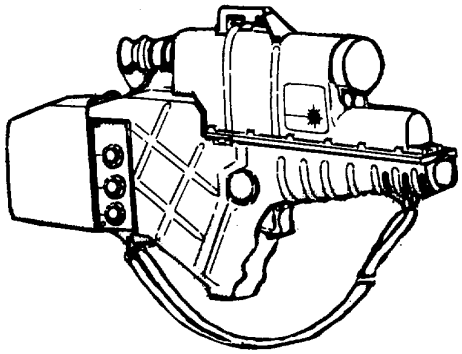
OPERATOR AND ORGANIZATIONAL MAINTENANCE



TARGET DESIGNATOR, LASER AN/PAQ-1 (LTD)

15 NOVEMBER 1980

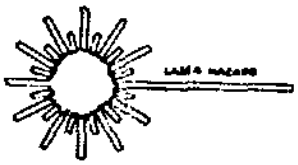
HEADQUARTERS, DEPARTMENT OF THE ARMY

MS 414606A

This copy is a reprint which includes current pages from Changes 1 through 6.

WARNING

LASER LIGHT - INVISIBLE



LASER BEAM IS DANGEROUS AND CAN CAUSE BLINDNESS IF IT ENTERS EYE - EITHER DIRECTLY OR REFLECTED FROM A SHINY SURFACE.

WHEN OPERATING LASER TARGET DESIGNATOR, OBSERVE THE FOLLOWING:

- Never look into laser; assume it is always dangerous
- Warn personnel before firing laser.
- Operate only in designated areas.
- Allow only trained personnel to operate LTD.
- Do not rely solely on front lens cover as laser light stop during maintenance.
- Do not aim laser at unprotected personnel or reflective surfaces.

MS 414607A

CHEMICAL

CLEANING SOLVENTS ARE EXTREMELY FLAMMABLE AND ARE ALSO TOXIC IF FUMES ARE INHALED DUE TO IMPROPER VENTILATION OF AREA.

ACCUMULATION OF FLAMMABLE GASES MAY RESULT IN AN EXPLOSION.

KEEP OPEN FLAMES AWAY when using flammable cleaning solutions.

BATTERIES MAY EXPLODE if improperly charged or completely discharged too rapidly.

CHARGE BATTERIES ONLY in well-ventilated area.

MS 414608

HOW TO USE THIS MANUAL

This manual is intended for you. It tells you what you need to know to operate and maintain the LTD set.

This manual is divided into three chapters and four appendices written to make t easy for the operator to use:

- Paragraphs are numbered in order in each chapter.
- Information is organized in about the order in Which the events are performed.

To help you learn what information is in the manual and Where to look to find it - read on:

Inside the front cover, and the facing page you will find some warnings that should be observed. Read them carefully.

Chapter 1 contains general information about the LTD that every soldier needs to know. You may know some of it from reading other manuals or you may not. Check it out.

Chapter 1 also introduces you to the external power adapter (EPA). In Section I, you will find a list of abbreviations that are used in the manual; it gives you the ‘short' name for many of the tongue-twister nomenclature designations given to the equipment (it is easier to say ‘EPA' than External Power Adapter). Section II contains information about each item of equipment which makes up the LTD set. Also, in Section II, tables give the weight and measurements of the equipment.

Chapter 2 tells you about-the knobs, switches, and handles you move to operate the set; all of this is in the Controls and Indicators Section. Section II tells you about safety precautions you must observe. Sections II I and IV cover operations under normal and unusual conditions respectively.

Chapter 3 tells you about crew and organizational maintenance, the things operator and maintenance men need to know to keep the LTD set operating.

Appendix A is a list of references - that is, it is a list of AR's, TM's, and other books available for you to use.

Appendix B is the Maintenance Allocation Chart. This chart lists the LTD maintenance functions and shows which maintenance level does each function. You can tell at a glance that practically all LTD repair is done by Direct Support (DS) personnel and above. As the operator, you are limited to simple, external inspection and replacements.

MS 414611

Appendix C is the Components of End Item List. This list tells you what you are supposed to get when the system is issued. The list is also handy for checking the items from time to time to see if something is missing.

Appendix D is the Expendable Supplies and Materials List. The things on this list are those consumables like oil, paint, wiping rags, and tape.

Appendix E is Airborne Packing Procedures for LTD-equipped airborne units. This shows you how to pack an LTD for airdrop.

Operator and Organizational Maintenance Manual
LASER TARGET DESIGNATOR
AN/PAQ-1 (LTD)
TABLE OF CONTENTS

REPORTING OF ERRORS

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 Equipment Publications and Blank Forms) direct to Commander, U. S. Army Missile Command, ATTN: AMSMI-LC-ME-PMC, Redstone Arsenal, Alabama 35898-5238.

A reply will be furnished to you.

Page

CHAPTER 1

INTRODUCTION

SECTION I. GENERAL INFORMATION

1-1. Purpose and Scope

This manual is for your use in operating and maintaining the LASER TARGET DESIGNATOR AN/PAQ-1 (LTD). Use it to maintain your proficiency and to keep your LTD system in peak condition. A look at the table of contents will show you the scope of the manual.

1-2. Maintenance Forms and Records

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750.

1-3. Reporting Equipment Improvements and Recommendations (EIRs)

If your LTD 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 your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail to the address stated in DA PAM 738-750.

1-4. Deleted

1-5. Destruction of Army Materiel to Prevent Enemy Use

Evacuation, rather than destruction, whenever possible is first priority.

Each using organization and/or installation having custody of LTD sets should have a standing operating procedure (SOP) for LTD set destruction.

The demolition plan should be suitably flexible to cover any situation. Destruction method should consider local deployment of friendly troops, availability of personnel, materials required, time available, etc. Methods are: gunfire, explosives, smashing, and burning after demolition.

The cross-reference list of official manual nomenclature lists the major items and the special issue items for your LTD.

Official Nomenclature	Part Number/ NSN	Common Name
Target Designator, Laser, AN/PAQ-1	13033888 1260-01-041-1567	LTD Set
Case, Target Designator, Laser, CY-7468/PAQ-1	13033889 1260-01-056-7507	LTD Transit Case
LTD Module	13033867	LTD (Designator)
Battery-Shoulder Stock BB-699/PAQ-1	13033982 6140-01-077-9447	Battery-Shoulder Stock
Transmitter Components Assembly T-1 298/PAQ-1	13033900 1260-01-056-0012	Transmitter
Electronic Components Assembly MX-9715/PAQ-1	13034200 1260-01-056-5348	Electronic Components Assembly
Kit, Cleaning-External Optics	5952355 1260-01-151-2698	External Optics Cleaning Kit

1-6. Nomenclature Cross-Reference List - - -

Official Nomenclature	Part Number/ NSN	Common Name
Adapter, External Power, MX-9653/PAQ-1	13034435 1260-01-040-1494	External Power Adapter (EPA)
Carrying Case Assembly - Adapter, External Power	13034452 1260-01-078-1986	Carrying Case
EMI Filter Assembly	13033990 1260-01-080-8394	EMI Filter
Converter, External Power	13034438	External Power Converter
Cable, Vehicle, W2	13033956 6150-01-071-3822	Vehicle Cable
Cable Assembly, Power Adapter Filter, W1	13034437 1260-01-059-0004	Interconnect Cable
Adapter, Cable Assembly 6150-01-099-2419	11508891	Slave Cable
NATO Connector	11509166 5935-01-253-5599	NATO Connector

1-6. Nomenclature Cross-Reference List - - -

Official Nomenclature	Part Number/ NSN	Common Name
External Power Adapter Assembly	13160200 4931-01-237-4135	External Power Adapter (EPA)
External Filter - Power Converter Assembly	13160201 1260-01-236-6984	External Power Converter (EPC)
Cable Vehicle, W2	13160199 6150-01-199-2519	Vehicle Cable
Carrying Case	13160195 4931-01-232-4524	Carrying Case

1-6. Nomenclature Cross-Reference List - - -

Official Nomenclature	Part Number/ NSN	Common Name
Night Vision Sight AN/TVS-5	5855-00-629-5327	Night Vision Sight
Battery Charger PP-7286	6130-01-041-3490	Battery Charger

1-7. List of Abbreviations

ASSY	Assembly
CTA	Common Table of Allowances
CW	Clockwise
CCW	Counterclockwise
DS	Direct Support
DS	Direct Support
EMI	Electromagnetic Interference
EPA	External Power Adapter
EPC	External Power Converter
EXT	External
F	Fahrenheit
GS	General Support
JTA	Joint Table of Allowances
LOS	Line of Sight
LTD	Laser Target Designator
MT/O&E	Modification Table of Organization and Equipment
NCOIC	Non-Commissioned-Officer-in-Charge
NSN	National Stock Number Part Number
PN	Part Number
PMCS	Preventive Maintenance Checks and Services
TM	Technical Manual
T/O&E	Table of Organization and Equipment

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1-8. Purpose of LTD Set

Your Laser Target Designator (LTD) is a battery-operated, lightweight, hand-held laser designator. The LTD transmits a coded laser beam that is used to designate point or area targets. The designated targets or areas can be detected and attacked by aircraft or munitions equipped with laser trackers and laser-guided weapons set to the same transmission code as that of the LTD. The LTD is a Category A laser designator, with limited capabilities to operate in Categories B and C.

1-9. LTD Major Components

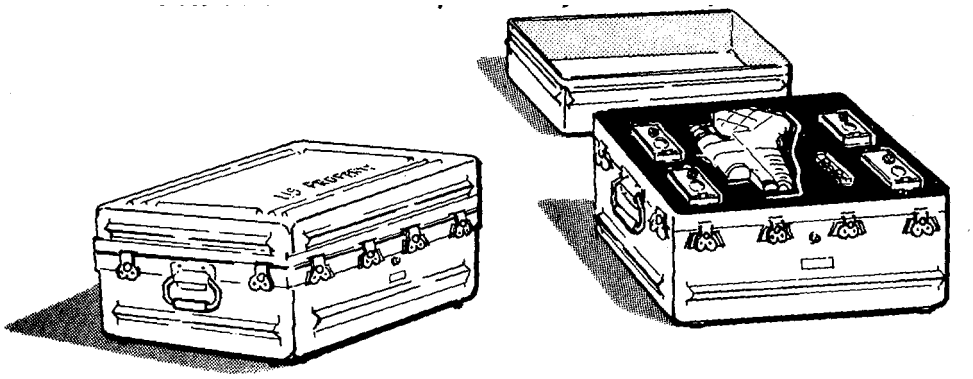
Major components of the LTD set are:

a. LTD Transit Case
b. Designator
c. Battery-Shoulder Stocks (4)
d. External Optics Cleaning Kit
e. External Power Adapter

MS 414621A

1-10. Location and Description of Major LTD Components

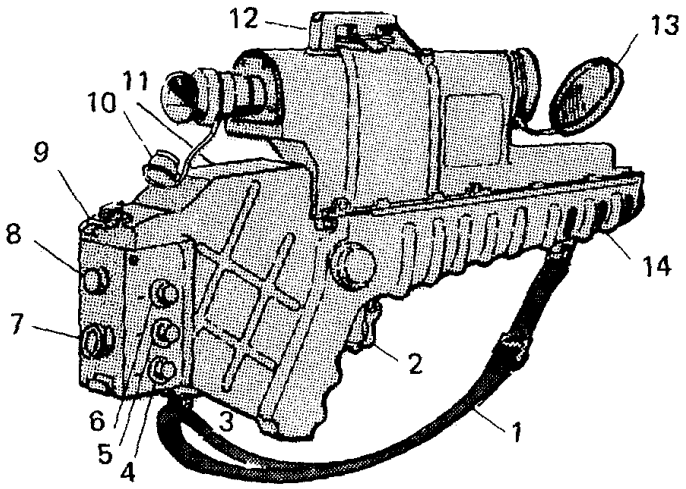
a. LTD Transit Case



You will receive your LTD in a transit case. This transit case is only intended for storage and transit purposes while in garrison. Care, however, should be taken to insure no damage to the device is incurred during field usage. This transit case will contain the designator, four battery-shoulder stocks, a cleaning kit, and TM 9-1260-479-12.

MS 414622

b. Designator



(1) Carrying strap
(2) Trigger safeguard
(3) Air intake vent
(4) Bottom code switch
(5) Middle code switch
(6) Top code switch
(7) LTD test connector protective
(8) Battery-shoulder stock connector
(9) Battery -shoulder stock latch
(10) Eyepiece lens cover
(11) LTD label
(12) Night sight adapter
(13) Front lens cover
(14) Exhaust vent

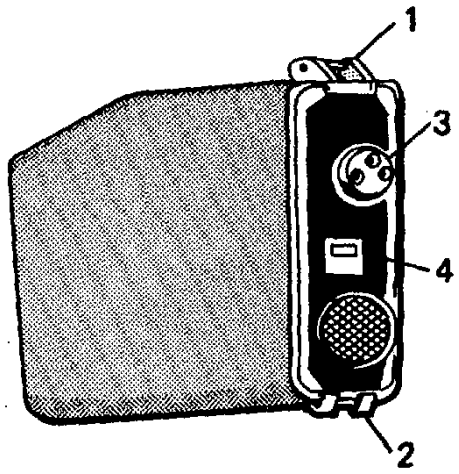
MS 414623A

c. Battery-Shoulder Stock

Contains twenty-two (22) nickel-cadmium cells which supply electrical input power to LTD.

Serves as shoulder stock for designator.

Is rechargeable using battery charger PP-7286.



Hinge (1) on battery mates with battery-shoulder stock latch on designator.

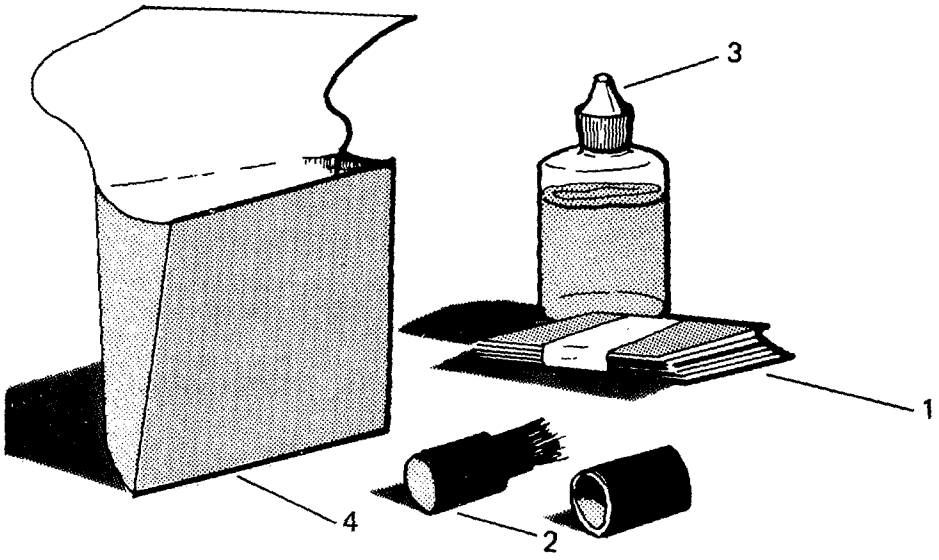
Hinge 12) on battery mates with hinge on designator.

Power connector (3) mates with battery-shoulder stock connector on designator.

Battery servicing label (4) shows date of last charging.

MS 414624

d. External Optics Cleaning Kit



(1) Lens tissue packet
(2) Lens brush
(3) Bottle
(4) Plastic bag container

MS 414625A

1-10.1. External Power Adapter (EPA)

There are two different models of the EPA; EPA (13034435) and EPA (13160200). Check the part number to find out which EPA you have. This manual covers both models. Some of the procedures are different depending on which EPA you have. Be sure to check the part numbers given in the procedures to make sure you are using the right information.

1-11. Purpose of External Power Adapter (13034435 or 13160200)

Use your external power adapter if no battery-shoulder stocks are available. The external power adapter should be used in below freezing temperatures when the operational situation permits.

The EPA allows you to power the LTD from your vehicle.

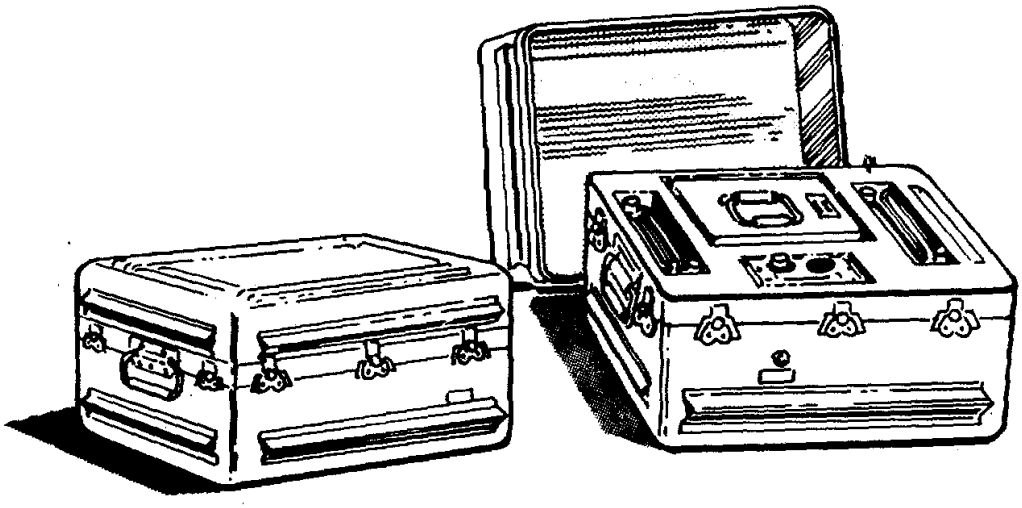
1-12. EPA (13034435) Major Components

Major External Power Adapter Components:

a. Carrying case (13034452)
b. External power converter (13034438)
c. EMI filter
d. Vehicle cable (13033956)
e. Slave cable
f. Interconnect cable
g. NATO connector.

1-13. Location and Description of Major EPA (13034435) Components

a. External Power Adapter Carrying Case {13034452)

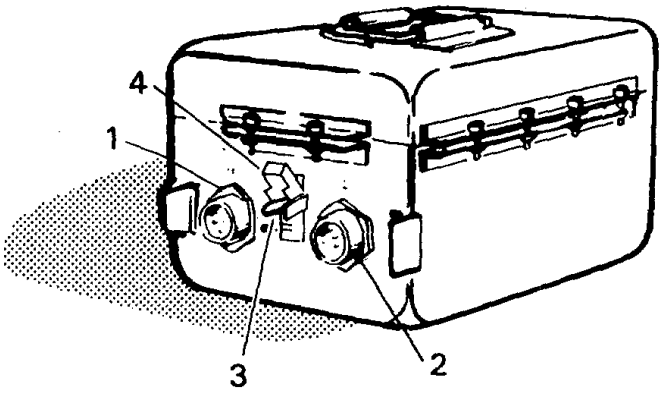


You will receive your EPA in a carrying case. Care should be taken to insure no damage to the device is incurred during field usage. The carrying case (13034452) will contain the external power converter (13034438), an EMI filter, an interconnect cable, a vehicle cable (13033956), a slave cable, and a NATO connector.

MS 414627A

b. External Power Converter (13034438)

Unit permits power sources of incorrect polarity to be connected to the LTD without damage. If polarity is incorrect, connections must be reversed before LTD will operate.



(1) Connector J1 for connecting unit to power source.

(2) Connector J2 for connecting unit to EMI filter.

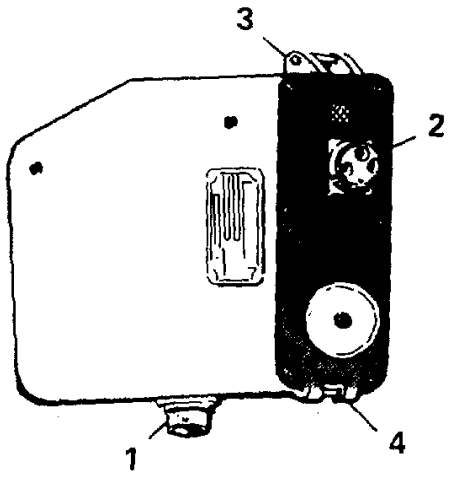
(3) POWER ON-OFF switch controls power applied to designator.

