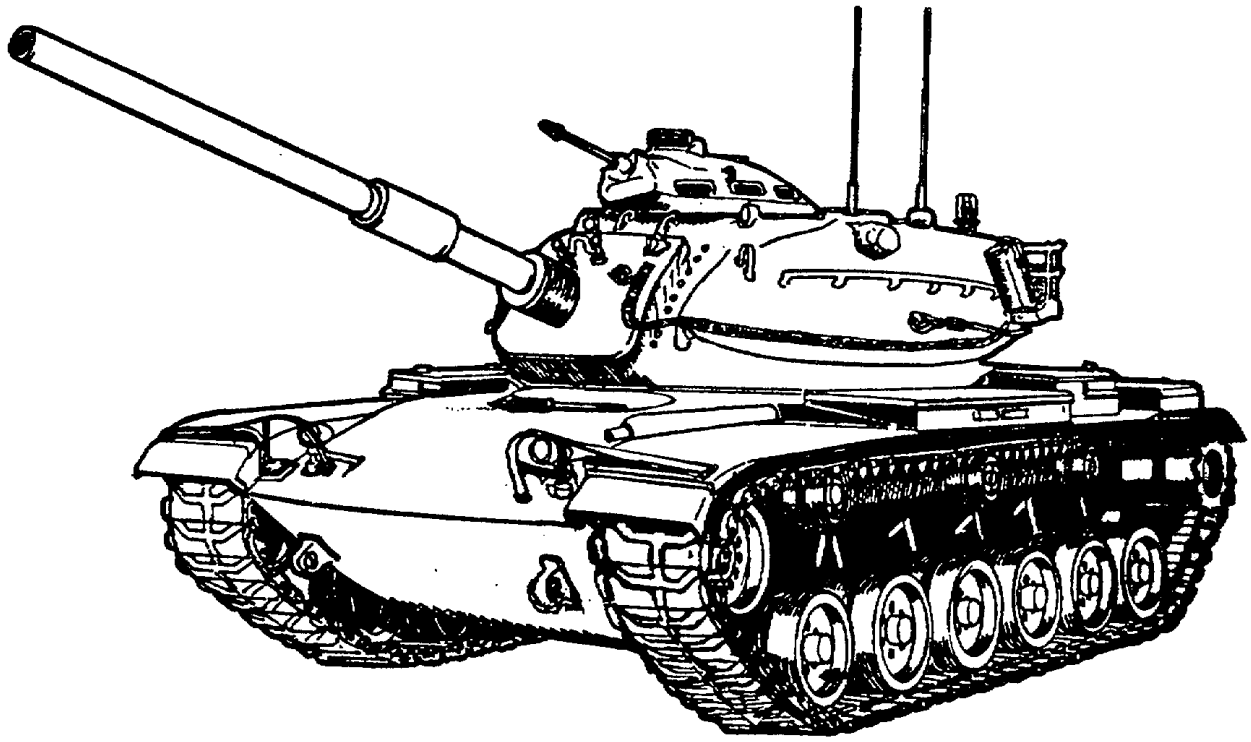
OPERATOR'S MANUAL
FOR
MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM
(MILES)
SIMULATOR SYSTEM, FIRING, LASER: M65
(NSN 1265-01-077-6080)
FOR
M60A1/A3 TANK



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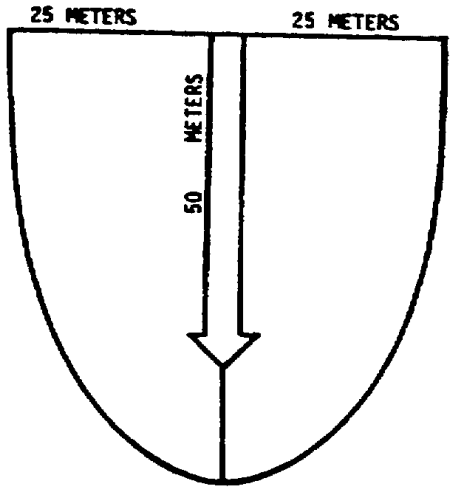
HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1988

WARNING

TANKERS, WEAR YOUR EARPLUGS

The MILES system for the M60A1/A3 uses blank ammunition and the HOFFMAN DEVICE to simulate the sight and sound of actual gunfire. Do not load MILES-equipped weapons with live or the wrong blank ammunition. Improper ammunition may cause fatal injuries to personnel. Refer to the M85 and Coax Machine Gun Operator's Manuals (TM 9-1005-231-10 and TM 9-1005-233-10) for information on the use of blank ammunition.



Stay 25 meters from the sides and 50 meters from the front of the Hoffman Device muzzle.

The muzzle blast can damage your ears and flying debris can injure you.

ALTHOUGH THE LASER LIGHT EMITTED BY MILES EQUIPMENT TRANSMITTERS IS CONSIDERED EYE SAFE BY THE BUREAU OF RADIOLOGICAL HEALTH, SUITABLE PRECAUTIONS MUST BE TAKEN TO AVOID POSSIBLE DAMAGE TO THE EYE FROM OVEREXPOSURE TO THIS RADIATED ENERGY. PRECAUTIONARY MEASURES INCLUDE THE FOLLOWING:

- AVOID VIEWING LASER EMITTER AT CLOSE RANGE (LESS THAN 12 METERS). INCREASING THE DISTANCE FROM THE EYE TO THE LASER SOURCE GREATLY REDUCES THE RISKS OF OVEREXPOSURE.
- AVOID VIEWING THE EMITTER DIRECTLY ALONG THE OPTICAL AXIS OF RADIATED BEAM.
- ESPECIALLY AVOID VIEWING THE EMITTER DIRECTLY ALONG THE OPTICAL AXIS OF THE BEAM THROUGH STABILIZED OPTICS SUCH AS BINOCULARS, TELESCOPES, OR PERISCOPES AT RANGES OF LESS THAN 75 METERS.

Tape mounting primer is highly flammable. Do not spray near heat, sparks or open flame. No smoking. Use only in well-ventilated areas.

For information on First Aid, see FM 21-11.

WARNING

HOFFMAN DEVICE SAFETY MEASURES

1. ATTENTION! BEFORE LOADING, RELOADING OR UNLOADING - REMOVE THE KEY.

The device shall only be loaded, reloaded or unloaded in the "LOADING POSITION." THE GREEN SIGNAL LIGHT MUST SHINE.

2. When loading, reloading or unloading, do NOT stand IN FRONT of the device.

3. When the device is loaded, the protective cover must NOT be drawn over the firing drums.

4. "Readiness for firing" shall not be established until the commander has given the order to do so. "Readiness for firing" as follows:

- **SWITCH ON THE IGNITION LOCKOUT**
- **RED SIGNAL LIGHT MUST SHINE**

Report: "Ready to fire."

5. "SETTING TO SAFETY" occurs by switching off the security lockout switch and removing the key. Gun loader to report: "DEVICE SET AT SAFE."

6. Should stoppages occur, further firing and reloading are permitted. The following points must, however, be observed:

- **Subsequent and still loaded pyro charges must first be fired off.**
- **Do NOT make preparations for reloading until a security interval of 15 minutes has elapsed.**
- **When reloading, LEAVE THE NON-IGNITED DUDS IN THE FIRING DRUMS. Cut the non-ignited dud(s) out of circuit by pulling out the plug of the ignition leads belonging to the dud(s) and by placing a short-circuit cap over the plug.**
- **Pull tight the ignition leads and plug with short-circuit cap and secure them again on the ignition leads retainer.**
- **Reload the device.**
- **After completion of the training practice, pyro experts shall be called in to unload and destroy the ignition dud(s).**
- **SAFETY DISTANCES when FIRING: 50 METERS IN FRONT: 25 METELS ON EACH SIDE.**
- **Firing within a RADIUS OF 150 METERS FROM BUILDINGS IS FORBIDDEN.**

TECHNICAL MANUAL

TM9-1265-369-10-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D.C., 15 JULY 1988

OPERATOR'S MANUAL
FOR
MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)
SIMULATOR SYSTEM, FIRING LASER: M65
(NSN 1265-01-077-6080)
M60A1/A3 TANK

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any. mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Armament, Munitions and Chemical Command, ATTN: AMSMC-MAS, Rock Island, IL 61299-6000. A reply will be furnished to you.

TABLE OF CONTENTS

*Supercedes TM 9-1265-369-10-1 dated 22 January 1982

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continue)

Storage Instructions

Equipment Distribution:

The MILES Equipment for the M6OA1/A3 is shown in Outside Task 2 of this Technical Manual (TM). Use the picture with Outside Task 2 as a guide for equipment distribution. Be sure to issue a copy of this TM along with the MILES equipment.

Equipment Return and Storage:

When receiving equipment for storage, always inspect the returned equipment using Operational Task 7 in this TM for guidance.

Return all MILES equipment and the TMs to their transit cases.

Special Instructions for Infrequently Used Equipment:

If M60A1/A3 MILES equipment is unused for 60 days, remove from transit case and perform Outside Tasks 2, 3, 5, and 7; inside Tasks 1, 3, 4, 6, and 8, MSS Machine Gun Task 1, MWLD Tasks 1 and 2; and Operational Task 7 in this TM.

Skills Needed To Use This Manual

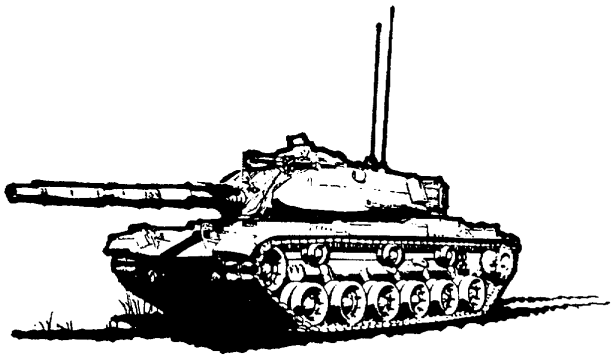
To Use This Manual, You Should Be Able To:

1. Aim and fire all M60A1/A3 weapons. See TM 9-2350-215-10.

2. Install M85 and coax machine guns. See TM 9-1005-231-10 and TM 9-1005-233-10.

3. Install blank-fire attachments on the M85 and coax machine guns.

4. Install Hoffman MG T/WESS firing device. Know how to interface with W1 trigger case assembly. See TM Simulator, Tank Gun Fire Device 17-61, and Hoffman Werke Jan. 79 and revised 1 Apr. 79.



