This appendix lists COEI and BII for the AN/PVS-14 to help you inventory items for safe and efficient operation of the equipment.

B-2 GENERAL

The COEI and BII information is divided into the following lists.

Components of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the AN/PVS-14. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the AN/PVS-14 in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the AN/PVS-14 during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you identify the items.

B-3 EXPLANATION OF COLUMNS IN THE COEI LIST AND BII LIST

Column (1), Illus Number. Gives you the number of the item illustrated.

Column (2), National Stock Number. Identifies the stock number of the item to be used for requisitioning purposes.

Column (3), Description CAGEC and Part Number. Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the CAGEC (commercial and Government entity code) (in parenthesis) and the part number.

Column (4), Usable on Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

Column (5), U/M (Unit of Measure). Indicates how the item is issued for the National Stock Number shown in column (2).

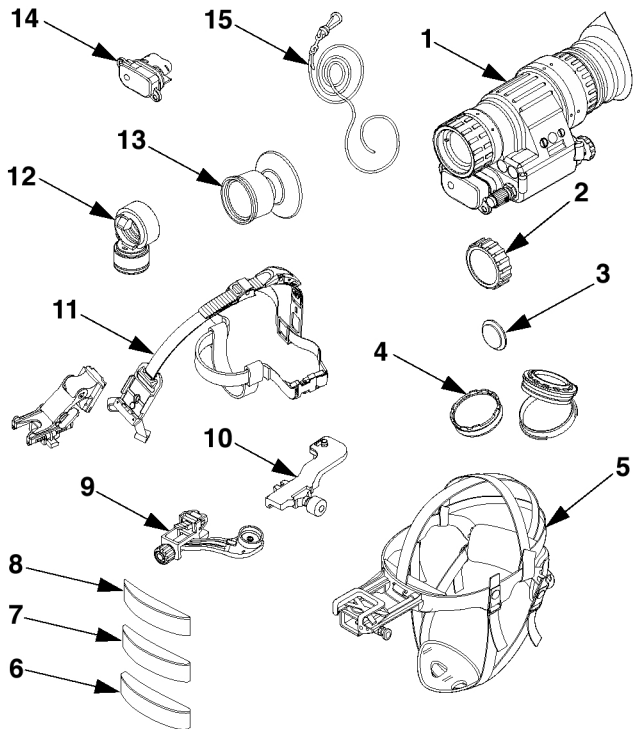
Column (6), Qty Rqr. Indicates the quantity required.

Supply System Responsibility. (Marine Corps Only) A list in alphabetical sequence, of items that are furnished with and must be turned in with the end item. Any item requiring replacement is the responsibility of the holding organization or using unit.

Collateral Material. (Marine Corps Only) A list, in alphabetical sequence, of items that are supplied with the initial issue of an end item and also retained by the unit.

5th Echelon Rehabilitation Program. (Marine Corps Only) Major items returned under this program will be evacuated under the provision(s) of the applicable Marine Corps Order(s) with items listed under "Supply System Responsibility" rebuild and replacement under the 5th Echelon Rehabilitation Program will be limited to these items only. Those items under the heading Collateral Material and using unit items shall be held by holding organizations/using units for application to replacement end items.

**Section II. Components of End Item.
(Marine Corps Supply System Responsibility)
(Sheet 1 of 2).**



**Section II. Components of End Item.
(Marine Corps Collateral Material)
(Sheet 2 of 2).**

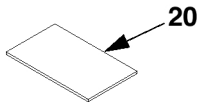
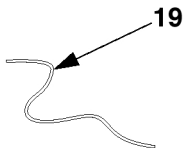
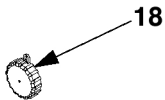
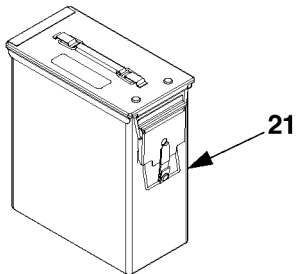
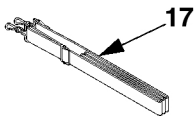
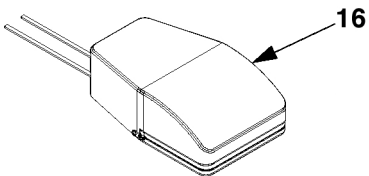