(4) Switch guard, when down, keeps switch in OFF position.

c. EMI Filter

Unit attaches to designator in place of battery-shoulder stock whenever external power is used.

Unit limits conducted electromagnetic interference from external power source to acceptable levels.



Connector (1) mates with interconnect cable.

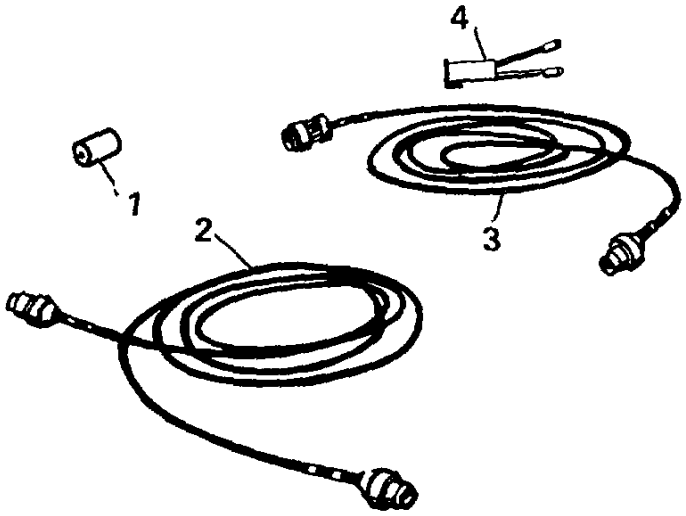
Connector (2) mates with designator.

Hinge (3) mates with battery-shoulder stock latch on designator.

Hinge (4) mates with hinge on designator.

MS 414629A

d. Connecting Cables



NATO connector (1) connects slave cable (4) to vehicles with single-pin power connectors.

Slave cable (4) connects vehicle cable to NATO connector, when NATO connector is used.

Slave cable (4) connects directly to vehicles with 2-pin power connectors.

Interconnect cable (2) connects EPC (13034438) to EMI filter mounted on designator.

Vehicle cable (3) connects slave cable to EPC (13034438).

MS 414630A

1-13.1. EPA (13160200) Major Components

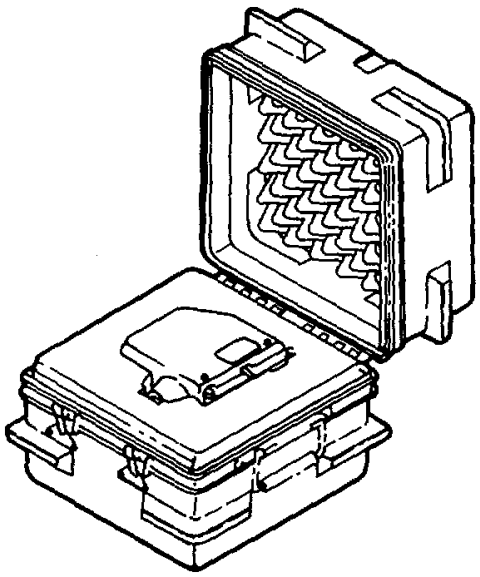
Major External Power Adapter Components:

a. Carrying case (131-60195)'
b. External power converter (13160201)
c. Slave cable
d. Vehicle cable (13160199)
e. NATO connector

1-13.2. Location and Description of Major EPA (13160200) Components

a. Carrying Case (13160195)

You will receive your EPA (13160200) in a carrying case. Care should be taken to ensure no damage to the device is incurred during field usage. The carrying case will contain the external power converter (13160201), a vehicle cable (13160199), a slave cable, and a NATO connector.

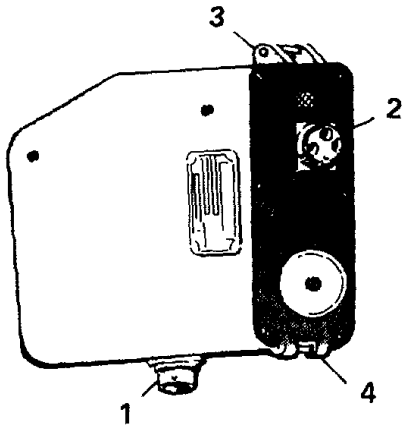


MS 585148

b. External Power Converter (13160201)

Unit permits power sources of incorrect polarity to be connected to the LTD without damage. If polarity is incorrect, connections must be reversed before LTD will operate.

Unit limits conducted electromagnetic interference from external power source to acceptable levels.



Connector (1) mates with vehicle cable.

Connector (2) mates with designator.

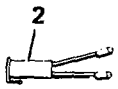
Hinge (3) mates with battery-shoulder stock latch on designator.

Hinge (4) mates with hinge on designator.

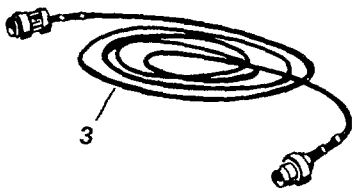
MS 585160

c. Connecting Cables

NATO connector (1) connects slave cable (2) to vehicles with single-pin power connectors.



Slave cable (2) connects vehicle cable to NATO connector, when NATO connector is used.



Slave cable (2) connects directly to vehicles with 2-pin power connectors.

Vehicle cable (3) connects slave cable to EPC (13160201).

MS 585149

1.14. Dimensions and Weights

Item	Length (In.)	Width (In.)	Height (In.)	Volume (cu. Ft.)	Weight (Lb.)
LTD Transit Case	29.0	29.0	16.5	8.1	64.3
Designator	24.8	3.0	12.4	0.5	12.1
Battery-Shoulder Stock	5.4	3.0	6.5	0.1	4.3
EPA Carrying Case (13034452)	20.1	16.9	18.0	3.6	46.4
External Power Converter (13034438)	8.5	11.0	8.0	0.4	8.5
EMI Filter	5.9	3.0	6.5	0.1	2.0
Interconnect Cable	180.0	-	-	-	2.0
Vehicle Cable (13033956)	300.0	-	-	-	10.0

Item	Length (In.)	Width (In.)	Height (In.)	Volume (cu. Ft.)	Weight (Lb.)
EPA Carrying Case (13160195)	14.5	14.5	11.1	1.4	9.9
Slave Cable	12.0	-	-	-	3.0
NATO Connector	4.9	2.0	-	-	1.0
External Power Converter (13160201)	6.2	3.5	5.2	0.1	4.8
Vehicle Cable (13160199)	300.0	-	-	-	5.0

Ambient temperature limits	
using battery-shoulder stock	32°F to 125° F (nominal)
using external power adapter	-25° F to 125° F
storage	-50° F to 160° F
Altitude	
operating	up to 10,000 feet above sea level
Relative humidity	100%
Leakage	capable of immersion in 3 feet of water for at least 5 minutes
DC power sources	
battery-shoulder stock	fully charged battery is 28.6 volts
external power source	23-29 VDC; 6-7 AMPS
Optical magnification	6.84 power
Field of view	7 degrees
Type of transmission	coded laser

MS 414632

SECTION III. TECHNICAL PRINCIPLES OF OPERATION

1-16. General

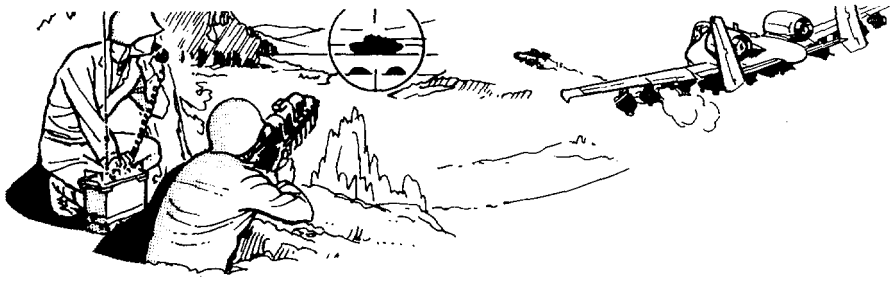
The purpose of the LTD is to designate point or area targets which can be detected and engaged by aircraft or munitions with similar laser trackers or seekers.

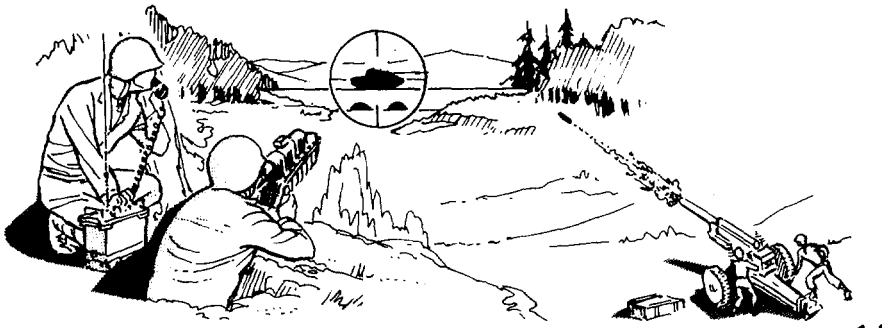
1-17. LTD Tactical Diagram

LTD designates target for laser-seeking munitions or acquisition devices.

- Operator visually locates target.
- Operator acquires and tracks target on reticle crosshairs.
- Operator receives command to designate target.
- Operator triggers continuous laser pulse train.
- Laser-seeking munition or acquisition device homes in on reflection of laser spot on target.
- Operator releases trigger immediately upon munition impact or when instructed to do so.

MS 414633





MS 414634

1-18. LTD Functional Block Diagram

A Initially, the battery-shoulder stock supplies the energy required by the system.

B The power supply converts the battery energy to low and high voltages. The low voltages are required for laser switching.

C The controls function provides the timing signals, malfunctions sensing, code setting, and firing capability.

D The laser generator produces coded laser pulses that have a high intensity and a short duration. Laser energy correction feedback is provided to maintain the required laser output power.

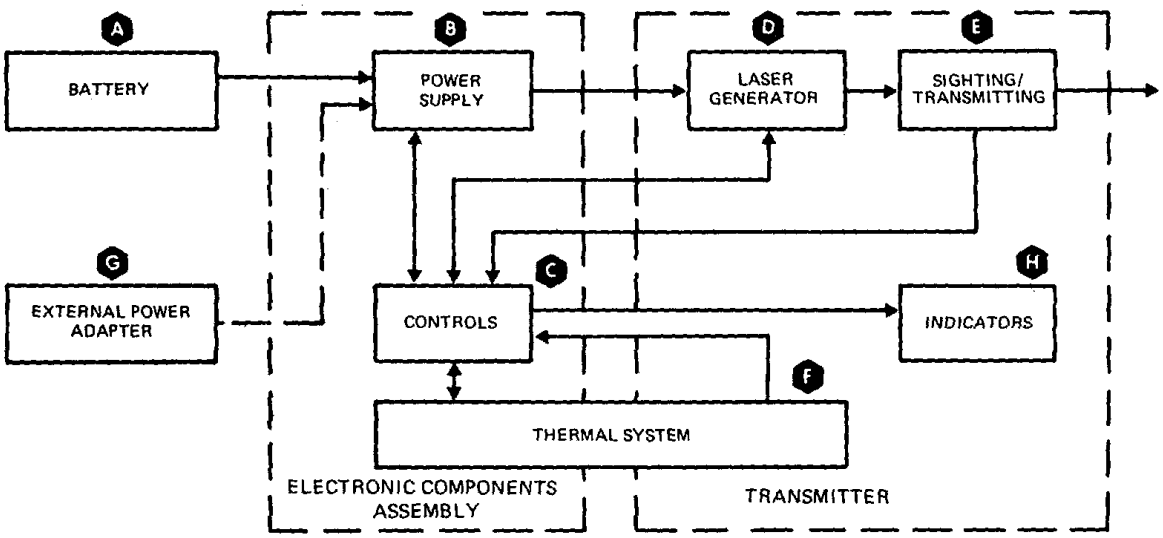
E The sighting/transmitting optics magnify the laser beam and provide a visual telescope for sighting the target and pointing the beam.

F The thermal system function is used to cool the LTD to a safe operating temperature. The laser cavity is closed loop and nitrogen cooled. Ambient air is passed over the cavity and the electronics to remove excess heat.

G The external power adapter function is to provide necessary filtering and voltage regulation. This function enables the LTD to operate from vehicular or facility power instead of battery power.

H Malfunction indication features are built into the LTD to provide for fast fault detection and to verify fault correction.

MS 414635


A
B
D
E
BATTERY
POWER SUPPLY
LASER GENERATOR
SIGHTING/ TRANSMITTING
G
C
H
EXTERNAL POWER ADAPTER
CONTROLS
INDICATORS
F
THERMAL SYSTEM
ELECTRONIC COMPONENTS ASSEMBLY
TRANSMITTER

MS 414636

CHAPTER 2
OPERATING INSTRUCTIONS
SECTION I. DESCRIPTION AND USE OF LTD CONTROLS AND INDICATORS

2-1. Know Your Unit Controls and Indicators

Before you operate your equipment, make certain that you are familiar with the location and operation of all controls and indicators.

2-2. Description and Use of Controls and Indicators

- Three code switches select pulse repetition rate of laser.

  (1) Upper knob sets first digit of code
  (2) Middle knob sets second digit of code
  (3) Lower knob sets third digit of code

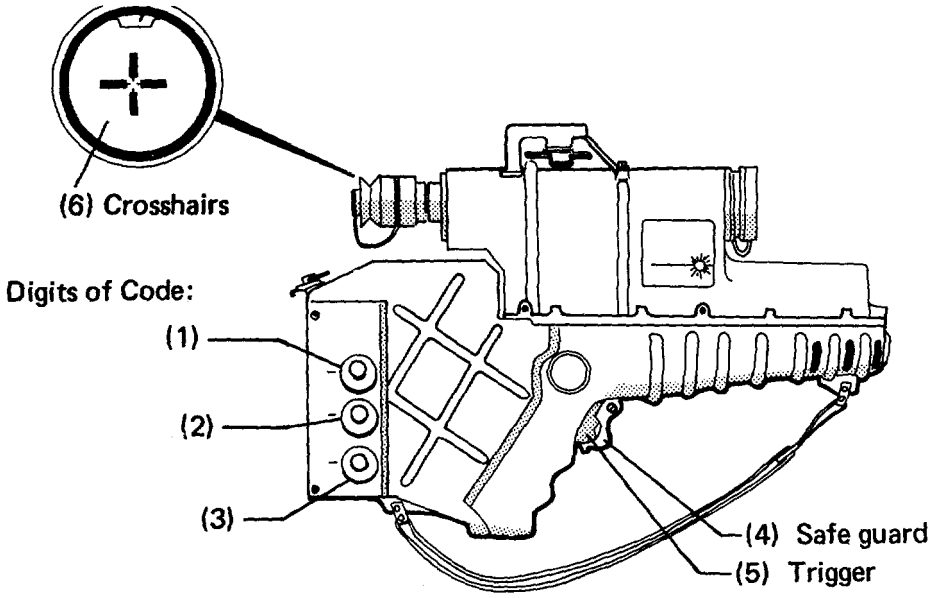
- Trigger safe guard (4) prevents accidental firing of laser.

- Trigger (5) starts laser pulse generation. Laser will transmit only as long as trigger is depressed.

- Reticle contains:

  - Crosshairs (6) to aid operator in tracking target.

  - Malfunction indicator (7) provides operator with continuous monitor of battery, laser power, and temperature.



MS 414638

SECTION II. SAFETY PRECAUTIONS

2-3. Handling

Sling your LTD as you would a rifle.

Treat your LTD like a football.
Your LTD is a precision optical device.

MS 414639

Keep those lens covers on when transporting. LTD optics can be easily scratched and damaged.

If your LTD shows signs of abuse, have your support maintenance run a check on it.

MS 414640

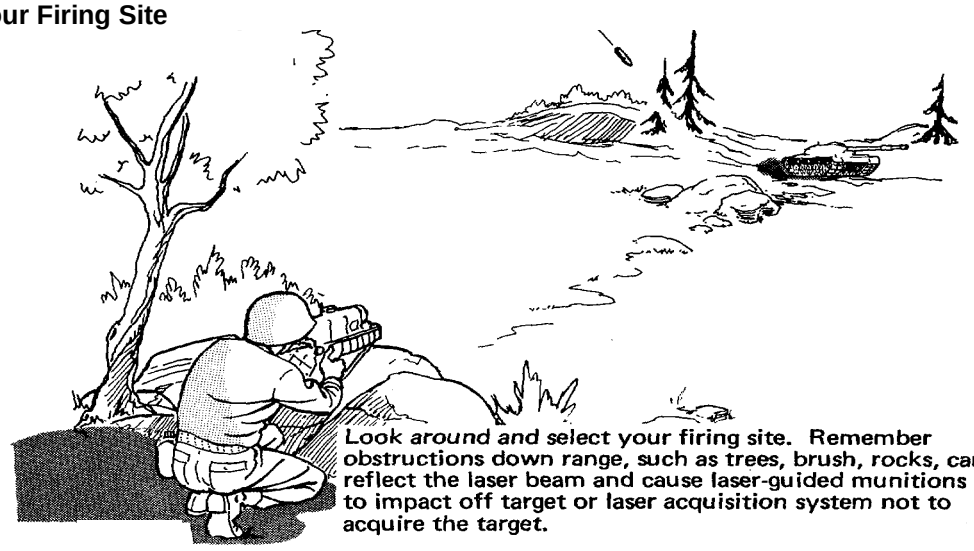
2-4. Sighting and Aiming Precautions

WARNING

Put on those laser safety goggles if required by local safety regulations. The LTD safety filter only protects the operator. Operator, you do not have to wear laser safety goggles. A safety filter in LTD optics protects you from reflected laser light, but all other individuals in the area must follow local safety regulations concerning the wearing of laser safety goggles.

MS 414641

2-5. Selecting your Firing Site



Look around and select your firing site. Remember obstructions down range, such as trees, brush, rocks, can reflect the laser beam and cause laser-guided munitions to impact off target or laser acquisition system not to acquire the target.

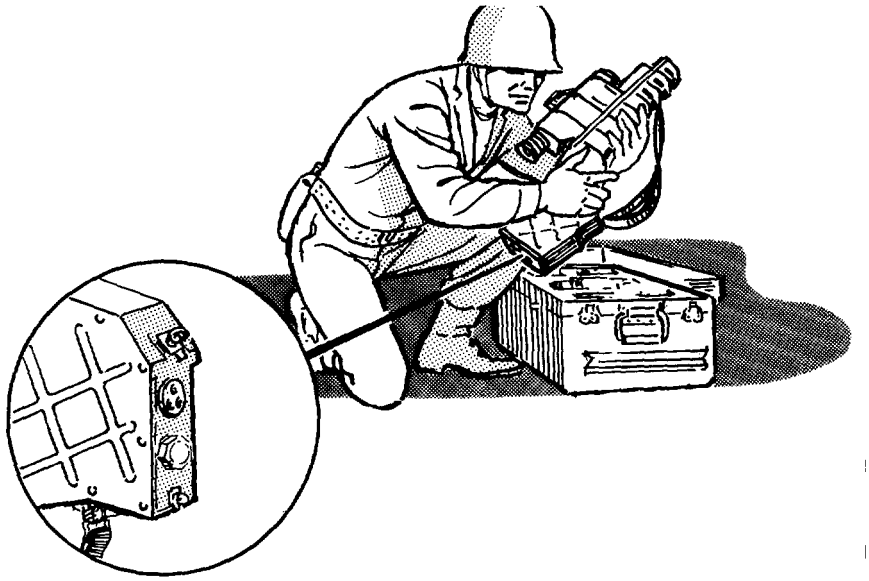
SECTION III. OPERATING PROCEDURES UNDER USUAL CONDITIONS

2-6. Scope

This section contains all information needed to operate the LTD under usual conditions.

CAUTION

NOTE
Before operating the LTD, be sure to do the "before operation" checks in paragraph 3-3.