5. Complete DA Form 2402.

If you can not do-these tasks, ask your NCO or instructor to show you how. When you can do all these tasks, proceed with the instructions in this manual.

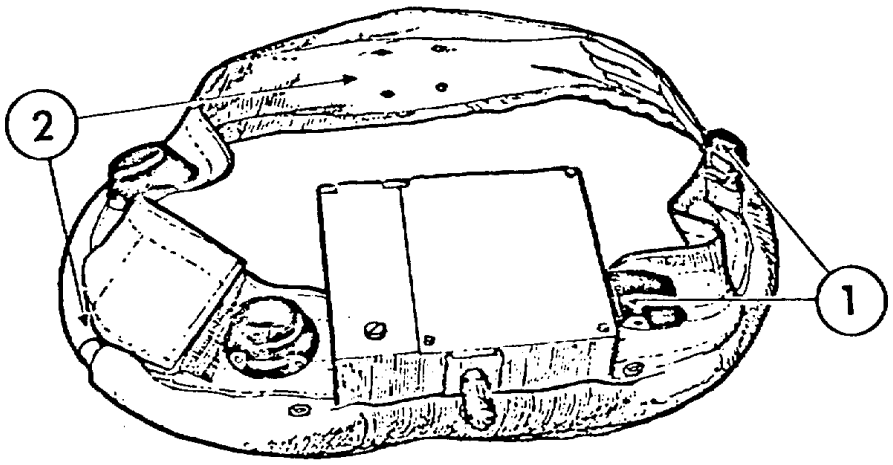
How to Use This Manual

Before You Use Any M60A1/A3/MILES Equipment, Read This Manual.

- The first part of the manual briefly explains the purpose of the equipment and how it is used.
- Then follows step-by-step guidance for every task you need to do with the M60A1/A3/MILES equipment.

TASK 2 Inspect and Clean Helmet Harness

MWLD



1. Wipe detectors clean. (Clean all 5.)
2. Inspect helmet harness for any damage that would prevent normal operation.

• Report any damage on DA Form 2404. Replace helmet harness only if not operable.

- The task pages look like this. Some longer tasks run more than one page. Before you begin a task, read all the steps in the task and look at each drawing carefully. To help perform the task, some steps have matching numbers in the drawings. Do each step just the way you are instructed.

How To Use This Manual, Continued:

- Do each task in the order it occurs in the manual.

- DON'T JUMP AHEAD - DON'T SKIP ANY STEPS -

- If your equipment has a problem you can't fix using this manual, report it on DA Form 2402. To get a replacement, turn in the faulty equipment and the completed DA Form 2402 to your NCOIC.

- In the back of this manual is a list of abbreviations and an explanation of terms used. If you read a word you don't understand, check pages 85-87 for an explanation.

General Information

This manual shows you how to operate and maintain the MILES equipment for the M60A1/A3 Tank. MILES transmitters are installed in the breech of the main gun and on the cooling jacket of the M85 machine gun in the cupola. The operator tasks for the MILES equipment are listed in the Table of Contents on Pages 1 and 2.

Purpose of Equipment:

The MILES EQUIPMENT FOR THE M60A1/A3 consists of two battery-operated laser transmitters and a detector system, which permits realistic combat training without the hazards of using live ammunition.

Forms and Records:

a. Reports of Maintenance or Equipment Replacement. Department of the Army forms and procedures for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

b. Reporting Equipment Improvement Recommendations (EIRs). EIRs can and must be submitted by anyone who is aware of an unsatisfactory condition with the equipment design or use. It is not necessary to show a new design or list a better way to perform a procedure, just simply tell why the design is unfavorable or why a procedure is difficult. EIRs may be submitted on SF 368. Mail direct to: Commander, U.S. Army Armament, Munitions and Chemical Command, ATTN: AMSMC-QAD, Rock Island, IL 61299-6000.

   A reply will be furnished to you.

c. Hand Receipt Manual

   Hand receipts for Components of End Item (COEI), Basic Issue Items (BII), and Additional Authorization List (AAL) items are published in a Hand Receipt manual, TM 9-1265-369-10-1-HR. This manual is published to aid in property accountability and is available through: Commander, U.S. Army Adjutant General Publication Center, 2800 Eastern Boulevard, Baltimore, MD 21220.

Equipment Description

Capabilities and Features:

Major Components:

a. Laser transmitter in breech of main gun.

b. Laser transmitter on barrel support of M85 machine gun in cupola.

c. Detector belt segments on each side of the turret and on the rear.

d. A combat vehicle kill indicator (CVKI) which mounts to rear turret lifting eye. This device consists of a flashing light to indicate a vehicle kill, near miss, and hit.

Operates in temperatures from -35°C (-31°F) to 62°C (144°F).
Eye safe laser transmitter.
Tactical skills practiced under realistic conditions.

The laser transmitters send harmless, invisible laser flight) beams toward targets. If the laser beam hits a vehicle target, a detector assembly on the target senses the beam and turns on a flashing light mounted on the target.

Battery Information:

Battery Box:

BA-200/U, 6v carbon zinc (2)

M85 Machine Gun Transmitter:

BA-3090/U, 9V alkaline (1)

Man Worn Laser Detector - Torso Harness:

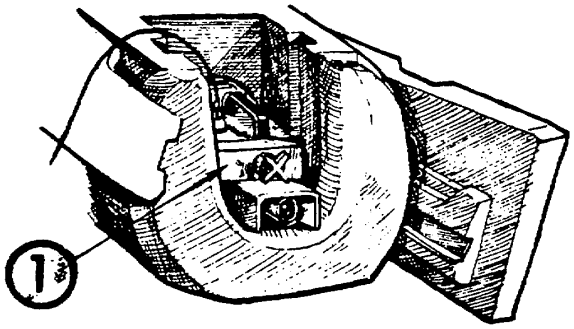
BA-3090/U, 9V alkaline (1)

Man Worn Laser Detector - Helmet Harness:

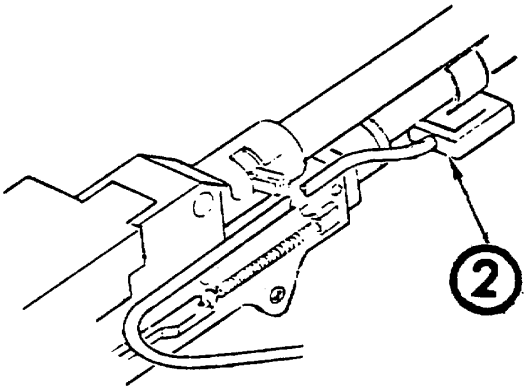
BA-3090/U, 9V alkaline (1)

Battery Life = 100 hours (approximate)

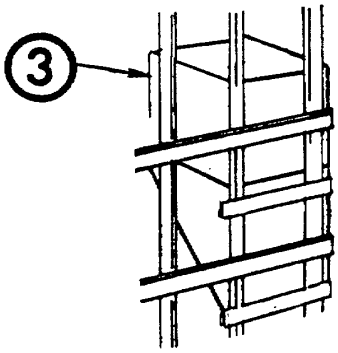
Location of Components:



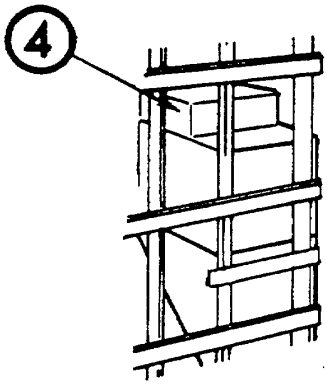
1. Main gun/coax machine gun transmitter. Fits into main gun breech.



2. Coax machine gun microphone attaches to machine gun barrel jacket mount.

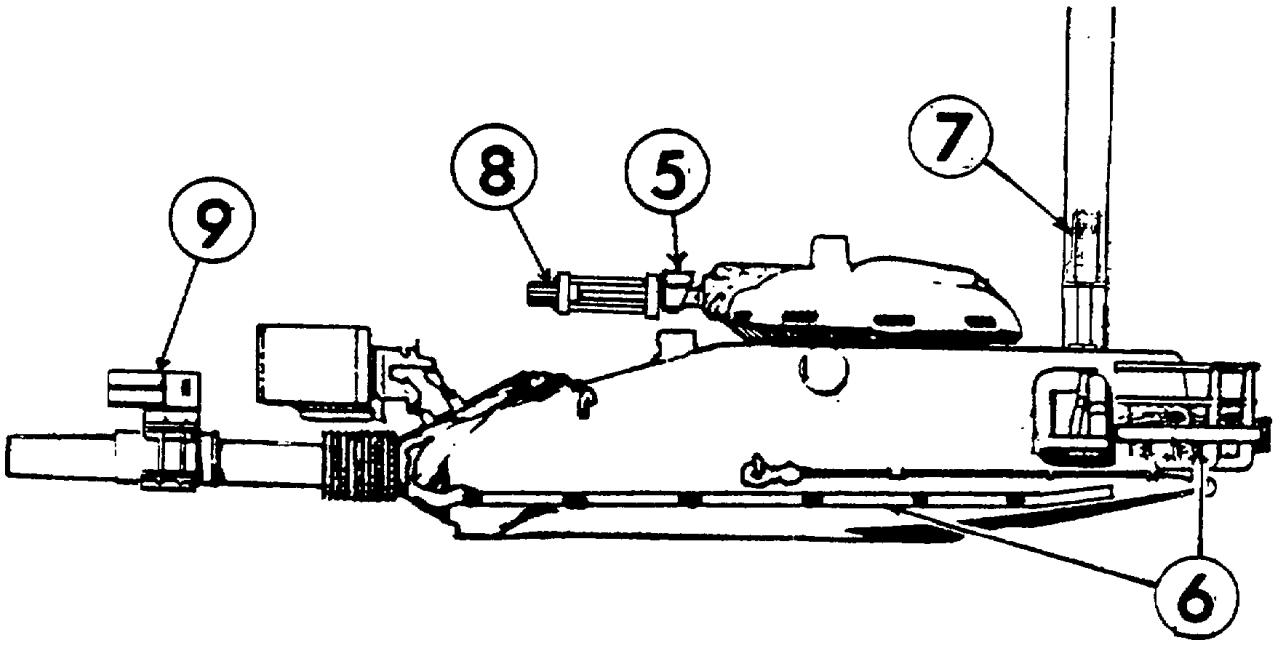


3. Control console. Mounted low on backside of radio guard rack, inside storage area, behind 105 mm gun ready rack on the turret floor.