Table 1. Components of End Item List.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
1		MONOCULAR ASSEMBLY (80063) A3256340		EA	1
2	5855-01-246-8271	WINDOW, SACRIFICIAL (80063) A3144264		EA	1
3	5855-01-444-1230	LENS, INFRARED RECEIVER (80063) A3256353		EA	1
4	5855-01-379-1410	FILTER, INFRARED LIGHT (54490) 5009737		EA	1
5	5855-01-246-8266	HEADSET ASSEMBLY (80063) A3144268		EA	1

Table 1. Components of End Item List - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
6	5855-01-297-7847	BROWPAD ASSY, THICK (80063) A3144436		EA	1
7	5855-01-355-8600	BROWPAD ASSY, MEDIUM (80063) A3144435		EA	1
8	5855-01-355-8599	BROWPAD ASSY, THIN (80063) A3144280		EA	1
9	5965-01-444-1216	ADAPTER, HEADSET (80063) A3256347		EA	1
10	5340-01-446-8588	BRACKET, MOUNTING (80063) A3256348		EA	1

Table 1. Components of End Item List - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
11	5855-01-457-2953	MOUNT, VIEWER (80063) A3256368		EA	1
11	5855-01-441-0401	or MOUNT, VIEWER (80063) A3260927		EA	1
12	5855-01-381-6052	COMPASS ASSEMBLY (80063) A3187430		EA	1
13	6650-01-444-1229	EYEGUARD, OPTICAL INSTRUMENT (80063) A3256345		EA	1
14	6160-01-444-1208	COVER, BATTERY RETAINER (80063) A3256344 (MARINES ONLY)		EA	1

Table 2. Components of End Item List

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
15	5340-01-451-7737	CLIP, RETAINING (80063) A3260933		EA	1
16	5855-01-398-4284	CASE, INFRARED EQUIPMENT (80063) A3187392		EA	1
17	5340-01-250-2431	STRAPPING (80063) A3144267		EA	1
18	5340-01-397-6608	CAP, PROTECTIVE, DUST (80063) A3144318		EA	1
19	4020-01-446-8097	CORD, FIBROUS (80063) A3144306		EA	1

Table 2. Components of End Item List

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
20		OPERATOR'S MANUAL TM 11-5855-306-10		EA	1
21		CASE, SHIPPING & STORAGE (80063) A3264350		EA	1

Basic Issue Items

Not Applicable

APPENDIX C

ADDITIONAL AUTHORIZATION LIST (AAL)

INTRODUCTION

C-1 SCOPE

This appendix lists additional items you are authorized for the support of the AN/PVS-14.

C-2 GENERAL

This list identifies items that do not have to accompany the AN/PVS-14 and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3 EXPLANATION OF COLUMNS IN THE AAL

Column (1), National Stock Number. Identifies the stock number of the item to be used for requisitioning purposes.

Column (2), Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the CAGEC (in parentheses) and the part number.

Column (3), Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

Column (4), U/M (Unit of Measure). Indicates how the item is issued for the National Stock Number shown in column (1).

Column (5), Qty Recm. Indicates the quantity recommended.

Using Unit Responsibility (Marine Corps Only). A list, in alphabetical sequence, of items that will not be issued with the end item. They must be requisitioned, as required, through the supply system by the holding organization or the using unit.

Table 1. Additional Authorization List.

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION, CAGEC, AND PART NUMBER	(3) USABLE ON CODE	(4) U/M	(5) QTY RECM
6135-00-985-7845	BATTERY, NON- RECHARGEABLE (AA), 1.5 Vdc (80058) BA-3058/U		EA	2
6135-01-333-6101	BATTERY, NONRECHARGEABLE (AA) (83740) L91, 1.5 Vdc		EA	2
6625-01-323-9584	TEST SET, ELEC. SYS. TS-4348/UV (80063) A3139775		EA	1
5855-01-423-0817	MAGNIFIER LENS ASSEMBLY (80063) A3256391		EA	1

APPENDIX D

EXPENDABLE AND DURABLE ITEMS LIST

INTRODUCTION

D-1 SCOPE

This appendix lists expendable and durable items that you will need to operate and maintain the AN/PVS-14. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

D-2 EXPLANATION OF COLUMNS IN THE EXPENDABLE/DURABLE ITEMS LIST

Column (1) - Item Number. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g. "Use lubricating oil, item 25, APPENDIX D").