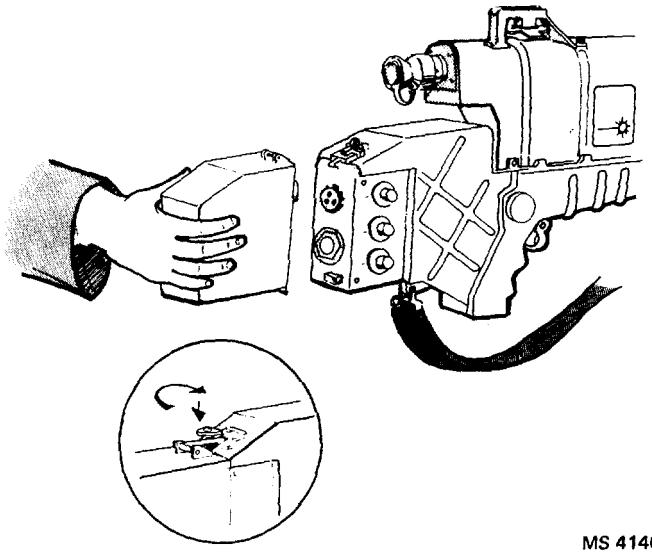
a. Grasp designator with both hands and remove from transit case.

b. Remove battery-shoulder stock from transit case.

MS 414644

2-7 LTD Preparation for Use With Battery-Shoulder Stock - - -

c. Place battery-shoulder stock hinge pin into hinge on designator housing. Rotate battery-shoulder stock forward until connector mates with power connector on designator.



MS 414645

d. Engage latch on designator housing with top hinge on battery-shoulder stock.

e. Secure battery-shoulder stock to designator by turning wingnut on designator housing cw.

f. Fold wingnut flat against designator housing.

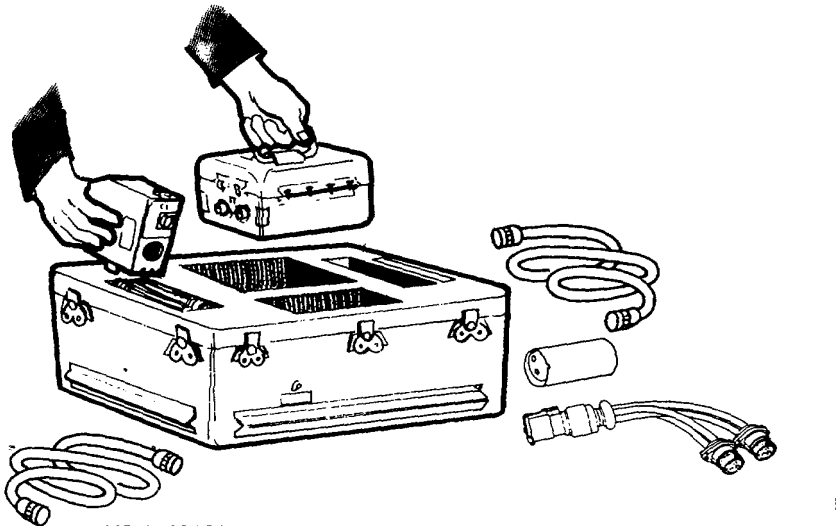
Proceed to paragraph 2-9 for LTD checkout procedures.

2-8. LTD Preparation for Use with EPA (13034435)

<u>REMEMBER, use your EPA</u>:

When no battery-shoulder stock is available. Consider it when ambient temperature is below 32 °F.

a. Remove the EMI filter, external power converter (13034438), vehicle cable (13033956), interconnect cable, slave cable, and NATO connector from EPA carrying case (13034452).



MS 414646A

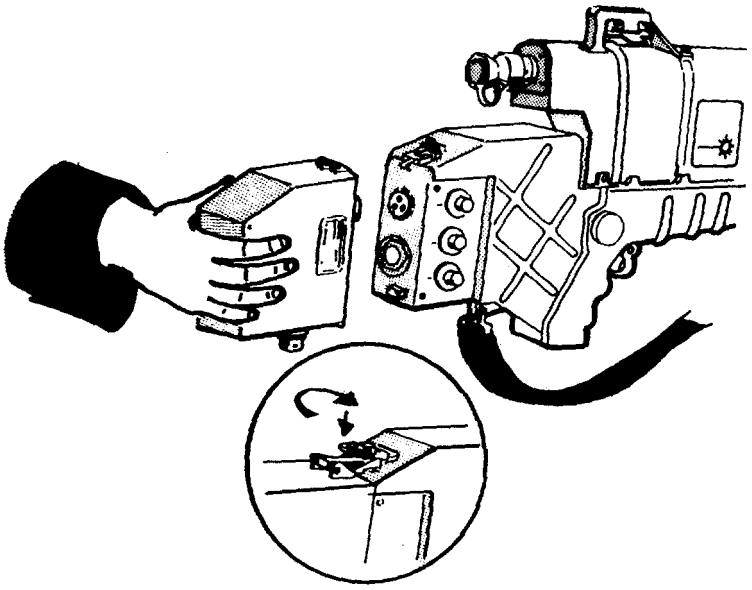
2-8. LTD Preparation for Use With EPA - - -

b. Attach EMI filter bottom hinge to hinge on designator housing.

c. Push EMI filter forward until connector mates with power connector on designator.

d. Engage latch on designator housing with top hinge of EMI filter. Secure EMI filter to designator by turning wingnut on designator housing cw.

e. Fold wingnut flat against housing.



MS 414647A

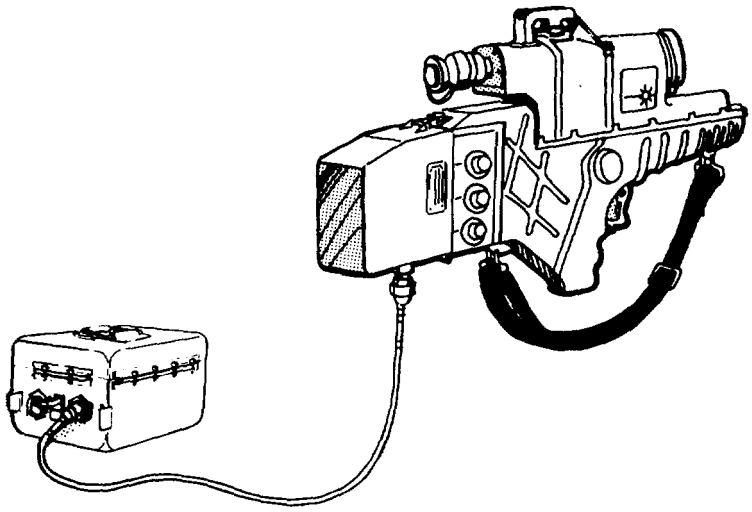
2-8. LTD Preparation for Use With EPA - - -

CAUTION

Do not twist cables. Turn outer retaining rings on cables when connecting.

f. Connect interconnect cable connector P2 to J2 on external power converter.

g. Connect interconnect cable connector P1 to connector J1 on EMI filter.



MS 414648A

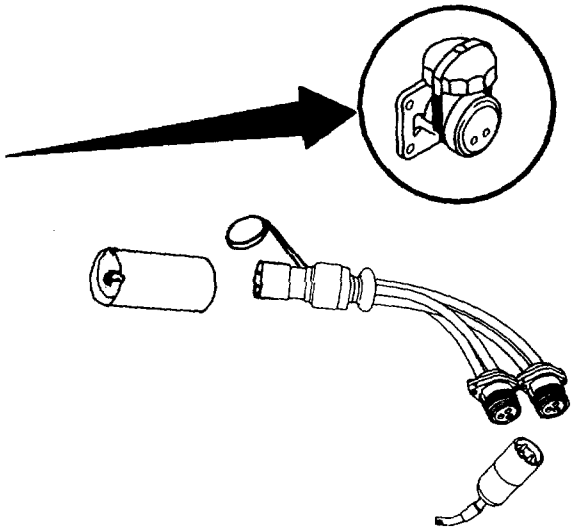
2-8. LTD Preparation for Use With EPA - - -

h. Connect vehicle cable connector P2 to slave cable connector

NOTE

If your vehicle has a 2-pin power connector, do not use NATO connector, go on to step j.

i. Pull back spring-loaded cover and connect slave cable to NATO connector.



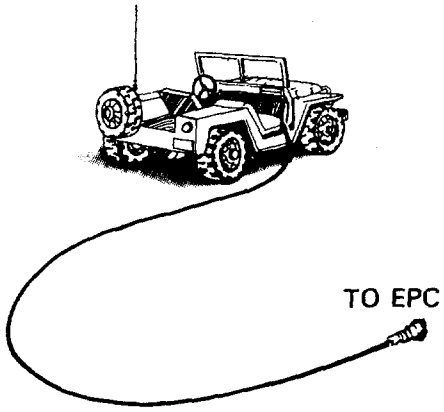
MS 585161

2-8. LTD Preparation for Use With EPA - - -

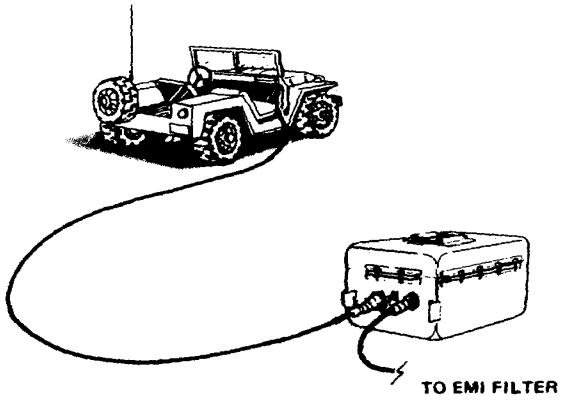
WARNING

High voltage is present at vehicle power connector. Do not touch connector socket.

j. Remove cover from vehicle power connector. Connect NATO connector (or slave cable) to vehicle power connector.



k. Ensure that switch guard on external power converter is covering POWER ON-OFF switch.
I. Connect vehicle cable connector P1 to J1 on external power converter.



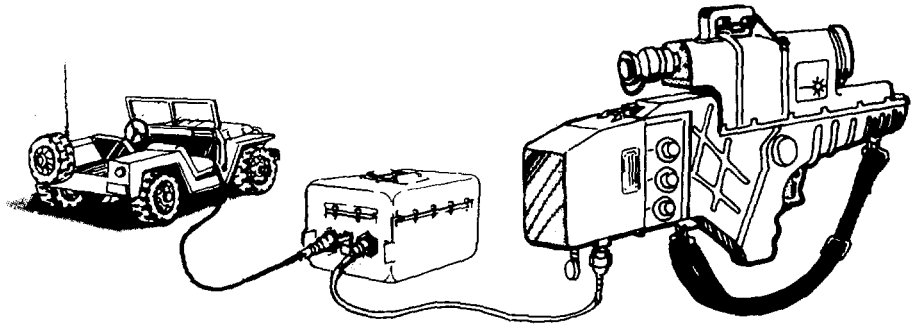
MS 414649A

2-8. LTD Preparation for Use With EPA - - -

m. When you are ready to use your LTD, lift switch guard on external power converter and set POWER ON-OFF switch to ON.

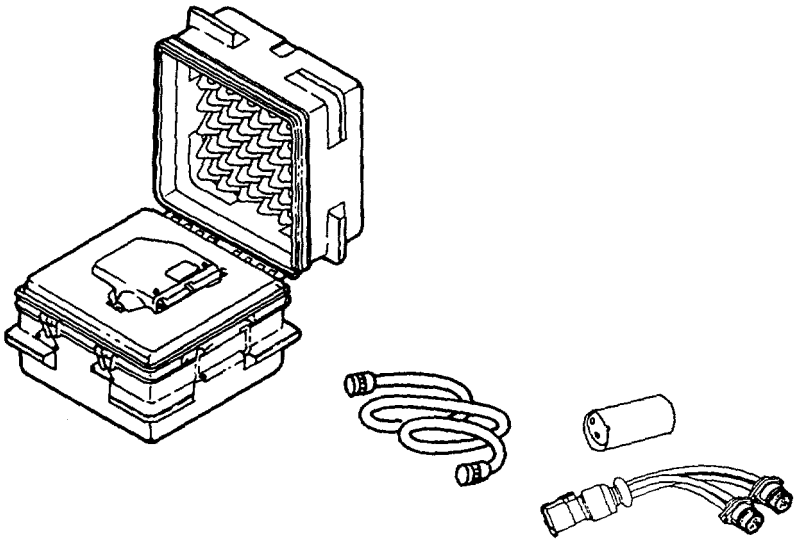
CAUTION

To prevent discharging of vehicle battery, vehicle engine should be run periodically.



MS 585166

2-8.1. LTD Preparation for Use with EPA (13160200)



These items are packed under the fitted insert.

<u>REMEMBER, use your EPA</u>: When no battery-shoulder stock is available. Consider it when ambient temperature is below 32°F.

a. Remove EPC (13160201), vehicle cable (13160199), slave cable, and NATO connector from EPA carrying case (13160195).

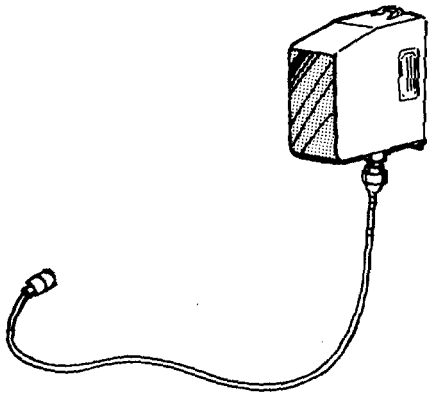
2-8.1 LTD Preparation for Use With EPA - -- -

b. Remove connector cover from EPC connector A4J1.

CAUTION

Do not twist cables. Turn outer retaining rings on cables when connecting.

c. Connect vehicle cable connector W2P1 to EPC connector A4J1.



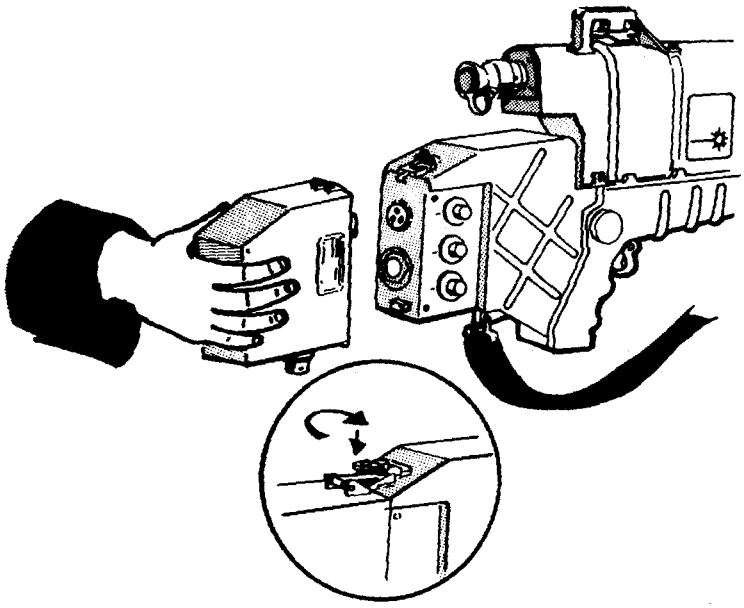
2-8.1. LTD Preparation for Use With EPA - - -

d. Attach EPC (13160201) bottom hinge to hinge on designator housing.

e. Push EPC forward until connector mates with power connector on designator.

f. Engage latch on designator housing with top hinge of EPC. Secure EPC to designator by turning wingnut on designator housing cw.

g. Fold wingnut flat against housing.



MS 585151

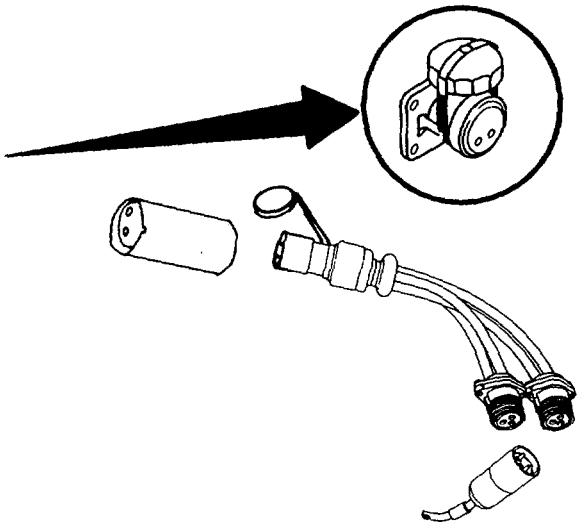
2-8.1. LTD Preparation for Use With EPA - - -

h. Connect vehicle cable connector W2P2 to slave cable connector.

NOTE

If your vehicle has a 2-pin power connector, do not use NATO connector, go on to step j.

i. Pull back spring-loaded cover and connect slave cable to NATO connector.



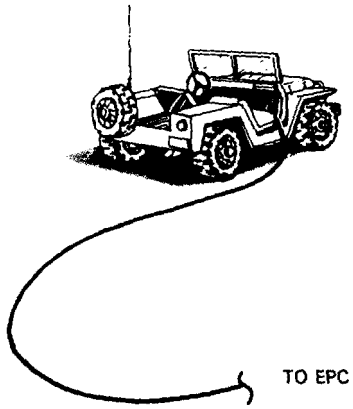
MS 585167

2-8.1. LTD Preparation for Use With EPA - - -

WARNING

High voltage is present at vehicle power connector. Do not touch connector socket.

j. Remove cover from vehicle power connector. Connect NATO connector (or slave cable) to vehicle power connector.



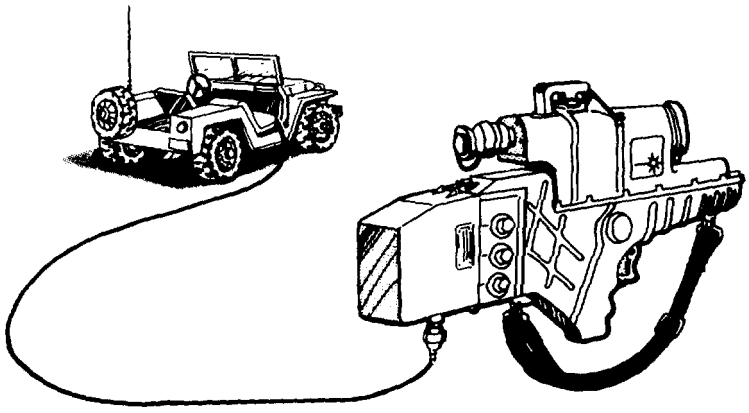
MS 585168

2-8.1. LTD Preparation for Use With EPA - - -

k. Your LTD is ready for use.

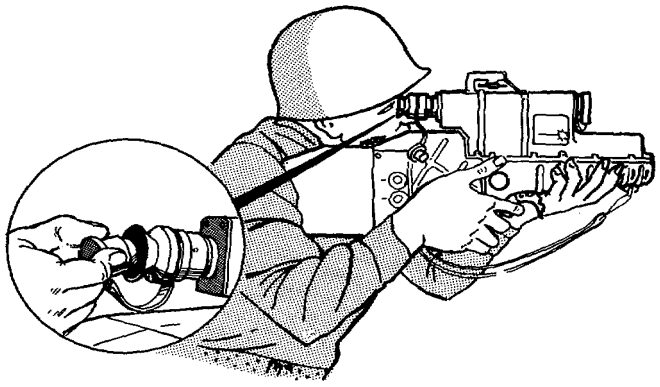
CAUTION

To prevent discharging of vehicle battery, vehicle engine should be run periodically.



MS 585169

2-9. LTD Checkout



NOTE

The following steps can be performed with either the battery-shoulder stock or EPA connected to the LTD. (Refer to paragraphs 2-7. and 2-8.)

a. Uncover the eyepiece lens of the designator and insure that the front lens is covered.

b. Hold the designator to your shoulder as you would your rifle.

c. Release the trigger SAFE guard by pulling it up.