4. Battery box. Mounted on top of control console.

Location of Components, Continued:



5. M85 machine gun transmitter mounted on barrel support of M85 machine gun.

6. Detector belt segment on front, rear (inside the bustle), and both sides of turret.

7. Combat vehicle kill indicator (CVKI) mounted on rear turret lifting eye.

8. Blank firing attachment (BFA) M20 for M85 machine gun.

9. Hoffman device simulator mounted on cannon tube.

How It Works:

MILES-equipped weapons work much like the real weapons. However, instead if firing cannon shells or machine gun bullets, the MILES-equipped weapons fire harmless laser beams at targets. To make the MILES-equipped weapons as real as possible, machine guns use blank ammunition and the MIILES-equipped main gun uses the Hoffman Device. "Hoffman Device" is the common name for the Main Tank Gun Weapon Effects Signature Simulator.

How MILES Is Used:

After the transmitters and detector assembly have been installed and tested, you will be ready to begin the training exercise.

- The M85 machine gun in the M60A1/A3 cupola is loaded with blank ammunition. The sound of blanks firing will cause the laser transmitter to fire. To use the MILES-equipped M85 machine gun, aim at your target and fire.

- The coax machine gun mounted in the turret works like the M85. The sound of blanks firing will trigger the laser transmitter.

- The main gun is fired using normal procedure. With this gun, a Hoffman device is used to simulate firing main gun rounds. When the trigger is operated, both the Hoffman device and the laser fire together.

- You must wait 5 seconds after firing the main gun before you can fire again. This is to simulate the time normally required to reload the weapon.

- After firing the main gun, you can check to see how many "rounds" the MILES system says you have left. This is done by turning the switch on the control console to MAIN GUN, pressing the display button, and reading the displayed number.

- The MILES system allows a basic load of 63 main gun rounds.

- Both the M85 and coax machine guns will operate their laser transmitters as long as blank ammunition is fired.

- The laser transmitters on all the MILES-equipped weapons can be fired without using blanks or the Hoffman device. To operate transmitters in this "dry-fire" mode, a controller key must be used to properly set the transmitter. Usually, the dry-fire mode is used only to test and boresight the equipment. The dry fire plug is used for dry firing the coax machine gun.

- If the laser detector belt on the M60A1/A3 is hit by laser fire, one of three things will happen:

    1. One to three tones will sound in the intercom and CVKI light will flash one to three times. This means a "near miss."

How MILES Is Used, Continued:

2. Four to six tones will sound in the intercom and CVKI light will flash four to six times. This means a "hit," but not a "kill."

3. The intercom tone will sound continuously and CVKI light will flash continuously. This means a "kill." To turn off tone, you must remove the orange key from the M85 machine gun transmitter (which turns off the transmitter), put the key in the receptacle in the control console, and turn. All other weapon transmitters are automatically turned off by a "kill." The CVKI light continues to flash until reset by a controller.

- If you attempt to remove the key from the control console, the intercom tone will begin again.

- The loader, gunner, and tank commander each wear a harness equipped with laser detectors and an alarm. If the harness is "hit" with a MILES-equipped weapon, one of two things will happen:

1. The alarm on the harness sounds briefly. This means a "near miss." Take cover.

2. The alarm sounds continuously. This means the soldier has been "killed." He must use his yellow key to turn of the alarm.

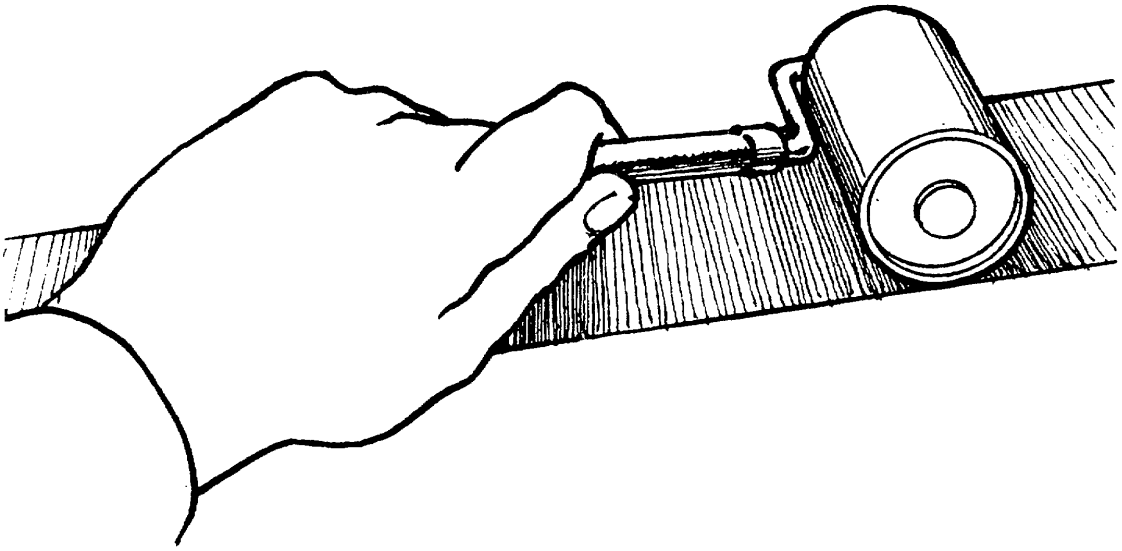
Limitations of Equipment:

MILES-equipped weapons have the same range and operational capabilities as the normal weapons, but a dirty laser transmitter lens may reduce the effective range of the transmitters. The primary targets for the M60A1/A3 are armored vehicles, but the M60A1/A3 is effective against all MILES-equipped vehicles and personnel.

Task Assignment

- To speed up installation of the MILES equipment on the M60A1/A3, the inspect, install, and test tasks are divided among the crew members. This way several tasks can be done at the same time.
  - Outside Tasks (1-8) are found on pages 16-34.
  - Inside Tasks (1-9) are found on pages 35-50.
  - M85 Machine Gun Tasks (1-4) are found on pages 51-54.
  - MWLD Tasks (1-5) are found on page 55-59.
  - Test Tasks (1-2) are found on pages 60-66.
  - Alignment Tasks (1-2) are found on pages 67-68.
  - Operational Tasks (1-7) are found on pages 70-79.
- The tank commander will assign each crewman to a set of tasks. The crewman turns to the appropriate task section and performs his tasks. Occasionally, the manual will tell you to wait to do a task until you have made sure that another crewman has completed an earlier task. On some tasks two crewmen will work together. Certain tasks must be done with the controller present. The TC will determine when to call the controller.
- The TC, gunner, and loader wear man worn laser detector assemblies (MWLDs). Only the TC, gunner, and loader do the MWLD Tasks. MWLD Tasks are Velcro Mounting Instructions for Crew Helmets (page 15), MWLD Tasks: 2, 3, 4,' and 5, and Test Task 1. The TC should coordinate the tasks, give assistance to any crewman who needs it, and check to make sure everything gets done.
- Those tasks involving the Controller must be done in this order:
  1. MWLD Task 3 (Install Batteries in MWLD Harnesses).
  2. Test Task 1 (Test Operation of MWLD).
  3. Test Task 2 (Test MILES System).
  4. Alignment Task 2 (Align M85 Machine Gun).

Install Velcro® Tape



NOTE

The word VELCRO is the registered trademark name of a particular brand of hook and pile fastener tape. The word Velcro is used to describe this tape, however, the tape you are issued may not, in fact, be the Velcro brand.

GENERAL INSTRUCTIONS FOR INSTALLING VELCRO TAPE

1. Before starting to mount Velcro tape, study all of the steps in this procedure. Before spraying the tape primer, be sure you know where to mount the Velcro. The location of the Velcro is shown on the drawings on the next page.

2. Clean all the areas where Velcro is to be mounted with water, brush, and rags. The tape will not stick to dirt and grease.