Column (2) - Level. This column includes the lowest level of maintenance that requires the listed item (C = Operator/Crew).

Column (3) - National Stock Number. This is the NSN assigned to the item, which you can use to requisition it.

Column (4) - Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). This column provides the other information you need to identify the item.

Column (5) - Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

Table 1. Expendable and Durable Items List.

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) ITEM NAME, DESCRIPTION, CAGE, PART NUMBER	(5) U/M
1	C	6640-01-459-4239	PAPER, LENS (81348) A-A-50177, TYPE I, CLASS 5	PK

SUBJECT INDEX

Para

A

Abbreviations, list of	1-8
Additional Authorization List	C-1
Adjustment (See specific adjustment.)	
Ambient temperature limits	1-12
Appendices	
A – References	A-1
B – Components of End Item (COEI) and Basic Issue Items (BII) Lists.....	B-1
C – Additional Authorization List (AAL)	C-1
D – Expendable and Durable Items List	D-1

B

Basic Issue Items List.....	B-1
Battery	
AA size.....	1-12
Alkaline	1-12
Installing.....	2-6
Life.....	2-6
Lithium	1-12
Low-battery indicator.....	1-10, 1-15, 2-1
Polarity Indicators.....	2-1
Replacing.....	2-6
Voltage.....	1-12, 1-15
Black spots.....	1-9, 2-4
Bright spots	1-9, 2-4
Browpads	1-9

SUBJECT INDEX - Continued

Para

C

Capabilities.....	1-10
Case	
Carrying	1-11
Shipping and Storage	1-11
Caution	1-9
Characteristics.....	1-10
Checks, preventive maintenance	2-2
Chicken wire	1-9, 2-4
Cleaning the MNVD	3-2
Compass	
Installation.....	2-16
Operation	2-23
Components of End Item List.....	B-1
Corrosion prevention and control	1-3
Cross-reference list, nomenclature	1-7
Current	1-12

D

Dark (or dark area)	1-9
Data.....	1-12
Electrical	1-12, 1-15
Environmental	1-12
Equipment.....	1-12
Mechanical.....	1-12, 1-13
Optical.....	1-12, 1-14
Demist Shield	
Description	1-11
Installation.....	2-8
Destruction of materiel.....	1-4

SUBJECT INDEX - Continued

Para

Diopter	1-9
Diopter Adjustment	2-1
Dusty conditions	2-27

E

Edge glow	1-9, 2-4
Electrical	
Current	1-12
Function	1-15
Voltage	1-12
Electronic circuit function	1-15
Equipment	
Characteristics, capabilities and features	1-10
Data	1-12
Improvement recommendations	1-5
Expendable and Durable Items List	D-1
Eye Relief	2-1
Eyecup, installation	2-7
Eyeguard, installation	2-7
Eyepiece lens	
Focus	1-12
Operation	2-1
Range	1-12

SUBJECT INDEX - Continued

Para

F

Features	1-10
Field-of-view	1-12
Filter (see LIF)	
Fixed-pattern noise	1-9, 2-4
Flashing	1-9, 2-4
Flickering	1-9, 2-4
Focus	
Eyepiece (see Eyepiece lens)	
Objective (see Objective lens)	

G

Gain control	2-1, 2-2, 2-25
General information	1-1
Glossary	1-9

H

Hand-held operation	2-18
Headmount/Helmet mount adapter installation	2-12
Head Mount	
Installation	2-11
Maintenance	3-3
Operation	2-19
Helmet Mount	
Installation and adjustment	2-13
Installation with protective mask	2-14
Operation	2-20
High Light	
Cut-Off	1-15

SUBJECT INDEX - Continued

Para

High Light (continued)	
Cut-Off	1-15
Honeycomb (see Fixed-pattern noise)	
Humid conditions	2-28

I, J, K

Illumination required	1-12
Image intensifier operation	1-14
Infinity focus	1-9
Inspection	
Criteria for proper image intensifier operation	2-4
Preventive maintenance	2-2
Intermittent operation	2-4
IR source operations	2-22