2-9. LTD Checkout - - -

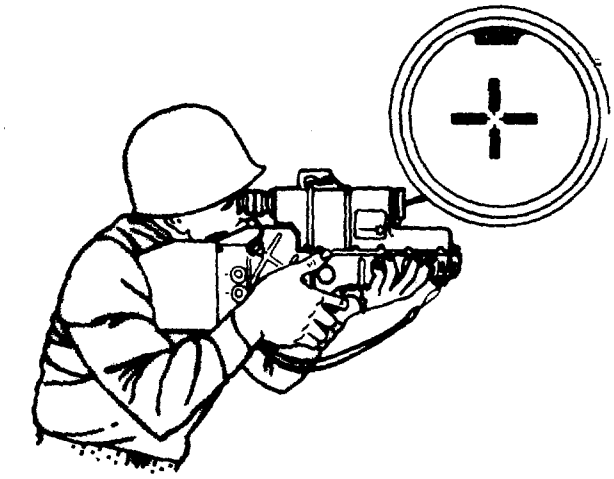
WARNING

Laser will be fired in the next step. Before proceeding, observe warnings on WARNING page at front of manual.

NOTE

The malfunction indicator may flicker for the first 10 seconds of lasing. This is a normal indication If the flickering continues for more than 10 seconds, a fault is indicated. If the malfunction indication is continuously lit at any time, a fault is indicated. Refer to paragraph 3-4 for malfunction indicator faults.

d. Look through the eyepiece and squeeze the trigger. The reticle will light, and the malfunction indicator at the top of the eyepiece lens will be unlit.



MS 414651A

2-9. LTD Checkout - - -

NOTE

The malfunction indicator may flash once as the trigger is released. This does not indicate a fault.

e. Release the trigger. The reticle light will go off.

f. Re-engage the trigger SAFE guard.

g. Replace the eyepiece lens cover.

Checkout is complete and your LTD is ready for operation.

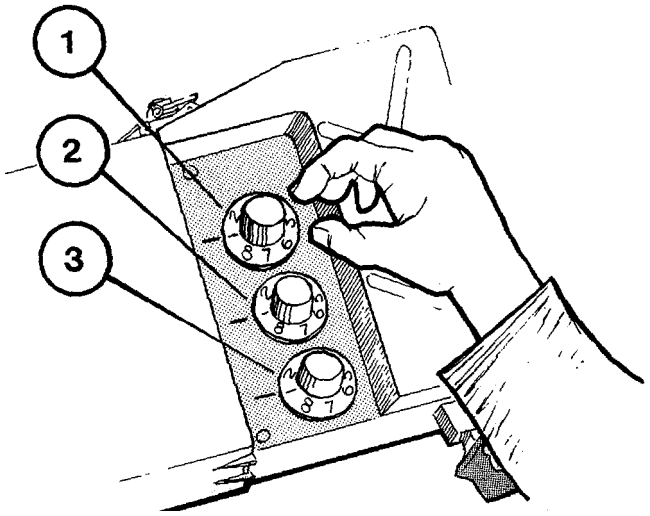
MS 414652A

2-10. Operating Your LTD

Now that you have your firing site picked out and have conducted a pre-operational check of your LTD, get ready to use your LTD to designate a target.

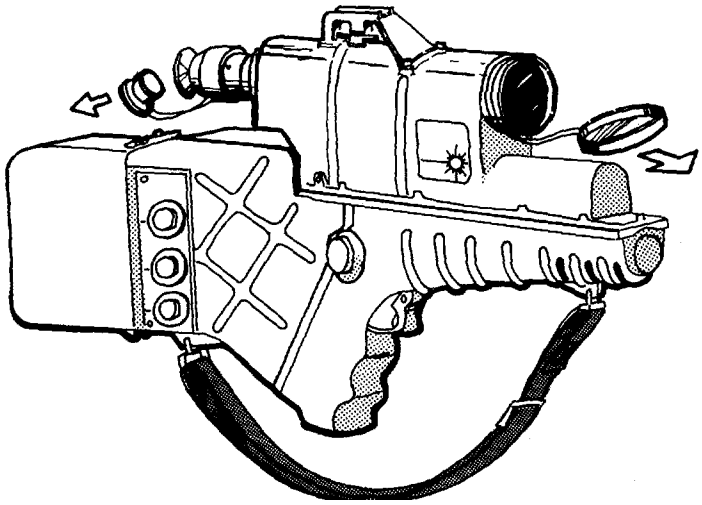
Code switches will be set or changed only when directed by local procedures.

a. Using the code switches, set the assigned code. The uppermost code switch is for your first number, the middle code switch is for your second number, and the bottom code switch is for your third number.



MS 414653

b. Remove the eyepiece lens cover and front lens cover.



MS 414654

2-10. Operating Your LTD - - -

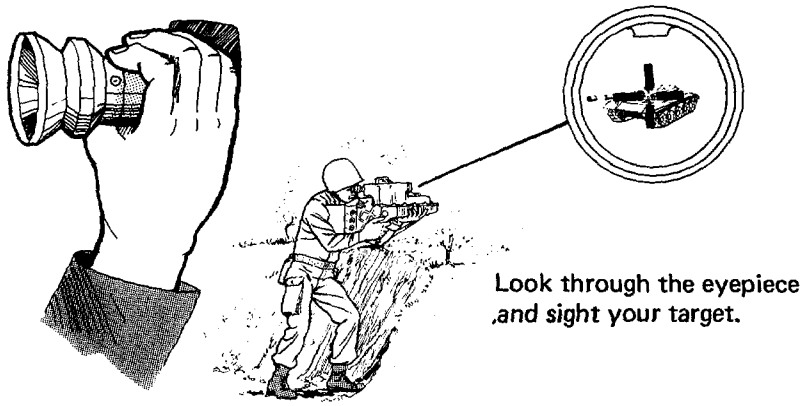
c. NOW ASSUME A GOOD TARGET DESIGNATING POSITION-NORMALLY THE STANDING SUPPORTED OR PRONE POSITION IS USED.

Place feet firmly on ground.
Hold LTD snugly against proper shoulder.
Keep legs straight and supporting elbow tucked in.
Keep eye firmly against eyepiece.
Control your breathing.

MS 414655

2-10. Operating Your LTD - - -

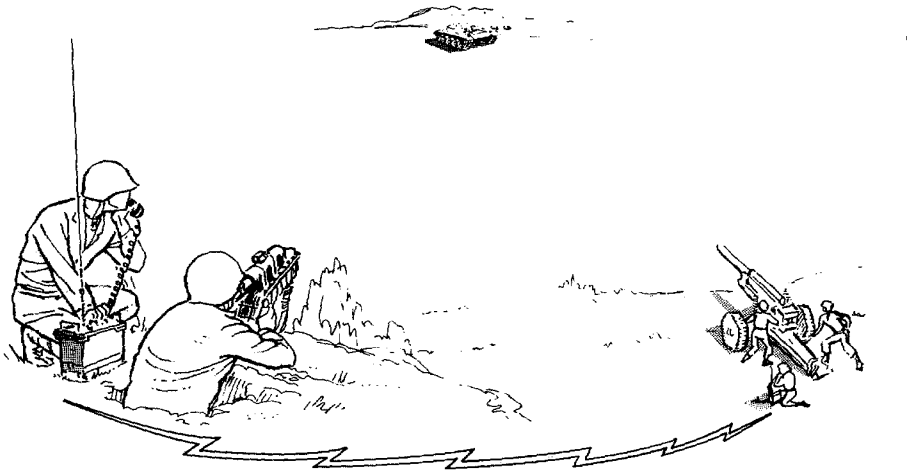
d. Focus the reticle by gradually turning the eyepiece.



MS 414656

2-10. Operating Your LTD - - -

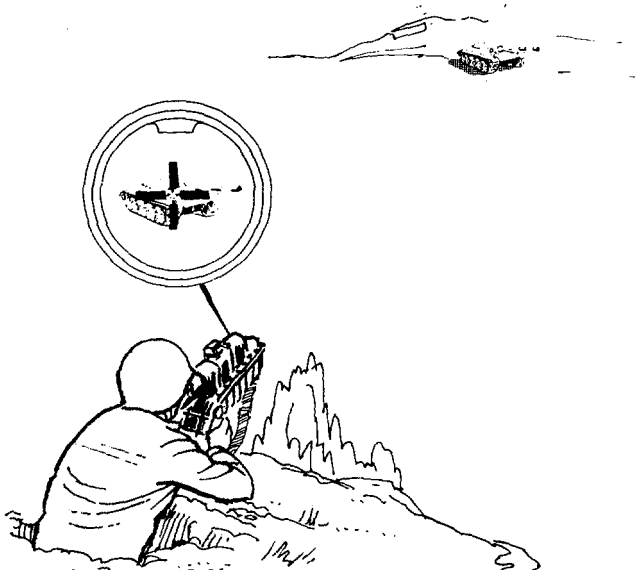
e. PREPARE TO DESIGNATE



MS 414657

2-10. Operating Your LTD - - -

f. Begin target tracking

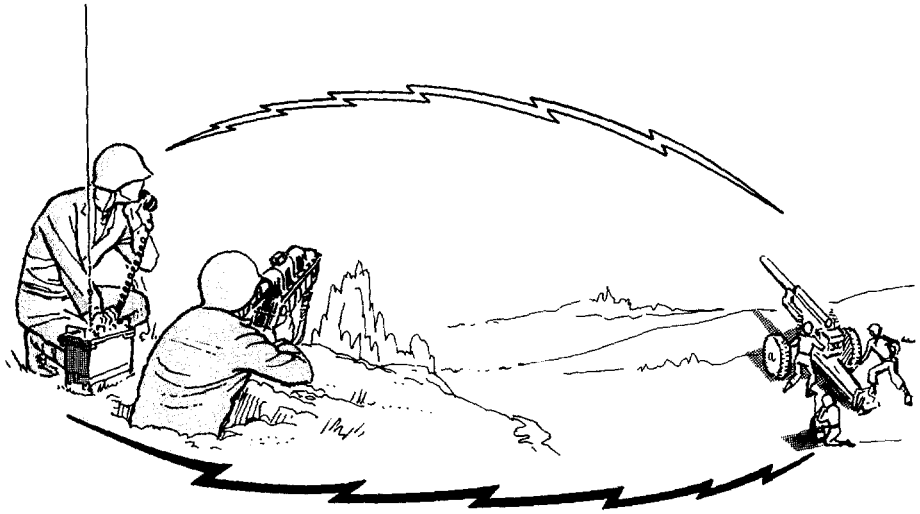


Center the crosshairs on the center of visible mass of the target. Remember to track moving target with a smooth motion. Excessive or jerky movement of the tracker could result in a mission failure.

2-10. Operating Your LTD - - -

g. DESIGNATE THE TARGET

Lift the trigger SAFE guard. Squeeze the trigger ON COMMAND. Maintain crosshairs on center of visible mass of the target.

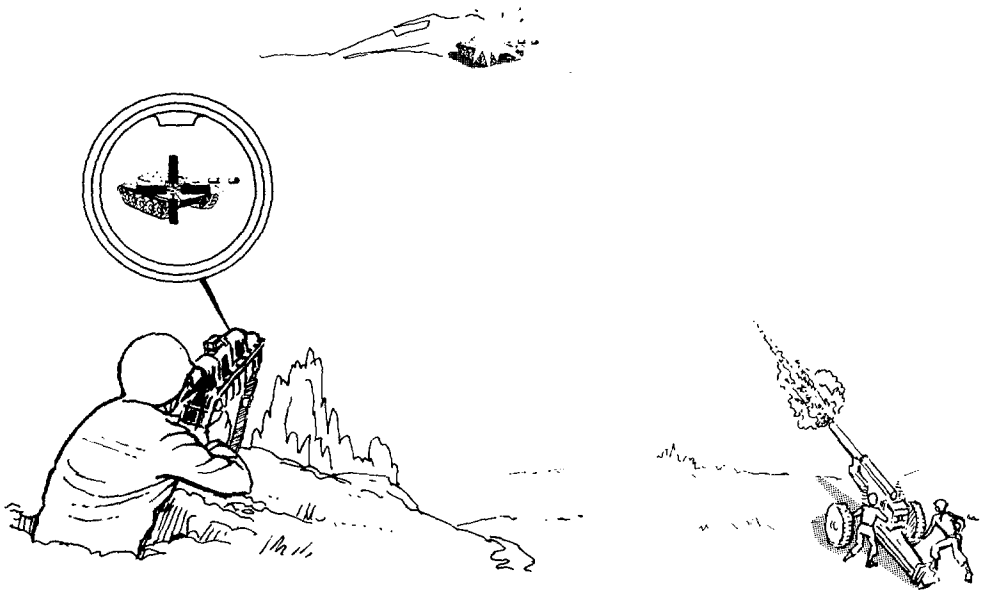


MS 414658

2-10. Operating Your LTD- - -

h. After the round impacts, or when told to do so, release trigger and replace trigger safeguard. If additional targets are to be engaged repeat above procedures for remaining targets.

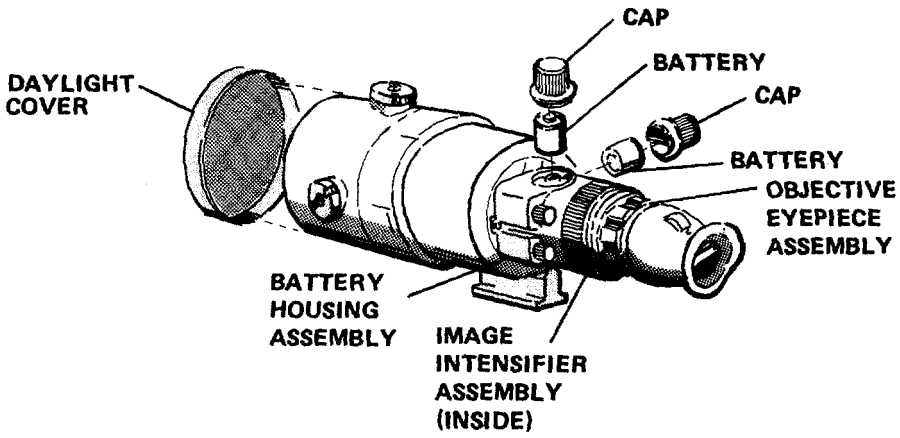
If no further targets are to be engaged, replace eyepiece lens cover and front lens cover.



MS 414659

2-11. Preparation for Use of Night Sight

Your LTD can be used under low visibility conditions or at night with the attachment of the night sight.



GET READY TO USE YOUR NIGHT SIGHT

MS414660

2-11. Preparation for Use of Night Sight - - -

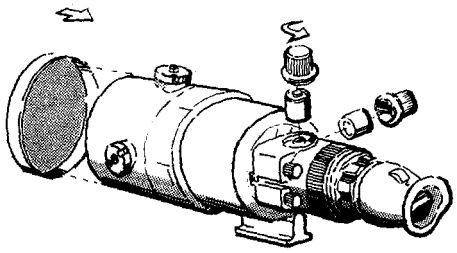
CAUTION

The daylight cover must be installed on the night sight when operating during daylight to protect the image intensifier tube from damage.

•· Remove battery caps by turning counter-clockwise.

• Insert a battery in each battery cap with negative (-) terminal facing into the cap as shown.

• Replace battery caps and tighten firmly.



CAUTION

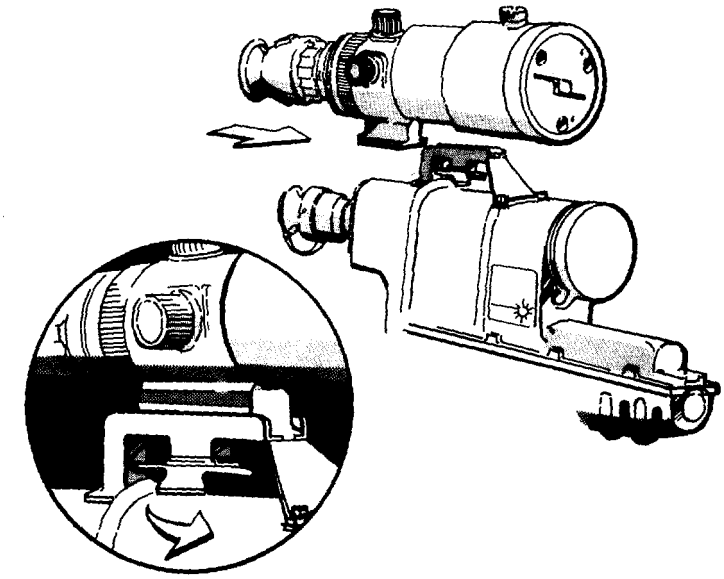
Remove the batteries when the sight is not in use to prevent accidental operation.

2-11. Preparation for Use of Night Sight - - -

• Slide the night sight mounting flange into the groove located on top of the night sight mounting bracket.

• Center the night sight mounting hole over the thumbscrew on the night sight mounting bracket.

• Secure the night sight to the LTD by tightening the thumbscrew located at the base of the night sight mounting bracket.



MS 414662

2-12. Alinement of Your LTD and Night Sight

CAUTION

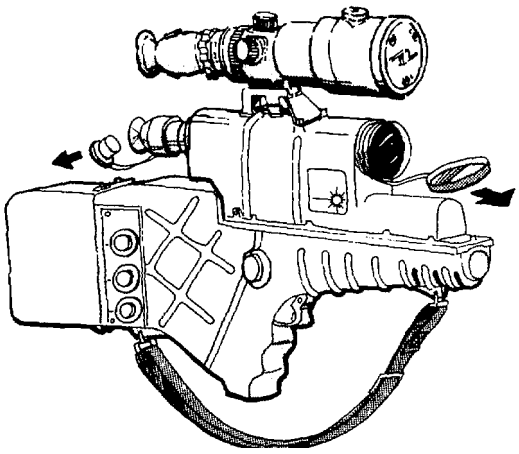
The daylight cover must be installed when operating the night sight during daylight to protect the image intensifier tube from damage.

NOTE:

Alinement of the LTD with the night sight optics must be accomplished in daylight.

a. Perform night sight preparation for use procedures per paragraph 2-11.

b. Remove LTD eyepiece and front lens covers.



MS 414663

2-12. Alinement of Your LTD and Night Sight - - -

c. Using sandbags or other means of support, physically stabilize the LTD to assure no movement during alinement.

• Press your eye against the eyeguard to open the rubber leaves.

• Turn the ON-OFF/TUBE BRIGHTNESS control clockwise to turn on the night sight.

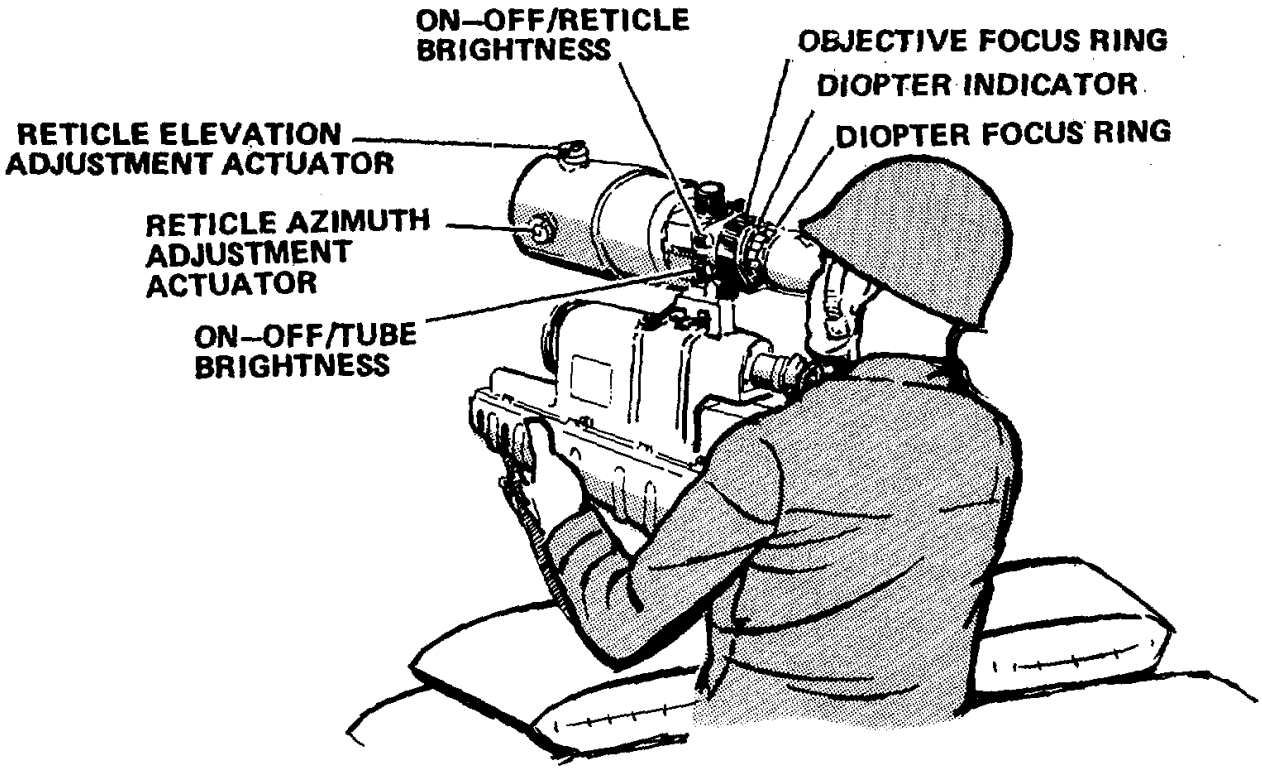
• Adjust the ON-OFF/TUBE BRIGHTNESS control to the lowest setting that will provide good target-to-background contrast.