3. Mark all areas.

4. Cut Velcro to match marked areas.

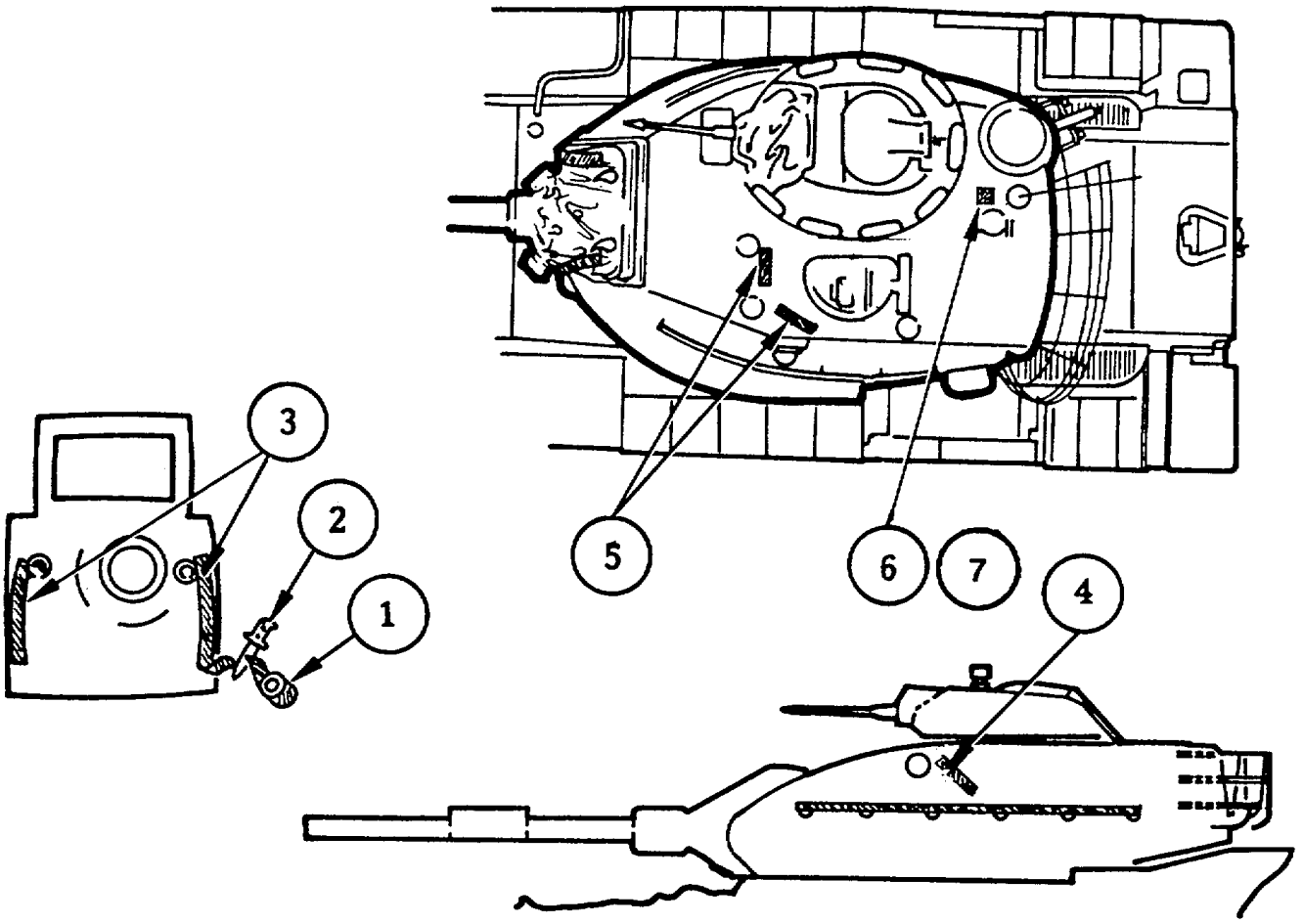
5. Spray tape primer on the areas where Velcro will be mounted. If Velcro is to be mounted on material other than metal, (for example, fabric gun shield covers), apply two coats of spray, allowing 5 minutes of drying time between coats.

6. Mount the Velcro tape as instructed in the steps on the following pages.

    - The Velcro tape has a protective paper backing which must be removed before mounting the tape. For small lengths of tape, the entire backing may be removed before mounting the tape. For long lengths of tape, however, it is recommended that the backing material be removed while the tape is being installed. This will prevent the adhesive on the back of the tape from accidentally sticking to itself.

7. After you put the Velcro in place, press it VERY HARD with the roller. Use the roller as shown in the picture above.

GET A ROLL OF VELCRO TAPE, TAPE PRIMER, AND A ROLLER FROM YOUR NCOIC.



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VELCRO MOUNTING INSTRUCTIONS FOR VEHICLE

o Make sure a heavy coat of tape primer is sprayed on all surfaces where Velcro is to be installed.

1. Unroll some Velcro tape.

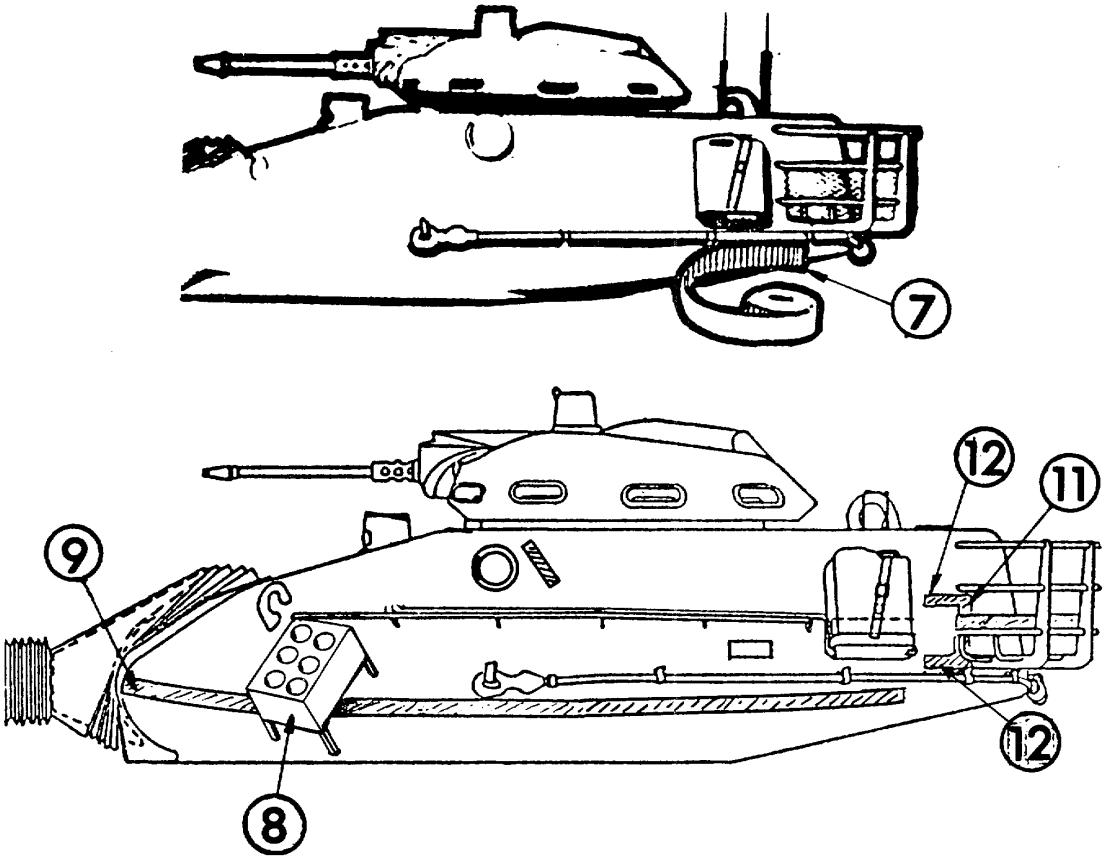
2. Cut the tape.

3. Remove the backing and put the tape straight down each edge of the gun shield cover. If the gun shield has a fabric cover, spray two coats of primer where the Velcro is to be installed, allowing 5 minutes between coats of spray.

4. Add a 12-inch length of Velcro just behind of the rangefinder end housing in the position shown.

5. Add two 12-inch lengths of Velcro on top of the turret in the positions shown.

6. Add a 2-inch length at base or rear lifting eye.



7. Stick Velcro tape close under the towing cable on the left side of the turret.

8. Keep sticking tape on the turret. KEEP IT LEVEL UNDER THE CABLE. If vehicle is equipped with a grenade launcher, route Velcro tape under and through support brackets.

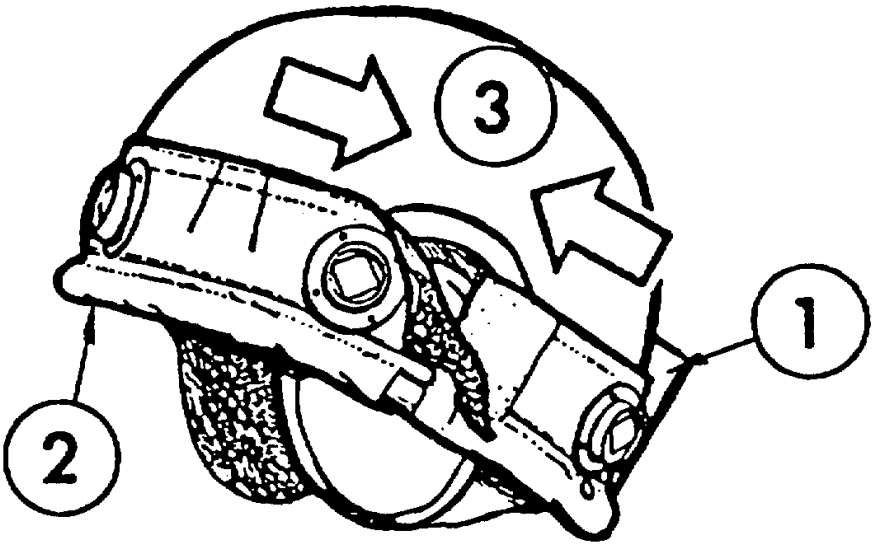
9. Keeping the tape level, mount it all the way to the front edge of the turret. Then cut the tape.

10. Cut three pieces of Velcro about 12 inches long.

11. Stick on vertically on the inside of bustle, just touching the inside of the lower bar of the bustle. Center the Velcro above and below the bar.

12. Stick the other two 12-inch long pieces of Velcro horizontally, beginning at the top and bottom of the vertical piece of Velcro.

13. Put Velcro on the right side of the turret. Follow Steps 7, 8, and 9.



VELCRO MOUNTING INSTRUCTIONS FOR CREW HELMETS

Crew helmets require three patches of Velcro glued to the outside to hold the MWLD helmet harness in place. The Velcro patches must be attached to the proper position on the helmet so that they will mate with the patches of Velcro which are attached to the harness.

1. Slip the helmet harness over the helmet so that the electronics box is at the rear.

2. Make sure the thick bottom edge of the harness completely covers and overhangs the rim of the helmet.

3. Pull the harness tight and mark the helmet where the three Velcro patches oh the harness touch the helmet. Remove the harness.

    - Spray tape primer over the marked areas where the Velcro will be attached. Allow spray to dry. Apply a second coat.