L

Laser threat environments	2-31
Latch	2-1
LED On Indicator	2-1
LIF	
Description	1-9, 1-11
Installation	2-10
Lithium battery (see Battery)	
Location and description of major components	1-11
Low-battery indicator	
Description	1-10, 1-15, 2-1
Operation	1-10, 1-15, 2-1
Lubrication	Chapter 3, Section I

SUBJECT INDEX - Continued

Para

M

Magnification	1-12
Maintenance	
Cleaning the MNVD.....	3-2
Forms and procedures	1-2
Headmount	3-3
Neck Cord	3-4
Mechanical data	1-12
Mechanical functions	1-13
Monocular	1-11

N

NBC environments	2-30
Neck cord	2-2, 3-4
Nomenclature	1-7

O

Objective lens	
Focus	1-12, 2-1
Function	1-14
Location	1-11
Operating temperature.....	1-12
Operator adjustment limits	1-12
Operator controls and indicators	2-1
Optical	
Data	1-12
Functions	1-14

SUBJECT INDEX - Continued

Para

P

PMCS.....	2-2
Power	
Source	1-12, 1-15
Switch	2-1
Preparation for storage	2-26
Purpose of equipment	1-1, 1-10

R

Rainy conditions	2-28
Reference list	1-7
References	A-1
Resolution check using the TS-4348/UV Test Set	2-3

S

Sacrificial Window	
Description	1-11
Installation	2-9
Salt water areas	2-29
Sandy conditions	2-27
Scintillation	1-9
Scope	1-1
Shading	1-9, 2-4
Shipping and storage case	1-11
Shutdown (see Preparation for storage)	
Storage temperature	1-12

SUBJECT INDEX - Continued

Para

T

Temperature limits	1-12
Test Set, TS-4348/UV	2-3
Troubleshooting	3-1
3X Magnifier	
Installation	2-17
Operation	2-24

U, V

Unpacking	2-5
Vertical adjustment	2-19
Voltage	1-12, 1-15

W, X, Y, Z

Warning	1-9
Warranty Information	1-6
Weapon mount	
Description	1-11
Installation	2-15
Weapon Mounted	
Operation	2-21
Weight	
Monocular	1-12
Shipping and storage case	1-12

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0017903

By Order of the Secretary of the Marine Corps:

RANDALL P. SHOCKEY
Director, Program Support
Marine Corps Systems Command

DISTRIBUTION:

To be distributed in accordance with the initial distribution number
(IDN) 360538 requirements for TM 11-5855-306-10.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



THEN...JOT DOWN THE
DOPE ABOUT IT ON THIS FORM.
CAREFULLY TEAR IT OUT, FOLD IT
AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

PUBLICATION DATE

PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE
NO.

PARA-
GRAPH

FIGURE
NO.

TABLE
NO.

IN THIS SPACE, TELL WHAT IS WRONG
AND WHAT SHOULD BE DONE ABOUT IT.

TEAR ALONG PERFORATED LINE

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS
ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR
RECOMMENDATION MAKE A CARBON COPY OF THIS
AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

LENGTH MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
 1 Kilometer = 1000 Meters = 0.621 Miles

WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
 1 Kilogram = 1000 Grams = 2.2 lb.
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

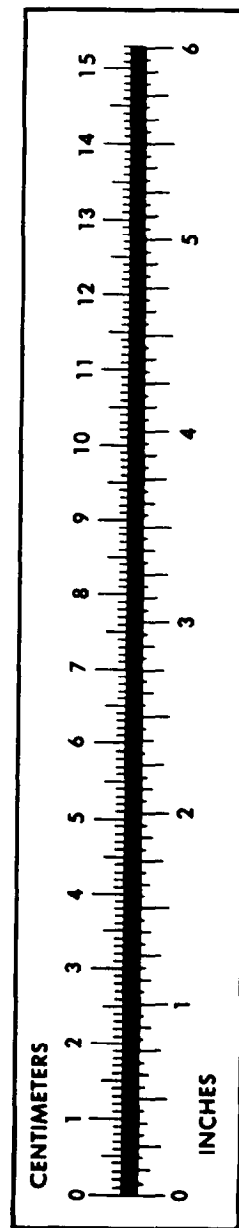
TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
its	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
ometers per Liter	Miles per Gallon	2.354
ometers per Hour	Miles per Hour	0.621



PIN: 076057-000