CAUTION

Excessive reticle brightness may damage the image intensifier tube.

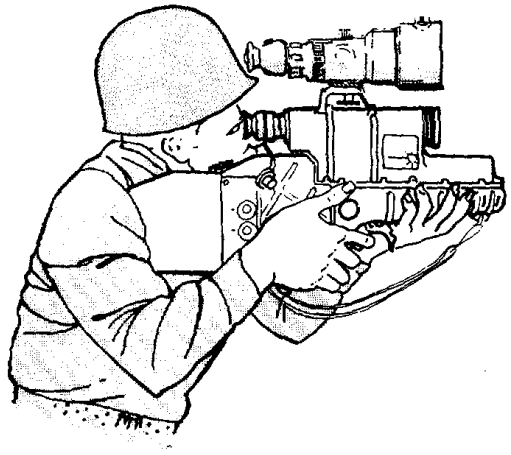
• Turn the ON/OFF/RETICLE BRIGHTNESS control clockwise to illuminate the reticle pattern.

2-12.



MS 414665

2-12. Alinement of Your LTD and Night Sight - - -



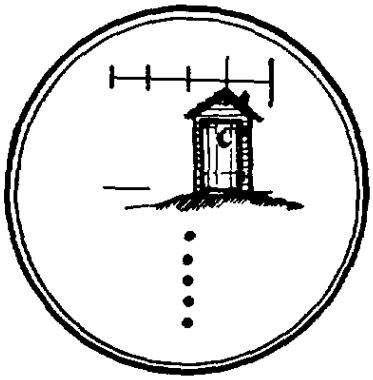
d. Now using your LTD, sight through the LTD eyepiece on a point at least 200 meters from your position.

MS 414666

2-12. Alinement of Your LTD and Night Sight - - -

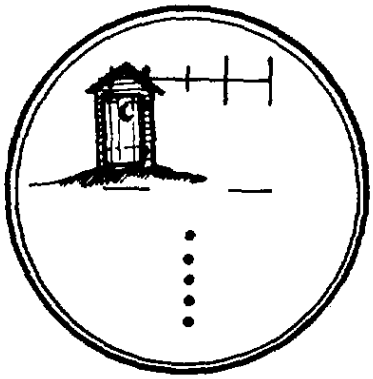
e. Without moving the LTD, sight the same target through the night sight. (Turn the diopter and objective focus rings until you get the clearest image of the target.)

YOU SHOULD SEE,



THIS INDICATES YOUR LTD AND NIGHT SIGHT ARE OPTICALLY ALINED. PROCEED TO PARAGRAPH 2-13.

BUT YOU MIGHT SEE



THIS INDICATES YOUR LTD AND NIGHT SIGHT ARE NOT OPTICALLY ALINED. PROCEED TO STEP f.

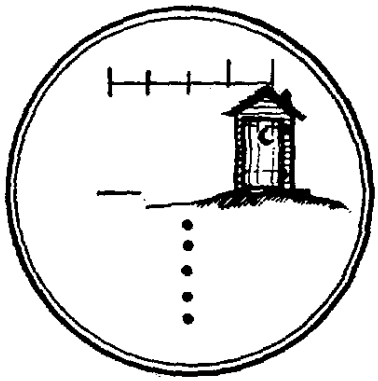
MS 414667

2-12. Alinement of Your LTD and Night Sight - - -

The following steps provide you with an alinement procedure for a typical case of boresight misalinement. These steps will provide you with a general understanding of how you can correct for any case of boresight misalinement you might encounter in actual use.

f. Insure the sight picture of the LTD is the same as in step d. Without moving the LTD, sight the same target through the night sight.

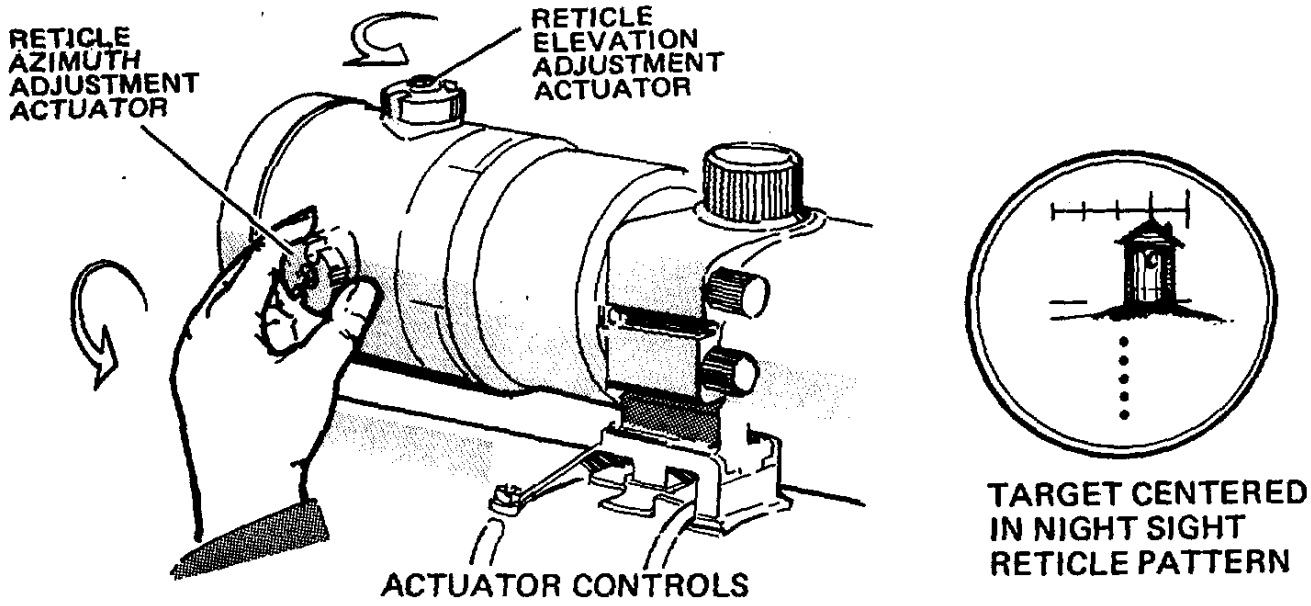
YOU MIGHT SEE



Proceed to step g...

MS 414668

2-12. Alinement of Your LTD and Night Sight - - -

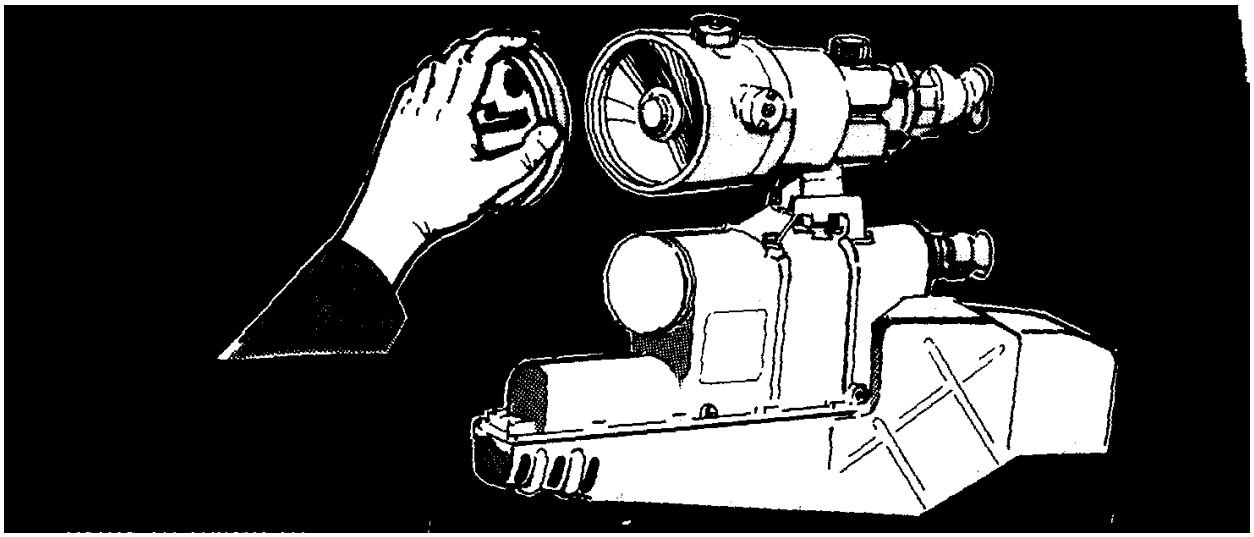


g. Insure your LTD sight picture is still the same as in step f. Without moving the LTD, sight the same target through the night sight and turn the reticle azimuth and elevation adjustment actuators counter- clockwise until the same sight picture is obtained in the night sight reticle pattern.

MS 414669

2-13. Operation Using Your Night Sight

THE DAYLIGHT COVER MUST BE INSTALLED DURING DAYLIGHT USE AND REMOVED FOR NIGHT TIME USE.



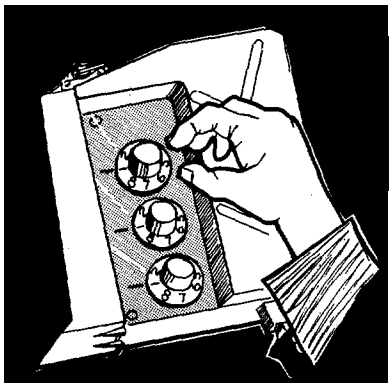
a. Perform night sight alinement procedures per paragraph 2-12 prior to using to designate targets.
b. Select your firing site (paragraph 2-5). Insure front lens cover on LTD is in place. Remove the daylight cover from the night sight.

MS 414670

2-13. Operation Using Your Night Sight - - -

NOTE

Now that you have picked out a firing site and conducted a boresight alinement of your LTD and night sight, get ready to use your LTD and night sight to designate a target.



IMPORTANT INFORMATION

Code switches will be set or changed only when directed by local procedures.

c. Using the code switches, set the assigned code. The uppermost code switch is for your first number, the middle code switch is for your second number, and the bottom code switch is for your third number.

MS 414671

2-13. Operation Using Your Night Sight - - -

d. Remove the eyepiece and front lens covers from the LTD. Now, assume a good designating position - normally the standing supported or prone position is used (paragraph 2-10).

e. ACQUIRE THE TARGET

- Press your eye against the eyeguard to open the rubber leaves.
- Turn the ON-OFF/TUBE BRIGHTNESS control clockwise to turn on the night sight.
- Adjust the ON-OFF/TUBE BRIGHTNESS control to the lowest setting that will provide good target-to-background contrast.

CAUTION

Excessive reticle brightness may damage image intensifier tube.

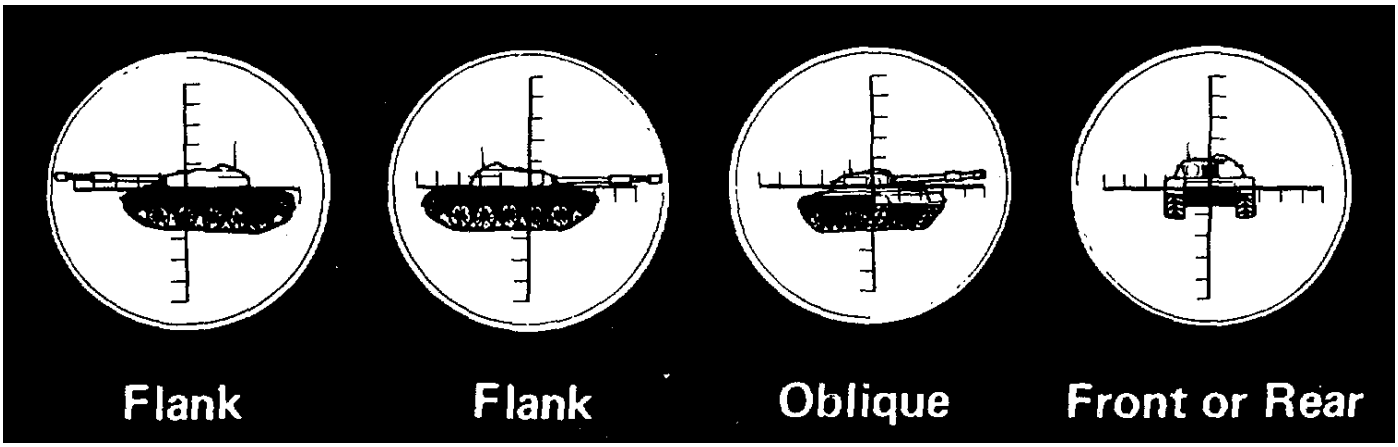
- Turn the On-Off/RETICLE BRIGHTNESS control clockwise to illuminate the reticle pattern.

MS 414672

2-13. Operation Using Your Night Sight - - -

f. BEGIN TARGET TRACKING...

Center the night sight crosshairs on the center of visible mass of the target. Remember to track moving targets with smooth motion. Excessive or jerky movement could result in a mission failure.



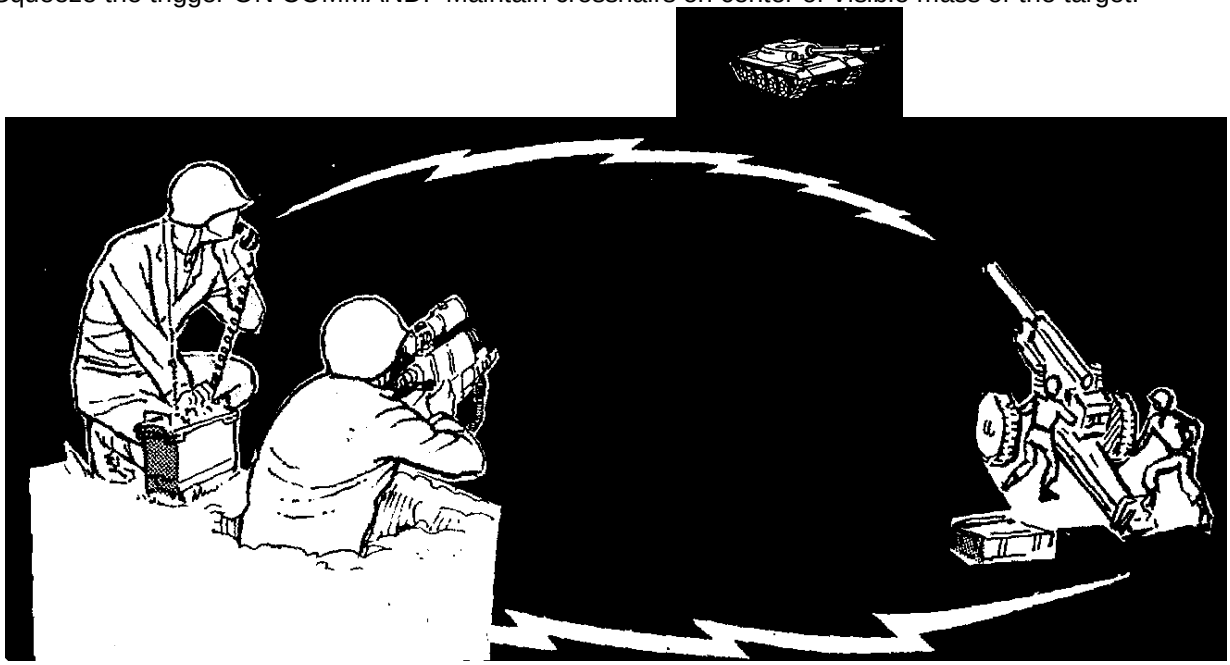
MS 414673

2-13. Operation Using Your Night Sight - - -

g. DESIGNATE THE TARGET

Lift the trigger SAFE guard.

Squeeze the trigger ON COMMAND. Maintain crosshairs on center of visible mass of the target.

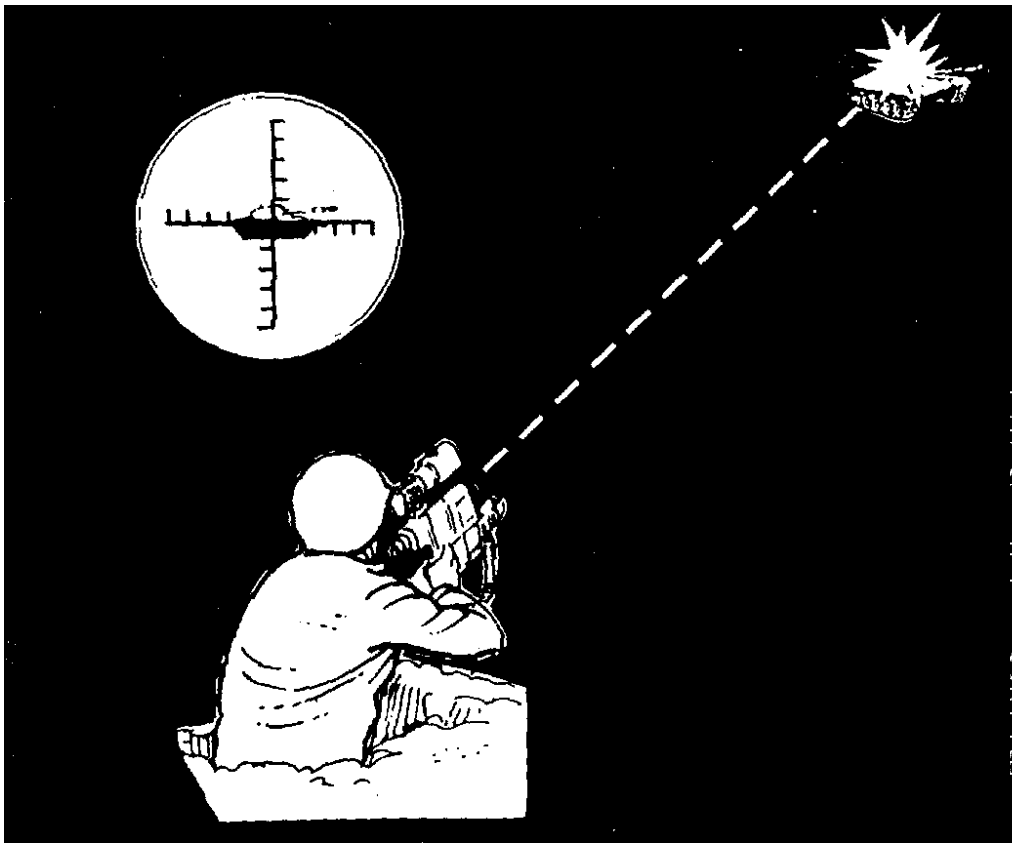


MS 414674

2-13. Operation Using Your Night Sight - - -

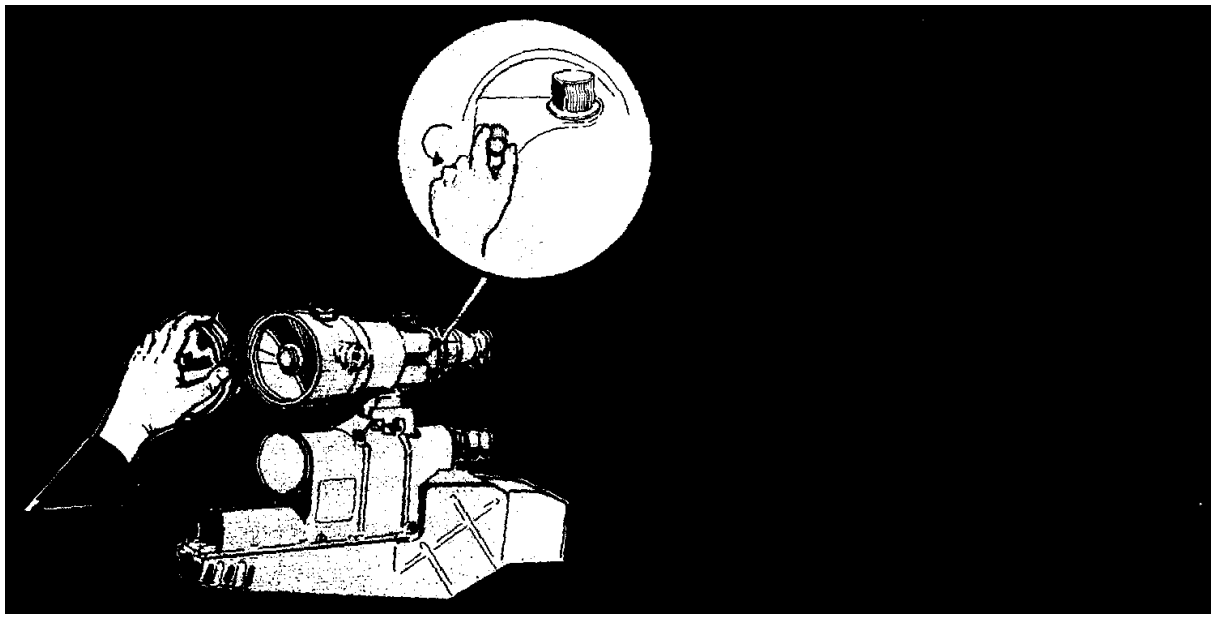
h. AFTER THE ROUND IMPACTS, OR WHEN TOLD TO DO SO, RELEASE TRIGGER AND REPLACE TRIGGER SAFEGUARD. IF ADDITIONAL TARGETS ARE TO BE ENGAGED REPEAT ABOVE PROCEDURES FOR REMAINING TARGETS.