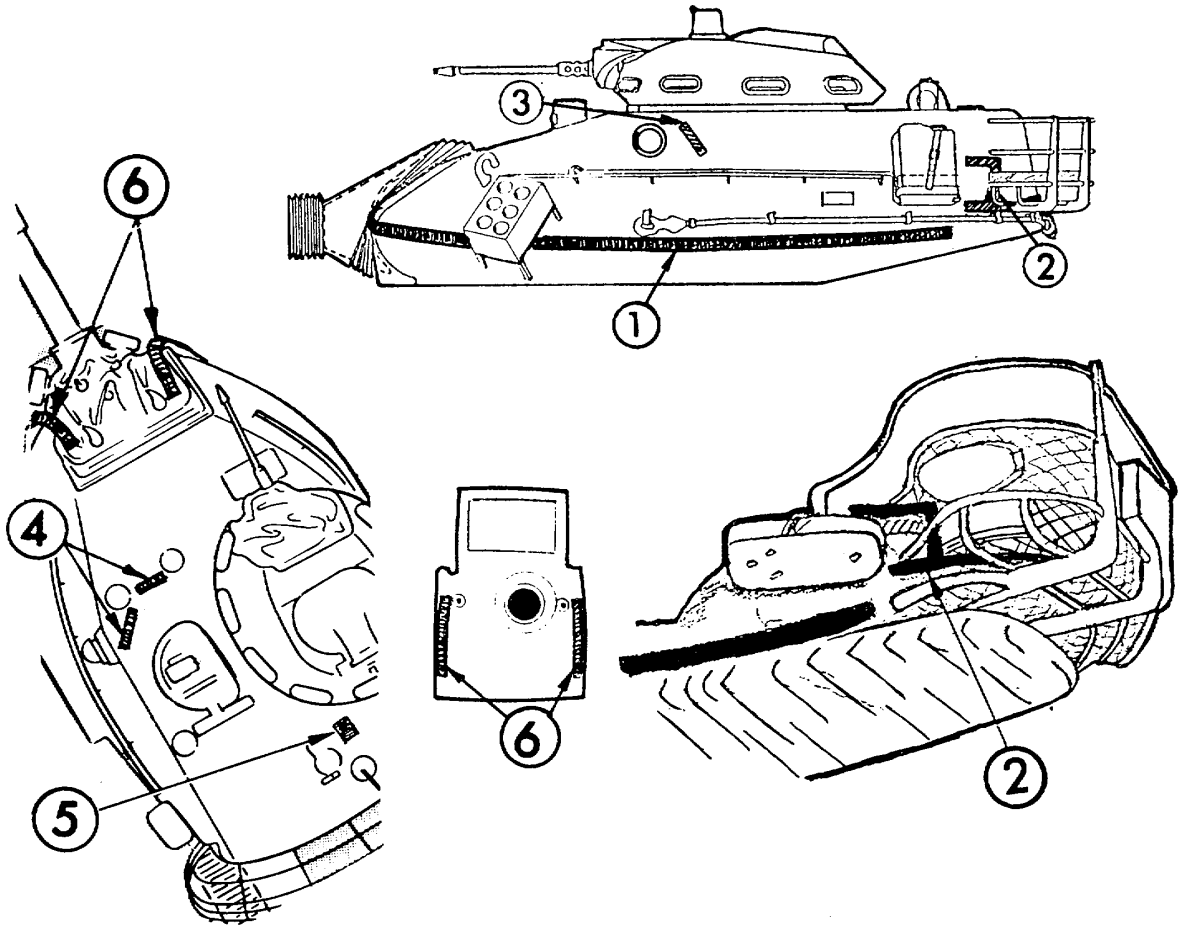
    - Cut three patches of Velcro (approximately 2 inches square).

    - Remove backing paper and firmly press the patches onto the helmet.

TASK

1 Inspect Velcro Tape

OUTSIDE



If any Velcro is missing from the turret, mount the Velcro on the place it belongs. Use the instructions given on pages 12-14.

1. Check that Velcro tape is mounted on both sides of the turret in the places shown.

2. Make sure that the vertical strip of Velcro touches the inside of the lower horizontal bar of the bustle.

3. Make sure that a 12 inch strip of Velcro is mounted vertically just behind of the rangefinder end housing on the left side of the turret.

4. Check that two more 12 inch strips of Velcro are installed at the places shown on top of the turret.

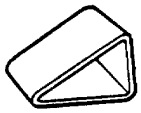
5. Check that Velcro is mounted at base or rear lifting eye.