IF NO FURTHER TARGETS ARE TO BE ENGAGED, REPALCE EYEPIECE LENS COVER AND FRONT LENS COVER



MS 414675

2-13. Operation Using Your Night Sight - - -



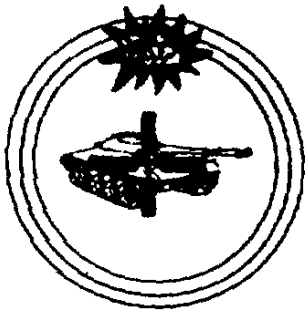
i. IF NO FURTHER TARGETS ARE TO BE ENGAGED; REPLACE THE LTD FRONT LENS COVER, THE EYEPIECE LENS COVER, AND THE NIGHT SIGHT DAYLIGHT COVER. TURN THE RETICLE BRIGHTNESS AND TUBE BRIGHTNESS CONTROLS OFF.

MS 414676

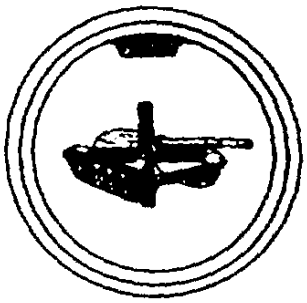
2-14. Malfunctions

a. LTD

It is possible while designating a target to get a ------



OR



A LOW LEVEL, RAPIDLY FLICKERING MALFUNCTION INDICATOR is normal.

FULL-ON or FLASHING FULL-ON MALFUNCTION INDICATOR indicates over-temperature, no laser energy output, or low battery.

Refer to troubleshooting procedures (paragraph 3-4). If you cannot correct malfunction, have your support maintenance run a check on your LTD.

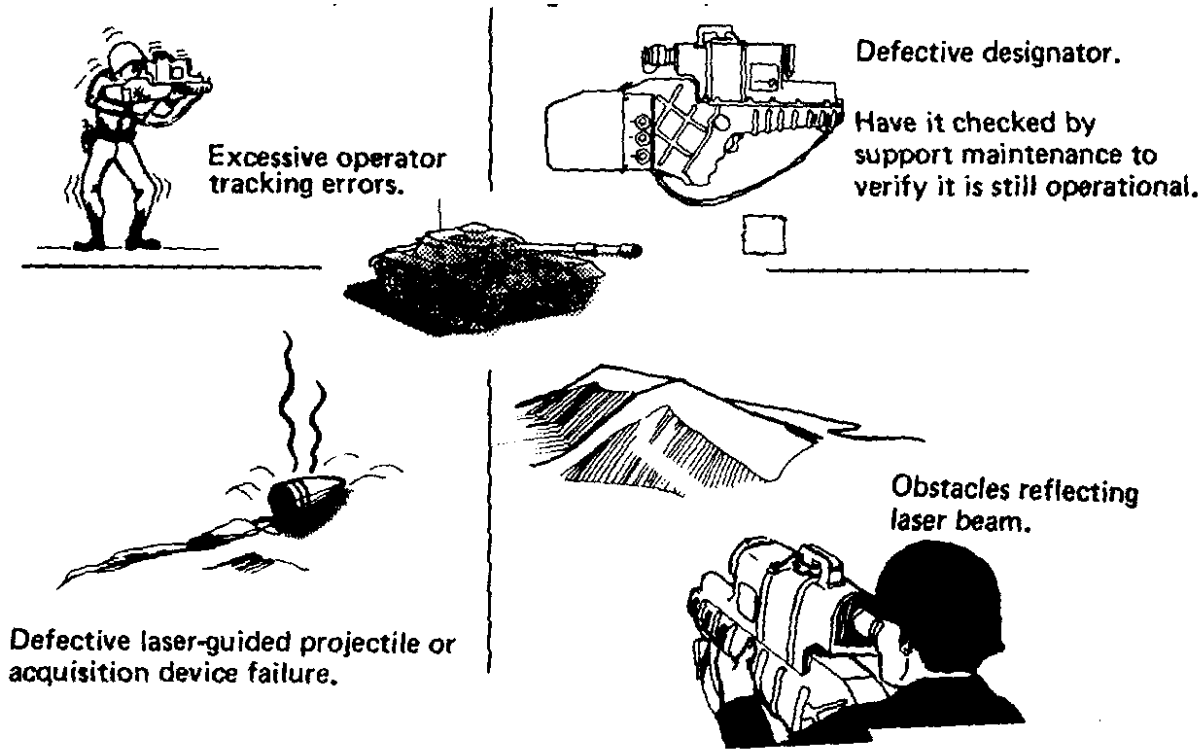
IN COMBAT THOUGH, THINGS ARE HANDLED A LITTLE DIFFERENTLY

You continue squeezing the trigger and designate until the mission is complete.

2-14. Malfunctions –

b. Mission failure

An uncontrolled flight of a projectile or failure of the acquisition device to lock on may occur as a result of any of the following conditions. but is not limited to:



MS 414678

SECTION IV. OPERATING PROCEDURES UNDER USUAL CONDITIONS

2-15. Scope

This section contains information needed to operate the LTD under unusual conditions.

CAUTION

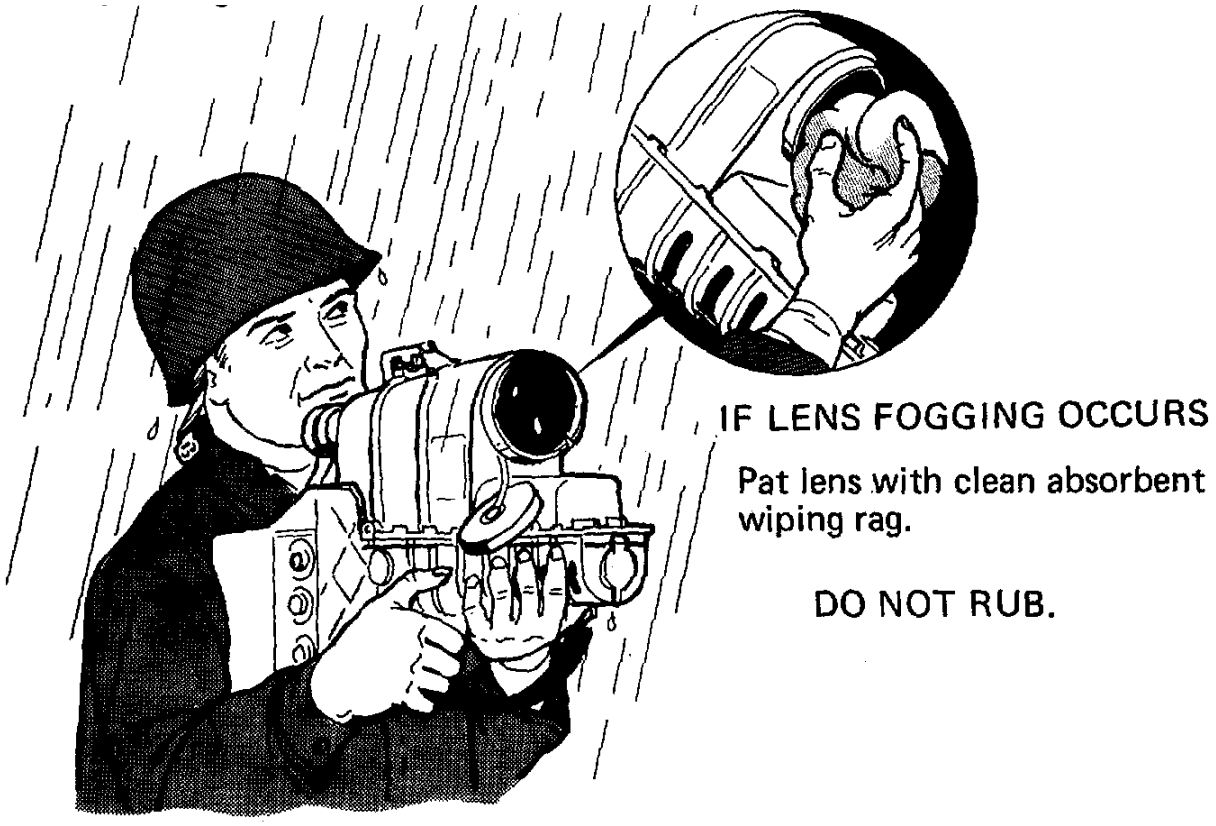
This equipment is a precision electro-optical instrument and must be handled carefully. Keep protective caps on at all times when not in use.

2-16. Operating in Adverse Weather

With the EPA connected you can operate down to -25° F.

MS 414680

2-16. Operating in Adverse Weather - - -



BAD WEATHER MAY MAKE IT DIFFICULT TO SIGHT THE TARGET.

MS 414681

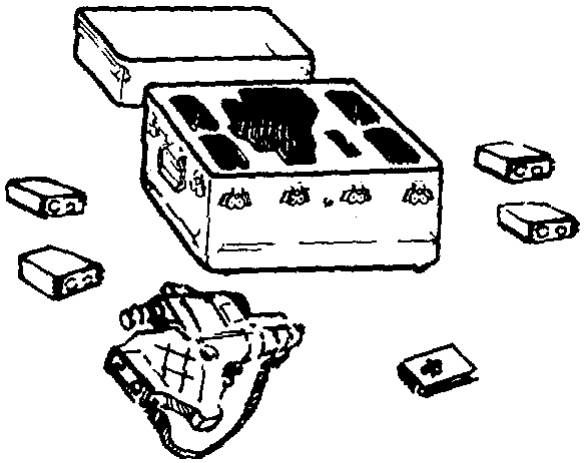
CHAPTER 3

MAINTENANCE

SECTION I. SERVICE UPON RECEIPT OF MATERIEL

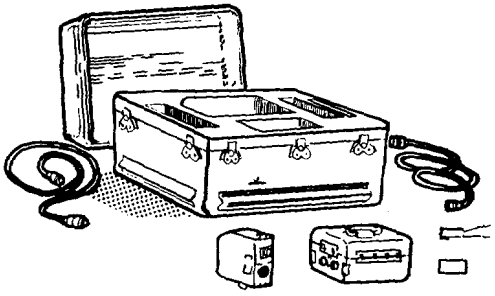
3-1. When you receive LTD set items, you must inspect and service them before using. A checklist is provided to remind you what needs to be done. Part numbers for all organizational replaceable items are found in Appendix C, section II.

3-2. Service Upon Receipt Checklist

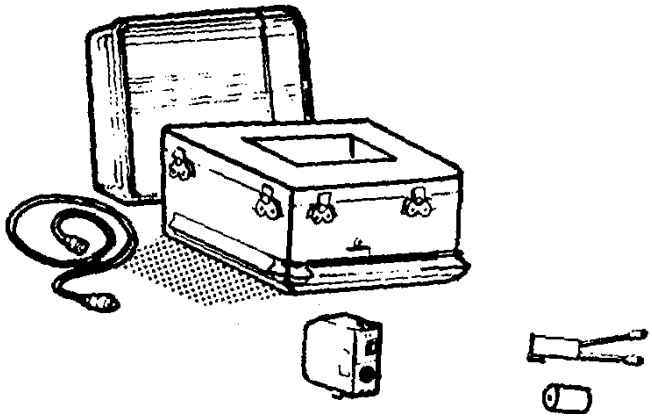
Item	Procedure	References/Remarks
(LTD) All Items		Refer to Appendix C, Section II, to inventory the LTD set. Inspect for missing or damaged items

MS 414682

3-2. Service Upon Receipt Checklist - - -

Item	Procedure	References/Remarks
EPA (13034435)	 Make sure none of the above items are missing. Report and replace any missing items.	Refer to Appendix C, Section II, to inventory the LTD system. Inspect for missing or damaged parts.

3-2. Service Upon Receipt Checklist - - -

Item	Procedure	References/Remarks
EPA (13160200) All Items	 Make sure none of the above items are missing. Report and replace any missing items.	Refer to Appendix C, Section II to inventory the LTD system. Inspect for missing or damaged parts.

IMPORTANT INFORMATION

Charged NICAD batteries will discharge during storage. The rate of discharge varies from battery to battery and varies with storage temperature. The storage time or charging interval must be verified at the time of battery issue. No battery should be issued which has been charged and stored for more than 10 days. For situations where storage temperatures are above 70° F (21.1° C), batteries which have been charged and stored for more than 5 days, should not be issued.

SECTION II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

3-3. Preventive Maintenance Checks and Services

a. *General*

(1) Before you operate always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS prior to the equipment leaving its containment area or performing its intended mission.

(2) While you operate always keep in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS when the equipment is being used in its intended mission.

(3) After you operate be sure to perform your after (A) PMCS after the equipment has been taken out of its mission mode or returned to its containment area.

(4) If your equipment does not perform as required, refer to Chapter 3 under Troubleshooting Procedures for possible problems. Report any malfunctions or failures on DA Form 2404, or refer to DA Pam 738-750.

b. *Purpose*

Your PMCS table lists the inspections and care of your equipment required to keep it in good operating condition.

c. *Explanation of Columns*

(1) The item number column of your PMCS tells how many items to check or service. In addition, this column serves as a source of item numbers for the "TM" column on DA Form 2404 in recording the results of PMCS.

(2) The interval column of your PMCS table tells you when to do a certain check or service.

(3) The item to be inspected column of your PMCS table tells you what items to check or service.

(4) The procedure column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have Direct Support maintenance do the work.

(5) The equipment is not ready/available if column tells you when and why your equipment cannot be used.

NOTE

The terms ready/available and mission capable refer to the same status: equipment is on hand and is able to perform its combat missions.

Perform weekly as well as before operations PMCS if:

- You are assigned as operator and have not operated the item since the last weekly PMCS inspection.
- You are operating the item for the first time.

Within designated intervals, these checks are to be performed in the order listed.

B - Before **A - After** **M - Monthly** **D -During** **W -Weekly**

Item No.	Interval B	D	A	W	M	Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
1.	•		•			LTD Transit Case	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return to Direct Support.	Latches or handles broken or missing. Deep dents or splits in case. Damaged or missing upper and lower inserts
						LTD		
2.	•		•			Designator External Housing	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return to Direct Support.	Housing is cracked or badly dented.

Item No.	Interval					Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
3.	•		•			Connectors	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return LTD to Direct Support.	Connectors are damaged.
4.	•		•			Battery-Shoulder Stock Latch	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return LTD to Direct Support.	Latch is damaged or missing.

Item No.	Interval					Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
5.	•		•			Code Switches	Check for damaged or missing knobs. Check for freedom of movement. If damaged, return LTD to Direct Support.	Knobs are damaged or missing. Code switches do not turn or they turn too freely.
6.	•		•			Carrying Strap	Check for physical damage. If damaged, return LTD to Direct Support.	Strap is damaged or missing.
7.	•		•			Eyepiece and Front Lens Covers	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, replace per paragraphs 3-11 and 3-12.	Covers are damaged or missing.

Item No.	Interval					Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
8.	*		*			Eyepiece and Front Lens	Check for dirt, cracks, and scratches. Check for moisture on inside of lenses. Clean per paragraph 3-6. If damaged, return LTD to Direct Support.	Lenses have scratches, cracks, and moisture on inside.
						Battery-Shoulder Stock		
9.		*				Connector	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return battery-shoulder stock to Direct Support.	Connector is damaged.

Item No.	Interval					Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
9.						Connector -	Continued Check for damaged or missing O-ring. Replace O-ring per paragraph 3-11.	O-ring is damaged or missing.
10.	•		•		•	Servicing Label	Check for damaged, obliterated, or missing servicing label. If damaged, obliterated or missing, return battery to Direct Support.	Servicing label is damaged, obliterated, or missing.

Item No.	Interval					Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
10.						Servicing Label -	Continued Check servicing label on all four batteries for last charge date.	Three or more batteries have been stored for more than 10 days; more than 5 days if storage temperatures are above 70°F (21°C) or below 32°F (0°C).
11.	•		•			External Optics Cleaning Kit	Inventory per appendix D, items 2, 3, 5, and 8. Replace missing contents.	Any item is missing.

Item No.	Interval					Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
						External Power Adapter (13034435)		
12.	•		•			External Power Converter (13034438)	Check exterior surface for oil, dirt, or grease. Clean per paragraph 3-6.	Excessive oil, dirt, or grease on surface of converter.
							Check for gouges, cracks, and punctures. If damaged, return EPC to Direct Support.	Gouges, cracks, and punctures are visible.
13.	•		•			EMI Filter	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return EMI filter to Direct Support.	Filter is damaged.

Item No.	Interval					Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
	B	D	A	W	M			
14.	•		•			EMI Filter Connector	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return EMI filter to Direct Support Check for damaged or missing O-ring. Replace O-ring per paragraph 3-11.	Connector is damaged. O-ring is damaged or missing.

Item No.	Interval B	D	A	W	M	Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
						External Power Adapter 13160200		
15.	•		•			External Power Converter (13160201)	Check for physical damage, dirt, and contamination. Clean per paragraph 3-6. If damaged, return to Direct Support.	Converter is damaged.
						Connector	Check for physical damage, dirt, or contamination. Clean per paragraph 3-6. If damaged, return EPC to Direct Support.	Connector is. damaged.

Item No.	Interval B	D	A	W	M	Item To Be Inspected	Procedures Check For And Have Repaired Or Adjusted As Necessary	Equipment Is Not Ready/ Available If:
						Connector -	Continued	
							Check for damaged or missing O-ring. Replace O-ring per paragraph 3-13.	O-ring is damaged or missing.
16.	•		•			Vehicle Cables (13033956 and 13160199), Interconnect Cable, Slave Cable, and NATO Connector	Check for physical damage, dirt or contamination. Clean per paragraph 3-6. If damaged, return to Direct Support.	Connector and/or cables are damaged.

SECTION III. TROUBLESHOOTING PROCEDURES

3-4. Troubleshooting Your LTD

a. This section contains troubleshooting information for locating and correcting operating troubles which may develop. Each malfunction for an individual component, unit, or system is followed by a list of tests or inspections which will help you determine probable cause and corrective actions to take. The tests/inspections and corrective actions should be performed in the order listed.

b. This manual cannot list all possible malfunctions that may occur, or all tests, inspections and corrective actions. If a malfunction is not listed (,except when malfunctions and causes are obvious), or is not corrected by a listed corrective action, refer the faulty item to Direct Support maintenance.

NOTE

Before you use the troubleshooting procedures, be sure you have performed all normal operating checks.

3-4. Troubleshooting Your LTD - - -

MALFUNCTION **TEST OR INSPECTION** **CORRECTIVE ACTION**

1. IMPROPER DESIGNATOR OPERATION WHEN BATTERY-SHOULDER STOCK ATTACHED

Step 1. Change battery-shoulder stock if there is no reticle light or if malfunction indicator flashes for more than 10 seconds on initial operation or remains "full on". Flashing during the first 10 seconds is acceptable.

(a) Turn wingnut on designator housing ccw.

(b) Remove battery-shoulder stock.

(c) Insert new charged battery-shoulder stock.

(d) Secure battery-shoulder stock to designator by turning wingnut cw.

3-4. Troubleshooting Your LTD - - -

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 2. Perform LTD checkout procedure (paragraph 2-9).

(a) If LTD fails checkout refer to Direct Support maintenance.

(b) If LTD passes checkout, refer to paragraph 3-8 for recharging procedures.

MS 414694

MALFUNCTION **TEST OR INSPECTION** **CORRECTIVE ACTION**

2. IMPROPER DESIGNATOR OPERATION WHEN EXTERNAL POWER ADAPTER (13034435) ATTACHED

Step 1. Check that POWER ON-OFF switch on external power converter is in ON (up) position.

Step 2. Check that interconnecting cables are properly attached.

Step 3. Check that external power source is operating.

MALFUNCTION **TEST OR INSPECTION** **CORRECTIVE ACTION**

Step 4. Removal of EMI filter and replacement with battery-shoulder stock.

(a) Set POWER ON-OFF switch on external power converter to OFF (down).

(b) Turn wingnut on designator housing ccw.

(c) Remove EMI filter.

(d) Insert charged battery-shoulder stock.

(e) Secure battery-shoulder stock to designator by turning wingnut cw.

3-4. Troubleshooting Your LTD - - -

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 5. Perform LTD checkout procedure (paragraph 2-9).

(a) If LTD fails checkout, repeat the checkout with a different battery.

(b) If LTD fails checkout a second time, return the LTD to its transit case. Evacuate it to Direct Support maintenance in its transit case.

(c) If LTD passes checkout, return the EPA components to the carrying case. Send the external power adapter in carrying case to Direct Support for repair.

3-4. Troubleshooting Your LTD - - -

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

2.1. IMPROPER DESIGNATOR OPERATION WHEN EXTERNAL POWER ADAPTER (13160200) ATTACHED

Step 1. Check that interconnecting cables are properly attached.

Step 2. Check that external power source is operating.

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

Step 3. Removal of EPC (13160201) and replacement with battery-shoulder stock.

(a) Disconnect NATO connector (or slave cable) from external power source.
(b) Turn wingnut on designator housing ccw.
(c) Remove EPC.
(d) Insert charged battery-shoulder stock.
(e) Secure battery-shoulder stock to designator by turning wingnut cw.

3-4. Troubleshooting Your LTD - --

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

Step 4. Perform LTD checkout procedure (paragraph 2-9).

(a) If LTD fails checkout, repeat the checkout with a different battery.

(b) If LTD fails checkout a second time, return the LTD to its transit case. Evacuate it to Direct Support maintenance in transit case.

(c) If LTD passes checkout, return the EPA components to the carrying case. Send the external power adapter in carrying case to Direct Support for repair.

3-4. Troubleshooting Your LTD - - -

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

3. LASER-GUIDED MUNITIONS FAIL TO IMPACT TARGET OR ACQUISITION DEVICE FAILS TO LOCK ON

Step 1. Insure that LTD satisfactorily passes checkout procedure (paragraph 2-9).

(a) If LTD fails checkout procedure, refer to Direct Support maintenance.

(b) If LTD passes checkout, proceed to step 2.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	

Step 2. Insure the LTD code switches are set to the proper code for that mission.

(a) If code switches are set to proper code, refer to Direct Support maintenance.

(b) If code switches are not set to proper code, set the proper code and resume operation.

SECTION IV. MAINTENANCE PROCEDURES

3-5. Scope

This section contains operational and organizational level maintenance procedures.

3-6. Keep it Clean

Cleaning of your LTD and EPA is important to maintain good operation. If the LTD is not kept clean, damage may be hidden and would not be found during an initial inspection. For list of items used during cleaning, see Appendix D.

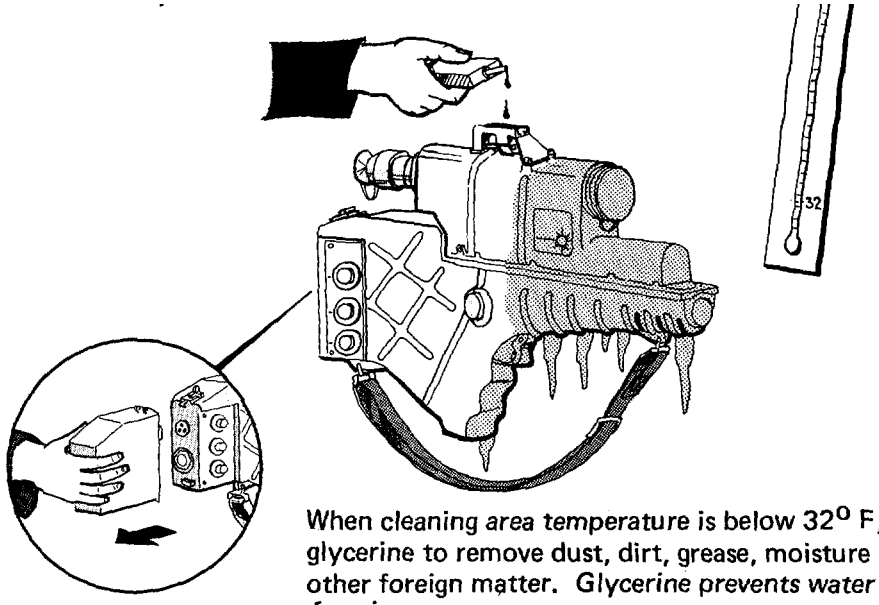
METAL PARTS. Use clean, dry rags to remove dust, dirt, grease, moisture, or other foreign matter.

RUBBER/SYNTHETIC PARTS. Use mild detergent and water. Then dry the parts using a clean, absorbent wiping rag.

WARNING

DO NOT PERFORM ANY CLEANING OR MAINTENANCE OPERATIONS WITH BATTERY-SHOULDER STOCK MATED TO THE LTD.

3-6. Keep it Clean ---



When cleaning area temperature is below 32° F, use glycerine to remove dust, dirt, grease, moisture or other foreign matter. Glycerine prevents water from freezing.

3.6. Keep it Clean ---

Do not clean the LTD lenses with rags or other materials that might scratch the lenses. Required cleaning materials are in the external optics cleaning kit in the LTD transit case.

1. Use the lens brush to gently brush away any dirt or lint from lenses.

2. If lens is still dirty, fold lens tissue in half. Again fold lens tissue in half.

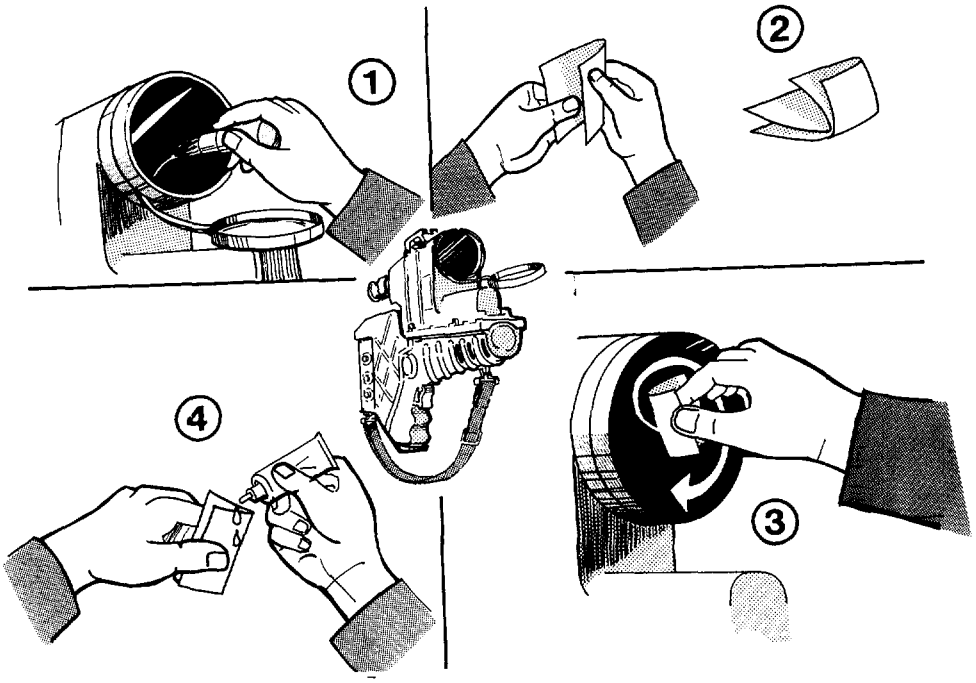
3. Beginning at the center of the lens, wipe in an expanding circular motion, applying a light downward pressure.

WARNING

Isopropyl alcohol is toxic, volatile, and flammable. Use only in well-ventilated area away from heat or open flame. Avoid prolonged breathing of vapor and contact with skin.

4. To remove grease or stubborn dirt put a few drops of a solution of isopropyl item 7, appendix D) on the lens tissue.

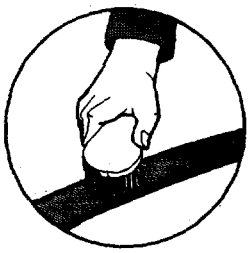
3-6. Keep it Clean ---



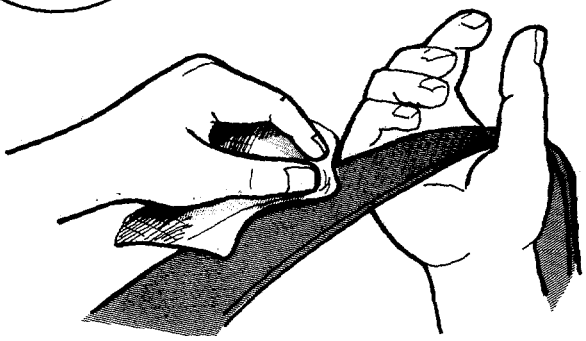
MS 414703

3-6. Keep it Clean ---

SLING AND WEB STRAP

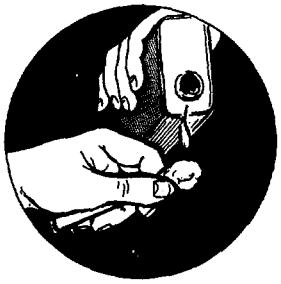


Use a stiff brush to whisk debris from webbing. If a brush does not sufficiently clean the material, use a mild detergent and water. Damp dry with absorbent wiping rag. Allow sufficient time for the material to air dry.



MS 414704

3-6. Keep it Clean ---

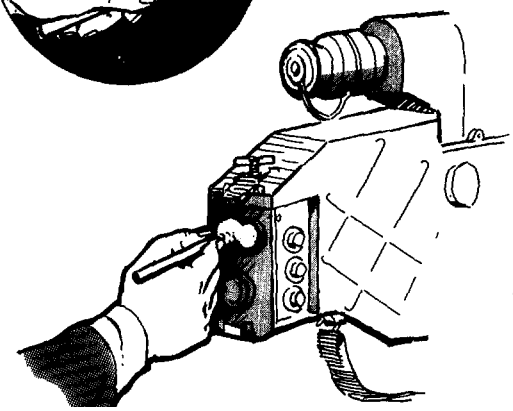


CONNECTORS

- Use a cotton swab or wrap clean wiping rag around a stick to form a swab.

WARNING

Isopropyl alcohol is toxic, volatile, and flammable. Use only in well-ventilated area away from heat or open flame. Avoid prolonged breathing of vapor and contact with skin.



- Wet swab with alcohol.
- Clean contact of connector with wet swab.

MS 414705

3-7. Spot Painting of the LTD and EPA

Surfaces must be clean before any spot painting takes place.

Use only forest green enamel.

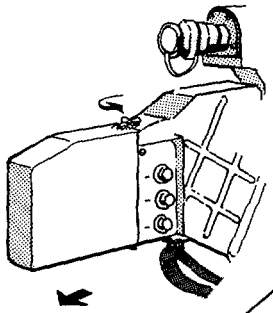
Do not use spray paint.

Insure that LTD objective lens and battery-shoulder stock connector covers are installed.

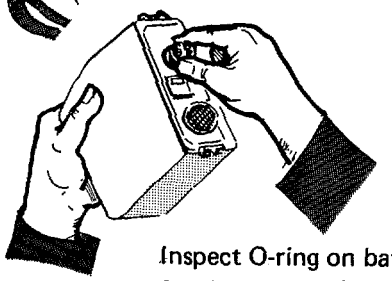
Care should be used to insure that no paint is used on eyepiece, optics, connectors, air intake/exhaust screens, code switches, or equipment identification plate.

On the EPA, insure that no paint is applied to connectors or identification plate.

3-8. Recharging Your Battery-Shoulder Stock



Turn wingnut on designator housing counter-clockwise to release battery-shoulder stock.



Inspect O-ring on battery-shoulder stock for damage, replace if necessary.

MS 414707

3-8. Recharging Your Battery-Shoulder Stock - - -

Lubricate O-ring using lubricant (14, Appendix D).

MS 414708

3-8. Recharging Your Battery-Shoulder Stock - - -

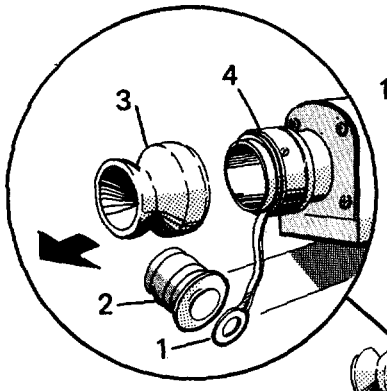
IMPORTANT INFORMATION

Battery-shoulder stocks requiring recharge should be turned in to the organization responsible for battery charging. The battery charger used is PP-7286 which will charge as many as five batteries at one time. The LTD uses a nickel-cadmium battery pack of 24 volt capacity. Typical charging information is marked on the battery-shoulder stock. The charging information marked on the BB-699 battery is:

300 ma FOR 7 HOURS AT ROOM AMBIENT

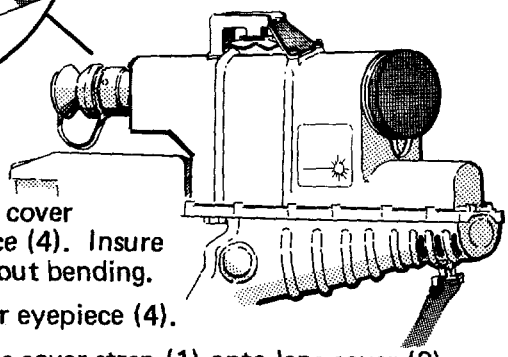
This means that your LTD battery should be charged at a rate of 300 milliamperes for 7 hours at room temperature.

3-9. Eyepiece Lens Cover Strap Replacement



1. REMOVAL

- Remove lens cover strap (1) from lens cover (2).
- Slide eyeguard (3) off eyepiece (4).
- Slide lens cover strap (1) off eyepiece (4).

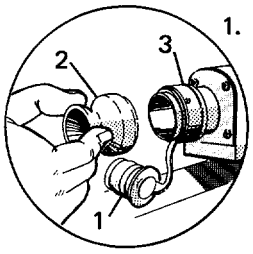


2. INSTALLATION

- Slip replacement lens cover strap (1) over eyepiece (4). Insure strap fits snugly without bending.
- Slip eyeguard (3) over eyepiece (4).
- Snap replacement lens cover strap (1) onto lens cover (2).

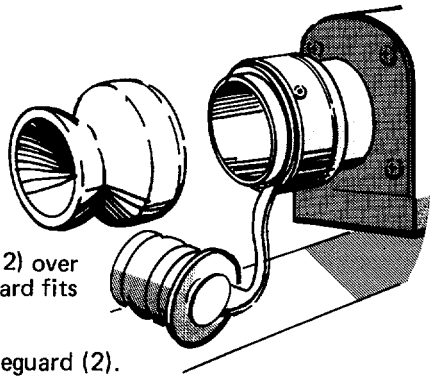
MS414710

3-10. Eyeguard Replacement



1. REMOVAL

- Remove lens cover (1) from eyeguard (2).
- Slip eyeguard (2) off eyepiece (3).

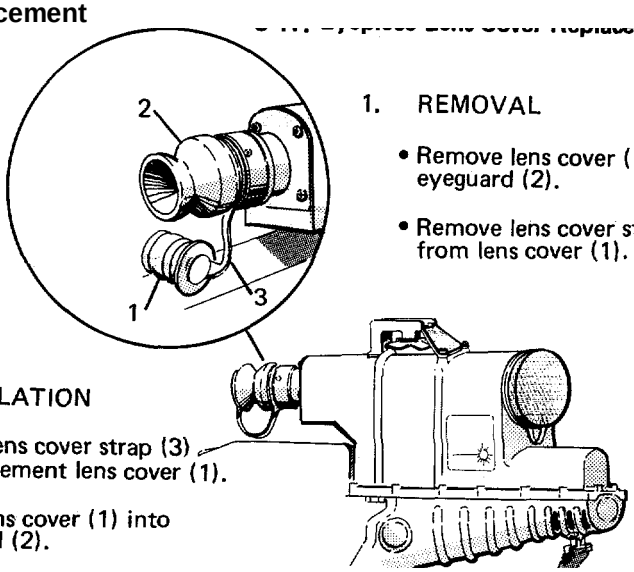


INSTALLATION

- Slip replacement eyeguard (2) over eyepiece (3). Insure eyeguard fits snugly without bending.
- Insert lens cover (1) into eyeguard (2).

MS 414711

3-11. Eyepiece Lens Cover Replacement



1. REMOVAL

- Remove lens cover (1) from eyeguard (2).
- Remove lens cover strap (3) from lens cover (1).

2. INSTALLATION

- Attach lens cover strap (3) to replacement lens cover (1).
- Insert lens cover (1) into eyeguard (2).

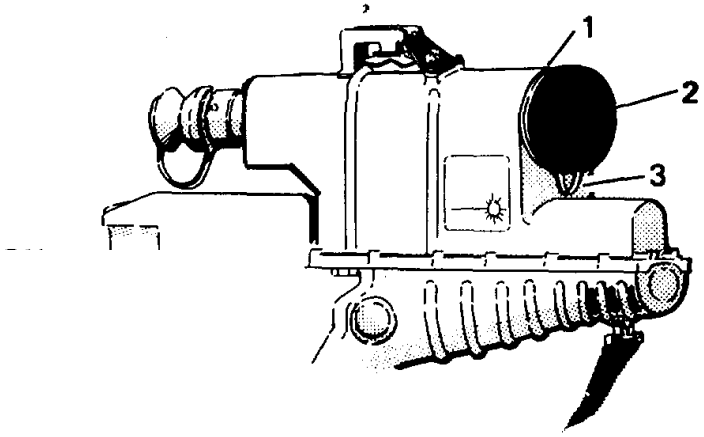
MS 414712

3-12. Front Lens Cover Replacement

1. REMOVAL

   • Remove front lens cover (2) from transmitter window (1).

   • Slide front lens cover strap (3) off transmitter window (1).

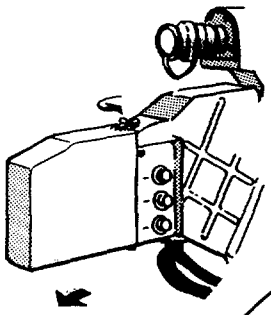


2. INSTALLATION

   • Slide front lens cover strap (3) on transmitter window (1).

   • Cover transmitter window (1) with front lens cover (2).