6. Check that Velcro is mounted on both sides of the gun shield, as shown.

TASK

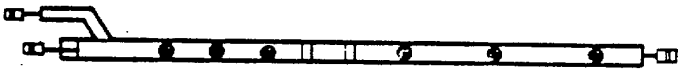
2 Get This Equipment From Your NCOIC

OUTSIDE



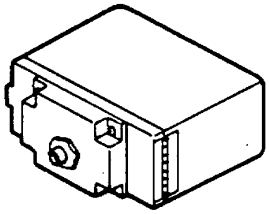
10 MOUNTING BLOCKS

2 DETECTOR BELT SEGMENTS LABELED NUMBER 3

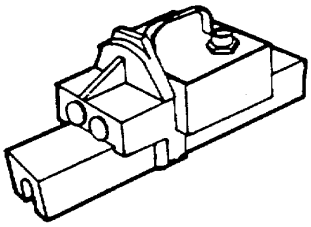


1 DETECTOR BELT SEGMENT LABELED NUMBER 4

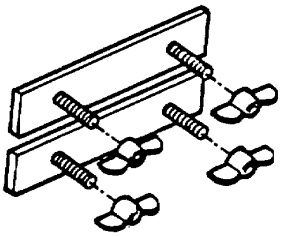
BATTERY BOX



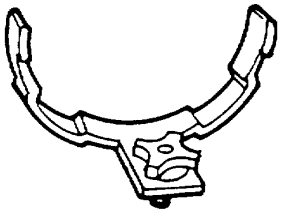
CVKI ASSEMBLY



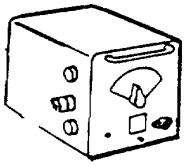
MAIN GUN/COAX LASER TRANSMITTER



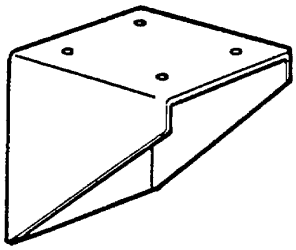
NUTS, WASHERS, BRACKETS



STOP ASSEMBLY

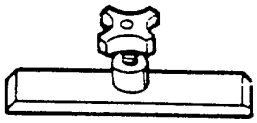


CONTROL CONSOLE



CONSOLE BRACKET

GROUND STRAP

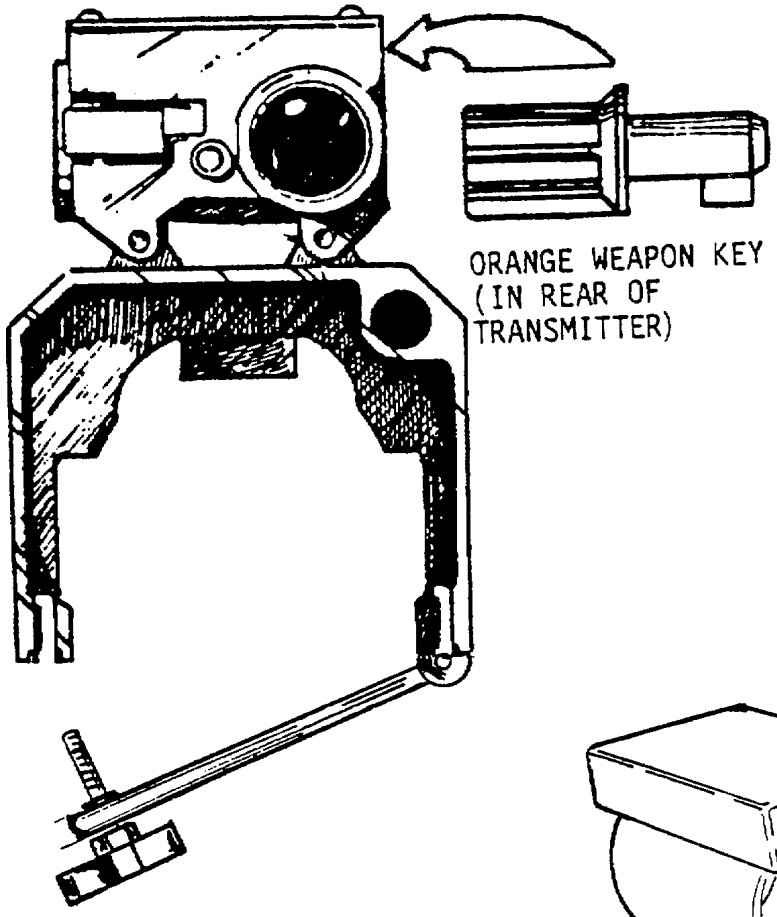


RETAINER ASSEMBLY

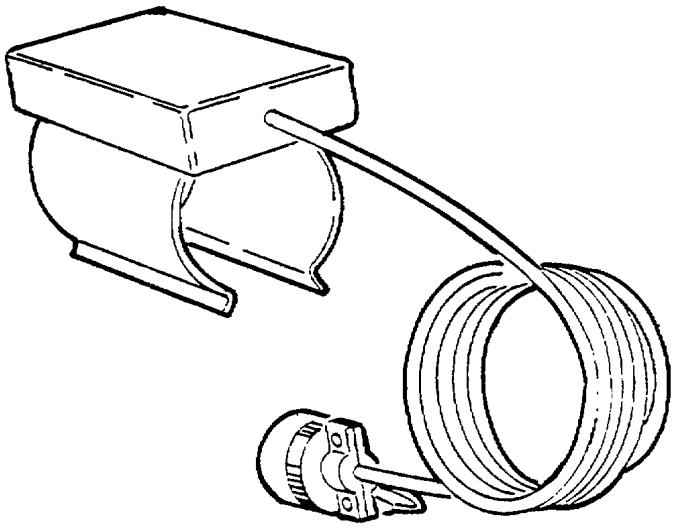
TASK

2

OUTSIDE



M85 TRANSMITTER

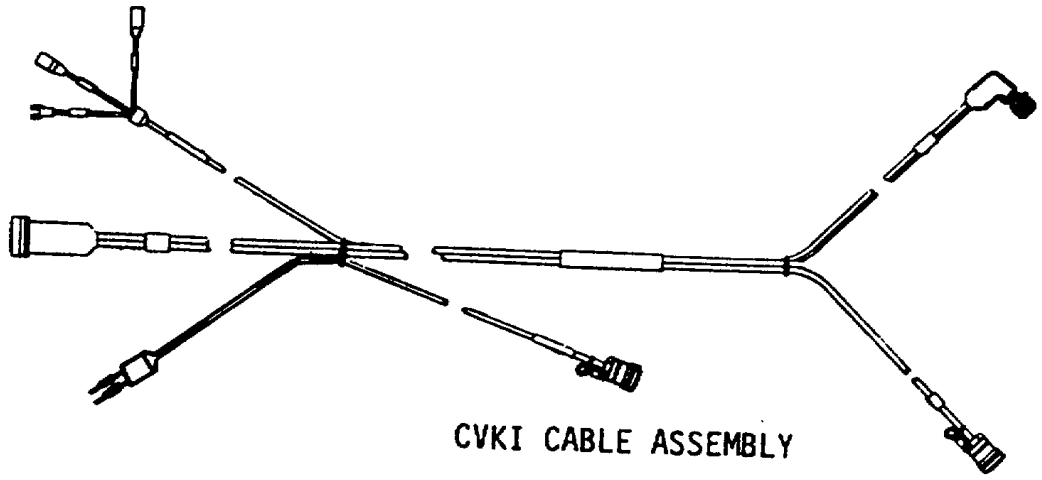


COAX MACHINE GUN MICROPHONE ASSEMBLY

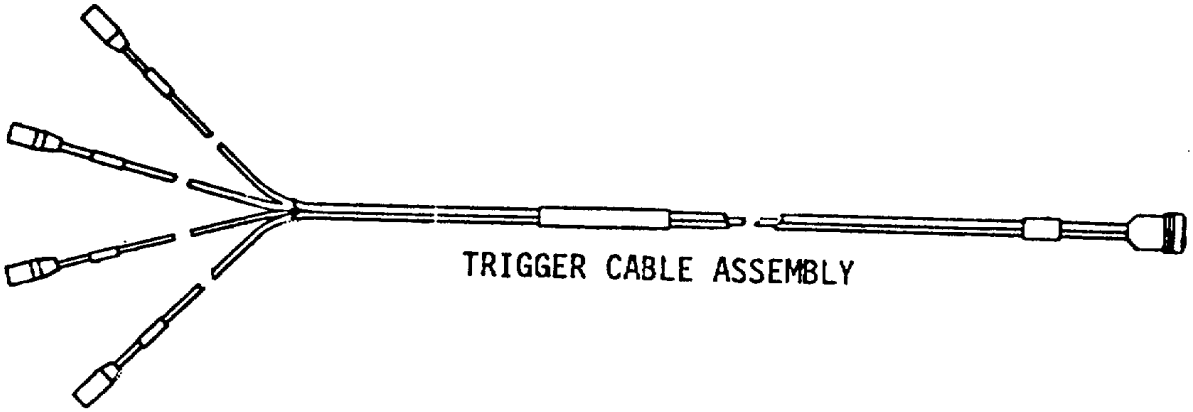
TASK

2

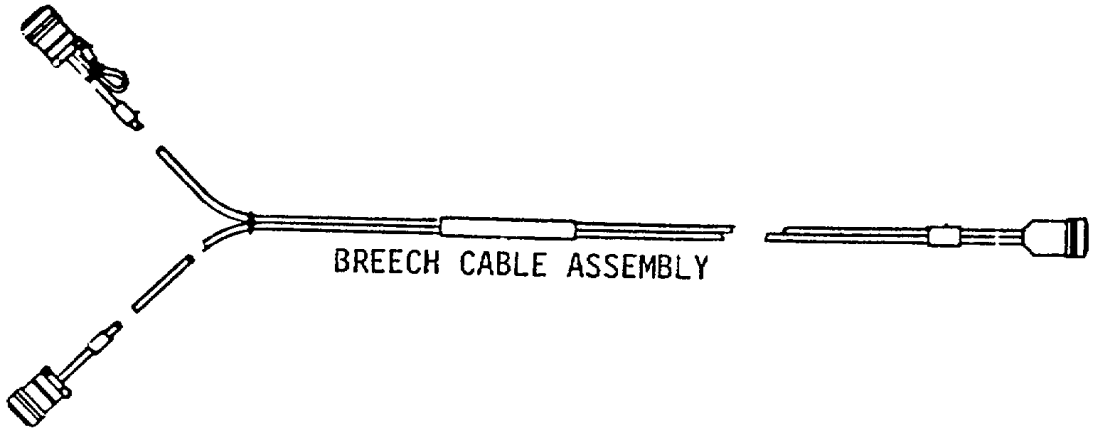
OUTSIDE



CVKI CABLE ASSEMBLY



TRIGGER CABLE ASSEMBLY

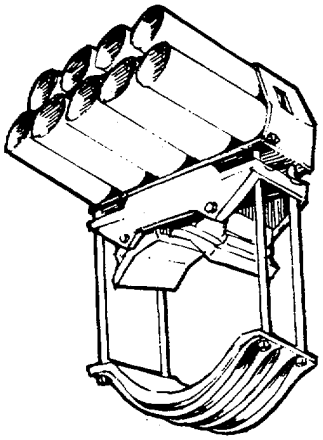


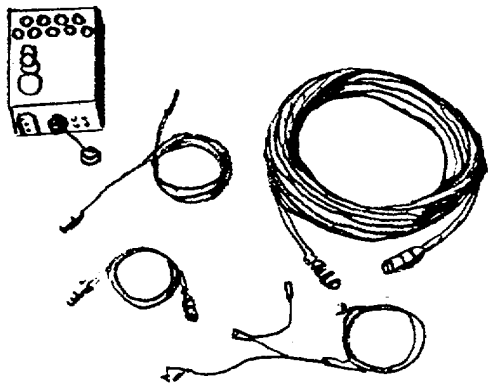
BREECH CABLE ASSEMBLY

TASK

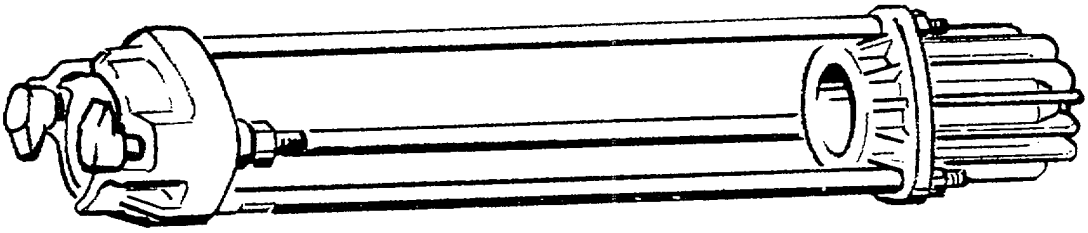
2

OUTSIDE



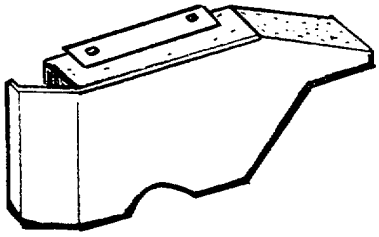


HOFFMAN COMPONENTS

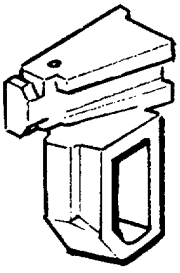


BARREL ATTACHMENT

ADAPTER



FILLER ASSEMBLY



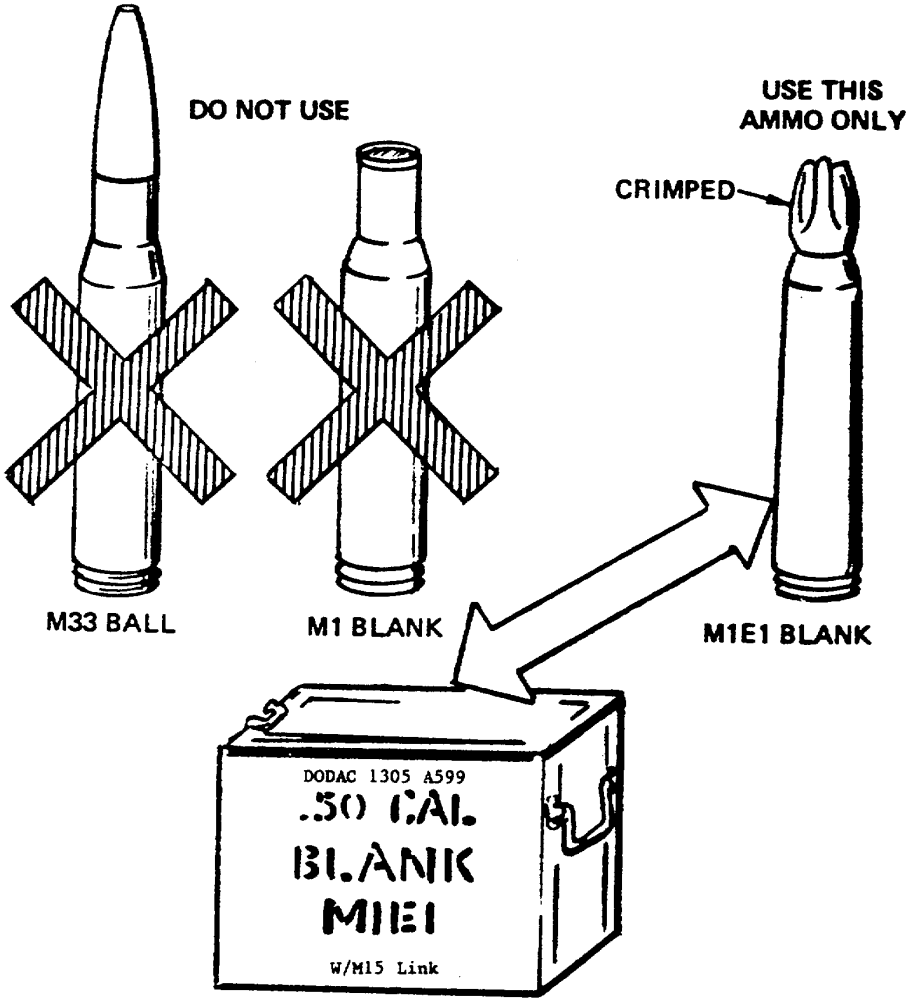
GUIDE

BLANK FIRE ATTACHMENT COMPONENTS FOR
M85 MACHINE GUN

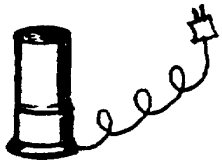
TASK

2

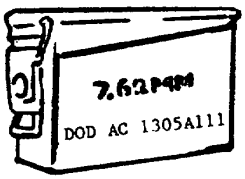
OUTSIDE



BLANK AMMUNITION FOR M85 MACHINE GUN



63 HOFFMAN CARTRIDGES

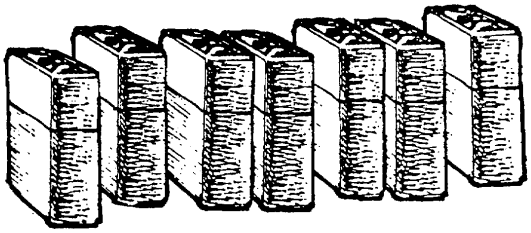


BLANK AMMUNITION FOR COAX MACHINE GUN

TASK

2

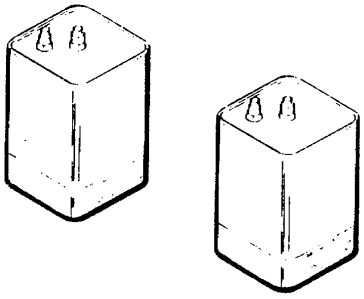
OUTSIDE



7 - 9V BATTERIES
BA-3090/U

BATTERIES:

For the 3 MWLDs and M85 Transmitter



2 - 6V CARBON ZINC
BATTERIES
BA-200/U

For the Battery Box

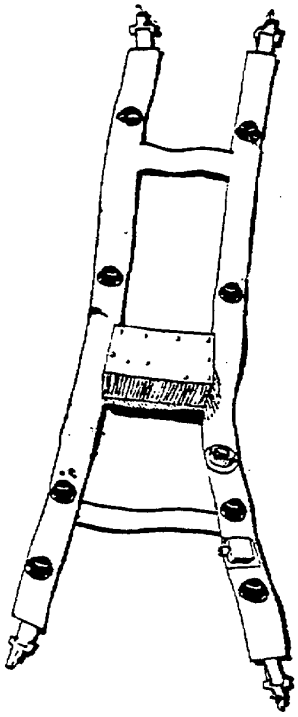
NOTE

If a battery is sticky from acid leakage, ask your NCOIC for a replacement.

TASK

2

OUTSIDE

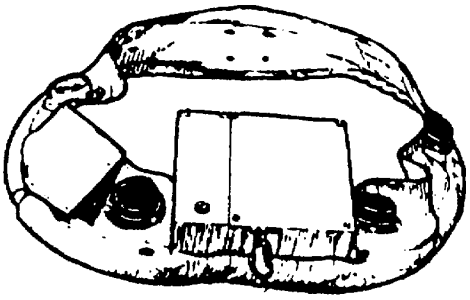


MAN WORN LASER DETECTOR (MWLD) EQUIPMENT:

- The MWLD equipment is worn by the tank commander, gunner, and the loader

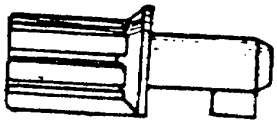
3 MWLD TORSO HARNESSES

3 MWLD HELMET HARNESSES



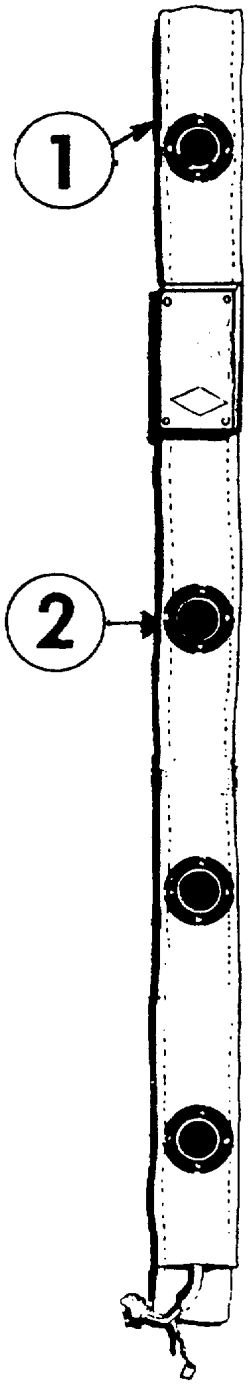
3 YELLOW KEYS

- The commander, gunner, and loader must carry one of these keys.



TASK 3 **Inspect and Service Detector Belt Segments**

OUTSIDE



Check all 3 Detector Belt Segments

1. Look for any damage that would prevent normal operation of the belt segments.

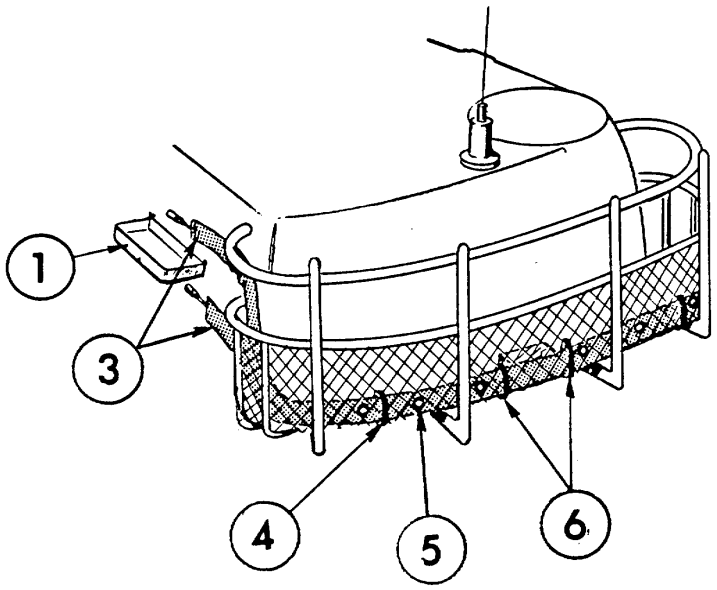
2. Wipe detectors clean.

- Report any damage on DA Form 2402, and replace belt segments if inoperable.

TASK

4 **Install Detector Belt Segments**

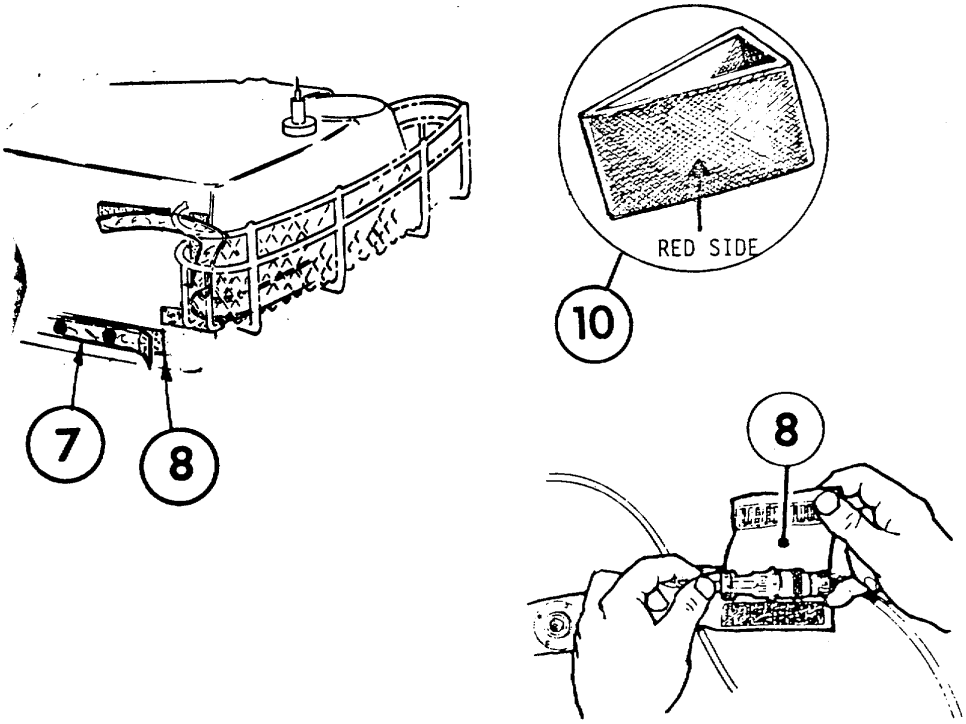
OUTSIDE



REAR BELT SEGMENT:

1. Remove the water can from the left rear corner of the turret.
2. Locate detector belt segment No. 4. Arrange the belt so that the end with the two connectors is on your left.
3. Starting at the left rear corner of the turret, begin attaching the detector belt segment end with the two connectors to the Velcro. If there is no Velcro installed, refer to pages 12,13, and 14 for instructions on mounting the Velcro.
4. Working to your right, attach the detector belt to the inside of the bustle grill with the Velcro straps that are attached to the belt.
5. Make sure each detector faces out through the holes in the grill.
6. Make sure the electronics box is securely fastened to the bustle grill with the Velcro straps located on each side of the box. Make sure electronics box is not making metal-to-metal contact with bustle grill.

TASK
4
OUTSIDE

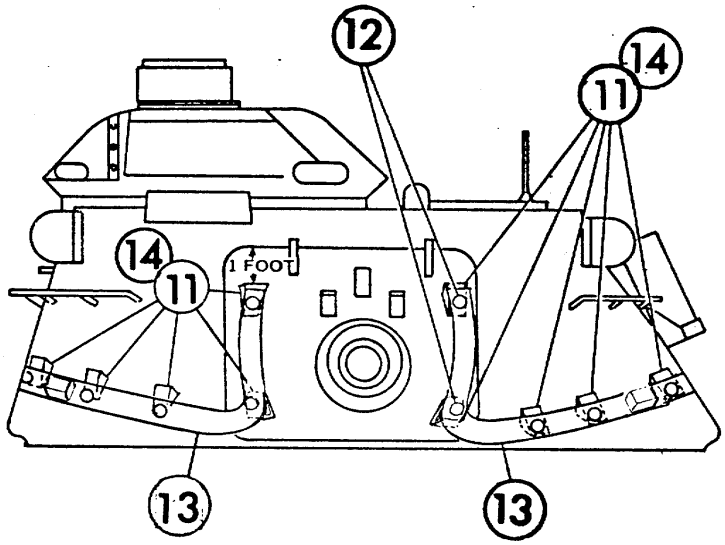


SIDE BELT SEGMENTS:

- Be sure the main gun is in the horizontal position.