3-13. O-Ring Replacement

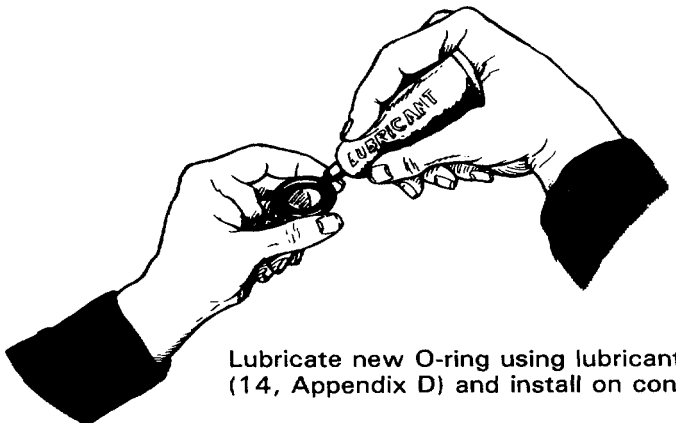


Turn wingnut on designator housing counterclockwise to release battery-shoulder stock, EMI filter, or EPC (13160201).

Remove O-ring from connector.

MS 585170

3-13. O-Ring Replacement ---



Lubricate new O-ring using lubricant (14, Appendix D) and install on connector.

APPENDIX A
REFERENCES

Refer to TM 9-1260-479-L for publications applicable to the LTD system.

APPENDIX B

MAINTENANCE ALLOCATION CHART

SECTION I

INTRODUCTION

B-1. General

This appendix contains the maintenance allocation chart which indicates the lowest level of maintenance authorized to perform particular maintenance operations.

B-2. Maintenance functions

Maintenance functions shall be limited to and defined as follows:

a. Adjust. Maintain within prescribed limits by bringing into proper or exact positions, or by setting the operating characteristics to the specified parameters.

b. Aline. To adjust specified variable element of an item to bring about optimum or desired performance.

c. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used * in precision measurements. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

d. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

e. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment/system.

f. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards in pertinent technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

g. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.

h. Repair. The application of maintenance services (inspect, test, service, adjust, aline, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, rematching, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system

i. Replace. The act of substituting a serviceable like-type part, subassembly, module (component or assembly) in a manner to allow the proper functioning of an equipment/system.

j. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean, preserve, drain, paint, or to replenish fuel/ lubricants/hydraulic fluids or compressed air supplies.

k. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

B-3. Explanation of Format

Purpose and use of the format are as follows:

a. Column 1. Group number. Column 1 lists group numbers, the purpose of which is to identify the number utilized in the parts manuals to group associated parts and assemblies.

b. Column 2. Functional group. Column 2 lists the component or assembly name.

c. Column 3. Maintenance function. Column 3 lists the eleven maintenance functions defined in B-2 above. Each maintenance function required for an item shall be specified by the symbol among those listed in f. below which indicates the level responsible for the required maintenance.

d. Column 4. Tools and equipment. This column is used to specify, by code, those tools and test equipment required to perform the designated function. The code is defined in Table B-2.

e. Column 5. Remarks. Self explanatory.

f. Use of symbols. The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed. The following symbols shall be used to prescribe work function responsibility:

C - Operator/Crew
O - Organizational
F - Direct Support
H - General Support
D - Depot

Table B-1

(1) GROUP NUMBER	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
0010	LTD													
0300	Transmitter Components Assy.	O	D		F			F	F		D		6	Service by purge and charge
0350	Front Lens Cover	O						O	O					
0350	Eyeguard	O						O	O					
0350	Eyepiece Lens Cover	O						O	O					
0350	Strap	O						O	O					
	Night Sight Adapter	O						F	F					
1700	Fill Valve	F						F	F					
1700	Cap	F						F	F					
1700	Packing	F						F	F					
1700	Flashlamp	F						F	F					

Table B-1

(1) GROUP NUMBER	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
2100	Electronic Component Assy.			F				F	F	F			2-7	
2100	Access Cover							F	F					
2100	Preformed Packing	F						F	F					
2100	Wiring Harness	F	F					F	F	D				
2100	Code Switch (3)	F	F					F	F					
2100	Knob (3)	F						F	F					
2100	O-Ring (3)	F						F	F					
2100	Interlock Switch	F	F		F			F	F					
2200	Air Control Assembly	F	D					F	F	D				
2500	Control Card	F	D					F	F	D				
2600	PFN Charge Supply	F	D					F	F	D				
2700	Pulse Forming Network	F	D					F	F	D				

Table B-1

(1) GROUP NUMBER	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
0010	Battery-Shoulder Stock	O	O	F			O						1	Service by charging
0010	O-Ring	O				O	O							Inspect for missing items
0010	External Optics Cleaning Kit	O					O							Service by cleaning
0100	LTD Transit Case	O	O											
0100	Inserts (2)	O					D							
0200	Carrying Strap	O				F	F							
2400	Housing	F				F	F	D						
2400	Latch	O				F	F							
2400	Hinge	O				F	F							

Table B-1---

(1) GROUP NUMBER	(2) Functional group	(3) Maintenance functions											(4) Tools and equipment	(5) Remarks
		A	B	C	D	E	F	G	H	I	J	K		
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
2800	EPA													
2800	Interconnect Cable, WI	O	F						F					
2800	Vehicle (Power) Cable, W2	O	F						F					
2800	Jeep Cable	O	F						F					
2800	EPA Transit Case	O		O										Service by cleaning
2800	Inserts (2)	O							F					
2900	External Power Converter	O	F						F				3,5,6	
3000	Pre-regulator Assembly	F	F					F	F	D				
3000	Switch	F	F					F	F					
3000	Connector (2)	F						F	F					
3000	Relay	F	F					F	F					
3000	Diode	F	F					F	F					
3100	Drive Electronics Card F	F						F	F	D				
3200	EMI Filter	O	F						F					
3200	0-Ring	O						O	O					

Table B-2

TOOL OR EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NSN/PN
1	0	Battery Charger (PP-7286)	6130-01-041-3490
2	F	Oscilloscope, 7633 W/Plug-in	6625-01-106-5581
3	F	Multimeter, AN/PSM-6B	6625-00-957-4374
4	F	Pulse Generator, Hewlett Packard Model HP214B	5895-01-080-7940
5	F	Test Set, AN/PAM-1. Target Designator, Laser	4931-01-040-3117
6	F	Tool Kit, Laser System Field Maintenance	5180-01-048-8570

APPENDIX C
COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

SECTION I. INTRODUCTION

C-1. SCOPE

This appendix lists components of end item and basic issue items for the LTD set to help you inventory items required for safe and efficient operation.

C-2. GENERAL

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the LTD set in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the LTD set during operation and whenever it is transferred between property accounts. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column (1) Paragraph Number (Para Number). This column indicates the number of the paragraph in which the item is shown.

b. Column (2) National Stock Number. Indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

c. Column (3) Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE (in parentheses) followed by the part number. Usable On Codes identify which items are used on different models. There are no different models therefore this column is blank.

d. Column (4) Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) Quantity Required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Note

There are three end items covered by this Components of End Item List.

- LTD 13033888
- EPA 13034435
- EPA 13160200

You will be issued an LTD and one of the EPAs.

SECTION II
COMPONENTS OF END ITEM

(1) PARA NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC AND PART NUMBER USABLE ON CODE	(4) U/M	(5) QTY RQR
1-10	1260-01-041-1567	LTD COMPONENTS (55717) 13033888		
1-10	6140-01-077-9447	BATTERY-SHOULDER STOCK (55717) 13033982	EA	4
1-10	1260-01-056-7507	CASE, LTD TRANSIT 155717) 13033889	EA	1
1-10	-	DESIGNATOR (55717) 13033867	EA	1
1-10	1260-01-151-2698	KIT, CLEANING, EXTERNAL OPTICS (188761 5952355	EA	1

COMPONENTS OF END ITEM - - -

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQR
1-13	1260-01-040-1494	EXTERNAL POWER ADAPTER COMPONENTS (55717) 13034435	-	EA	1
1-13	1260-01-059-0004	CABLE, INTERCONNECT (55717) 13034437	-	EA	1
1-13	6150-01-099-2419	CABLE, SLAVE (18876)11508891	-	EA	1
1-13	6150-01-071-3822	CABLE, VEHICLE (55717) 13033956	-	EA	1
1-13	1260-01-078-1986	CASE, CARRYING (55717) 13034452	-	EA	1

COMPONENTS OF END ITEM - - -

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC AND PART NUMBER	(4) USABLE ON CODE	(4) U/M	(5) QTY RQR
1-13	5935-01-253-5599	CONNECTOR, NATO (18876) 11509166	-	EA	1
1-13	-	CONVERTER, EXTERNAL POWER (55717) 13034438	-	EA	1
1-13	1260-01-080-8394	FILTER, EMI (55717) 13033990	-	EA	1
1-13.2	4931-01-237-4135	EXTERNAL POWER ADAPTER COMPONENTS (18876) 13160200	-	EA	1
1-13.2	6150-01-099-2419	CABLE, SLAVE (18876) 11508891	-	EA	1

COMPONENTS OF END ITEM - - -

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQR
1-13.2	6150-01-199-2519	CABLE, VEHICLE (18876) 13160199	-	EA	1
1-13.2	4931-01-232-4524	CASE, CARRYING (18876) 13160195	-	EA	1
1-13.2	5935-01-253-5599	CONNECTOR, NATO (18876) 11509166	-	EA	1
1-13.2	1260-01-236-6984	CONVERTER, EXTERNAL POWER (18876) 13160201	-	EA	1

SECTION III
BASIC ISSUE ITEMS

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC AND PART NUMBER	USABLE ON CODE	(4) U/M	(5) QTY RQR
-	-	FIRST AID DATA (-) FM 21-11	-	EA	1
-	-	LASER MEDICAL PRACTICES (-) TB MED 524	-	EA	1
-	-	OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL (-) TM 9-1260-479-12	-	EA	1

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

D-1. Scope

This appendix lists expendable supplies and materials you will need to operate and maintain the set. These items are authorized to you by CTA 50-970. Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. Explanation of Columns

a. Column 1 - Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App. D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

(enter a applicable)

C	-	Operator/Crew	F	-	Direct Support
O	-	Organizational	H	-	General Support

c. Column 3 - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4 - Description. Indicates the Federal item named end, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parentheses, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This me re is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II

EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	0	6505-00-514-6513	Alcohol, Isopropyl TT-1-735	1
2	0	8105-00-137-9133	Bag. Plastic PP-B-26 Type II, Style 3, internal dimensions 4.5 x 5.2 inches	1
3	0	8125-00-824-9058	Bottle Plastic PPP-B-26 Type I, Finish 2, (18876)	1
4	0	7920-00-514-2417	Brush, Acid Swabbing	1
5	0	7920-01-032-3624	Brush, Dusting. Lens, Retractable (18876)	1

EXPENDABLE SUPPLIES AND MATERIALS LIST - - -

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
6	C	7920-00-205-1711	Rags, Cotton Wiping	3
7	C	--	Solution:	1 Qt.
		6150-00-514-6513	Alcohol, Isopropyl TT-1-735	50%
		--	Water, Distilled	50%
8	C	6640-00-597-6746	Tissue, Lens, Cleaning Packet	50 SH

EXPENDABLE SUPPLIES AND MATERIALS LIST - - -

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
11	0	--	Water, Distilled i Qt.	
12	0	T7-P1757	Primer, Sealing	1 Qt.
13	0	MIL-E-52798	Enamel, Forest Green	1 Qt.
14	C	--	O" Ring Lubricant, MIL-L4343	1 Qt.
15	C	--	Glycerine	1 Pt.

APPENDIX E

AIRBORNE PACKING PROCEDURES FOR LTD-EQUIPPED AIRBORNE UNITS

E-1. Scope

This appendix contains instructions to protect the LTD when dropped by parachute.

E-2. Materials

The Container Weapons Individual Equipment bag (CWIE), honeycomb packing material, and cellulose wadding contained in this procedure can be obtained from unit supply. All other items are part of the operator's field gear. Materials required to airdrop packing are listed on next page.

a. CWIE.

b. Cellulose wadding piece(s) large enough to cover LTD module, minus the battery.

c. Honeycomb packing material (three pieces).

   (1) Two pieces approximately 14 x 14 inches square and one inch thick.

   (2) One rectangular piece approximately 14 x 42 inches and one inch thick.

d. Poncho.

e. Standard US Army webb gear.

f. Shelter-half.

g. Sleeping bag with cover.

h. Raincoat.

E-3. Airdrop Procedures

a. Insert one 14 x 14 inch square of honeycomb material flat in the bottom of CWIE bag.

b. Wrap one LTD battery in a poncho and place poncho in butt pack. Wrap butt pack with webb gear. Place wrapped butt pack on top of honey- comb material in CWIE bag.

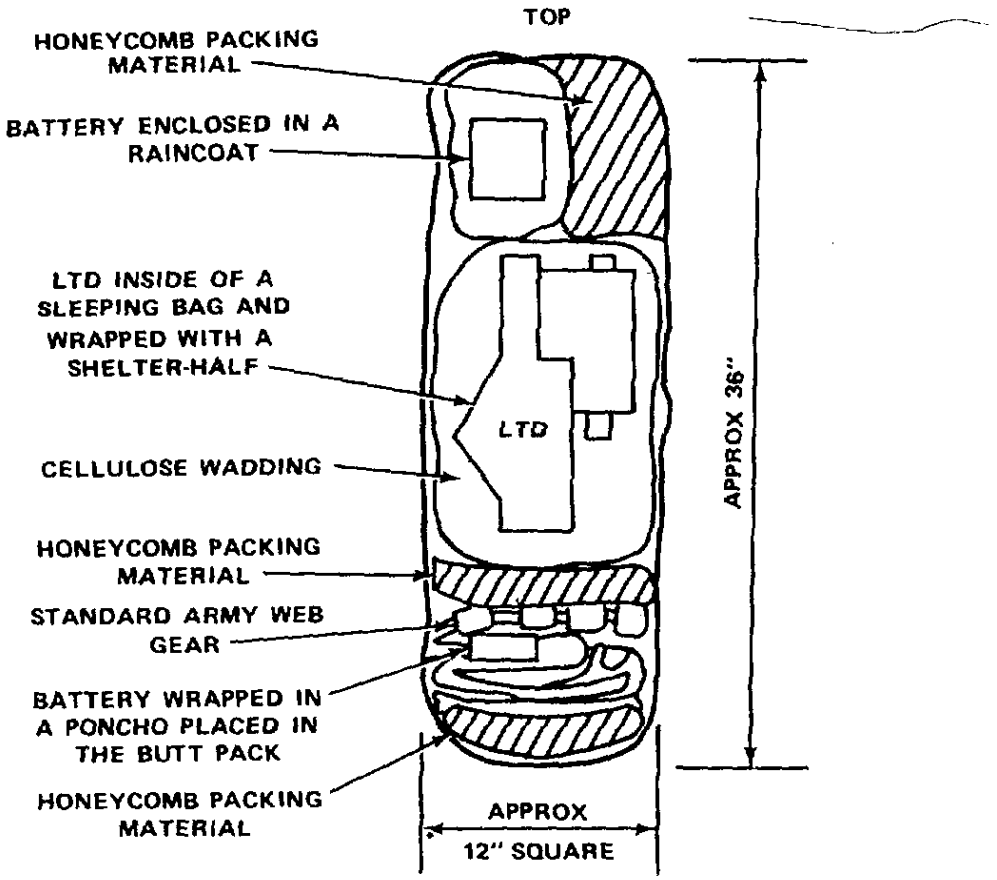
c. Place remaining 14 x 14 inch square of honeycomb material flat on top of wrapped butt pack.

d. Wrap LTD module (minus battery) in cellulose wadding piece(s). Place LTD module inclosed in cellulose wadding in center of sleeping bag roll. Place sleeping bag roll in sleeping bag cover. Wrap and cover sleeping bag roll with shelter-half. Place butt of covered LTD module on top of second square of honeycomb material in CWIE bag.

e. Wrap second LTD battery in raincoat. Place raincoat on top of barrel end of LTD module in CWIE bag.

f. Place 14 x 42 inch piece of honeycomb material on top of the battery and on top of the exposed portion of the LTD module. Double-fold extra honeycomb material as necessary to protect LTD module.

g. Close and secure CWIE bag. The LTD is now rigged for vertical lowering position on drop.


TOP
HONEYCOMB PACKING MATERIAL
BATTERY ENCLOSED IN A RAINCOAT
LTD INSIDE OF A SLEEPING BAG AND WRAPPED WITH A SHELTER-HALF
LTD
CELLULOSE WADDING
HONEYCOMB PACKING MATERIAL
STANDARD ARMY WEB GEAR
BATTERY WRAPPED IN A PONCHO PLACED IN THE BUTT PACK
HONEYCOMB PACKING MATERIAL
APPROX 36"
APPROX 12" SQUARE

MS 009361

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

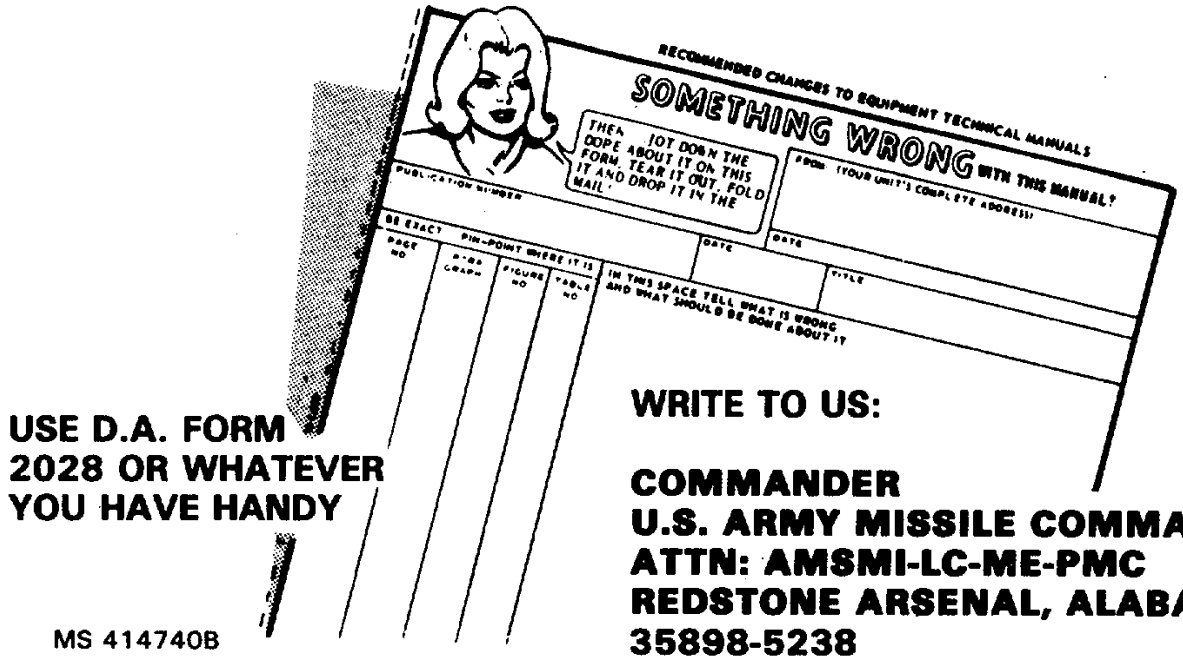
J. C. PENNINGTON
Major General, United States Army
The Adjutant General

Distribution:

To be distributed in accordance with DA Form 12-32, Section III, Organizational Maintenance requirements for the Laser Target Designator.

*U. S GOVERNMENT PRINTING OFFICE 1996 - 733-072/40147

DID WE GOOF?
DO YOU KNOW A BETTER WAY?
DON'T KEEP THOSE GRIPES TO YOURSELF
WE'D LIKE TO HAVE YOUR IDEAS



USE D.A. FORM 2028 OR WHATEVER YOU HAVE HANDY

WRITE TO US:

COMMANDER
U.S. ARMY MISSILE COMMAND
ATTN: AMSMI-LC-ME-PMC
REDSTONE ARSENAL, ALABAMA
35898-5238

MS 414740B

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.

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

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 048004-000