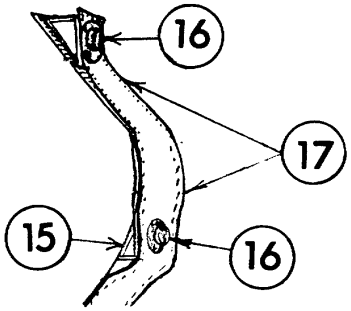
7. Select one of the two belt segments labeled No. 3.
8. Put the end of the belt with the connector on the Velcro strip near the left rear corner of the turret. Attach the connector to the lower connector on the rear belt segment. Cover connectors with the Velcro flap.
9. Continue installing the belt along the Velcro, working toward the front of the turret.
10. Velcro-covered mounting blocks will be used behind some of the detectors on both sides of the turret. Note that one side is painted RED and that one of the sides is much shorter than the other two.

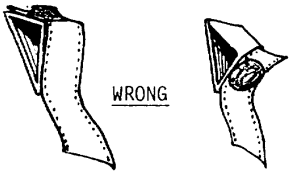
TASK
4
OUTSIDE



11. Install mounting block behind the first five detectors counting from the front of the- tank. Be sure the red side is on the OUTSIDE and that the short side is UP. Five mounting blocks will be used on each side of the turret.
12. The last two detectors are installed in a vertical position on the gun
13. Leave about 6 inches of slack in the belt at the bottom of the gun shield to allow for main gun movement.
14. **NOTE**: Mounting blocks must be used behind the two vertically-mounted detectors on the main gun shield and behind the next three detectors mounted horizontally along the side of the turret. Center the detectors over the mounting blocks. <u>The picture shows the blocks partly out for illustration purposes only.</u>

TASK
4
OUTSIDE





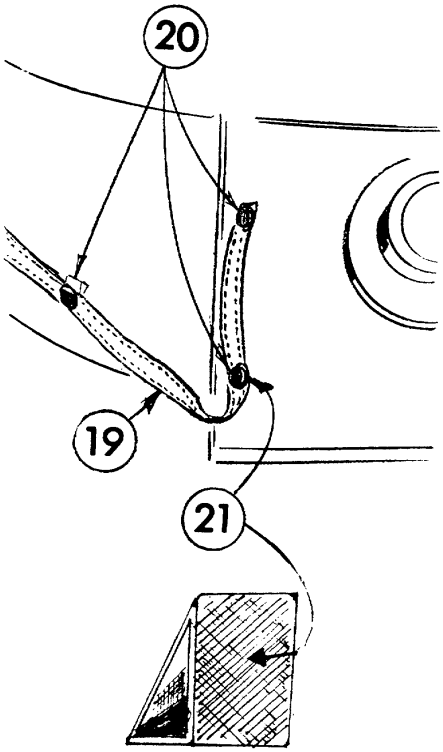
15. The mounting block for the bottom detector on the gun shield is normally installed with the short side DOWN. All other blocks are installed with the short side UP.

    - Due to Velcro attachment variations and positioning on the main gun shield cover, the correct detector angle may require the lower wedge blocks to be placed with the short side UP.

16. Make sure that all of the detectors point straight out. If the detectors do not point straight out, they are mounted wrong.

17. Be sure the detector belt fits snugly against the blocks and the turret as shown.

TASK
4
OUTSIDE



18. Now, take the other detector belt segment labeled No. 3. OUTSIDE Find the end with no connector and begin at the right side of the main gun shield and work around the right side of the turret toward the rear.

19. Leave about 6 inches of slack in the belt at the bottom of the gun shield to allow for main gun movement.

20. Put mounting blocks behind the two vertically-mounted detectors on the main gun shield and on the next three horizontally-mounted detectors on the turret. Make sure the detectors are facing straight out. Center the detectors over the mounting blocks.

21. **NOTE: The bottom mounting block on the gun shield is normally installed with the short side DOWN. All others are installed with the short side UP.**

    - Due to Velcro attachment variations and positioning on the main gun shield cover, the correct detector angle may require the lower wedge blocks to be placed with the short side UP.

22. Continue installing the belt segment on the Velcro until the entire belt is securely fastened.

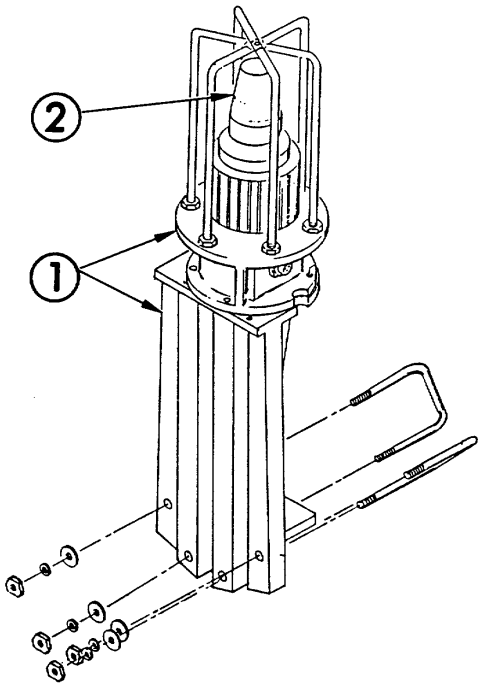
23. Connect the right side detector belt segment to the rear belt. Make sure the connector is covered with the Velcro flap.

24. One final check. Elevate and depress the main gun all the way. If the belt segments on either side of the turret pull off, remount them, leaving more slack (see steps 13 and 19).

TASK

5 Inspect and Service CVKI

OUTSIDE

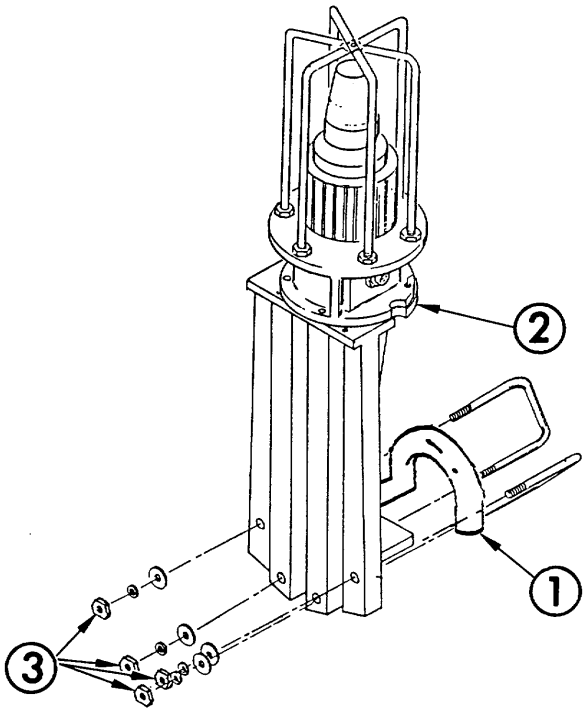


1. Inspect CVKI and CVKI extension for any damage that would affect proper installation or operation.

2. Inspect yellow lens for cracks.

o Report any damage on DA Form 2402, and replace CVKI.

TASK
6 **Install the CVKI**
OUTSIDE



1. Mount the CVKI extension to the rear turret lifting eye as shown. Make sure mounting bracket is flush against the eye and securely fastened.

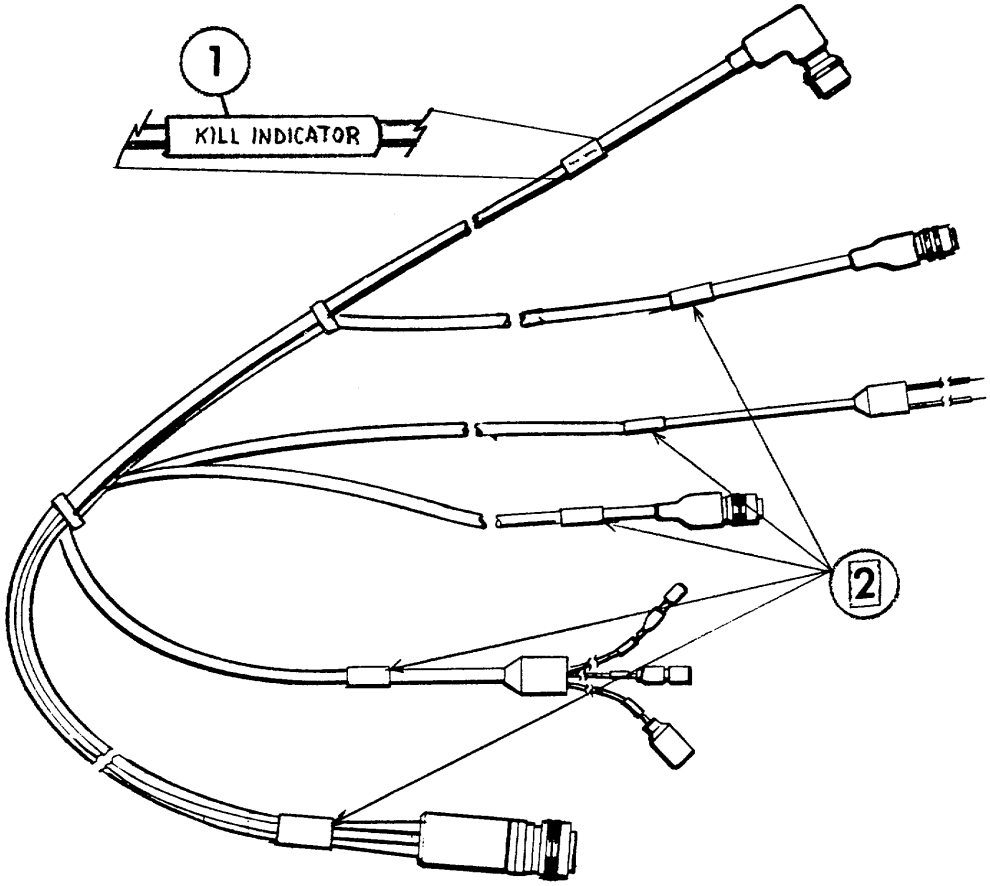
2. Connector on side of CVKI must be pointing toward the front.

3. Tighten mounting bolts with a 7/8-in. wrench.

TASK

7 **Inspect CVKI Cable Assembly**

OUTSIDE

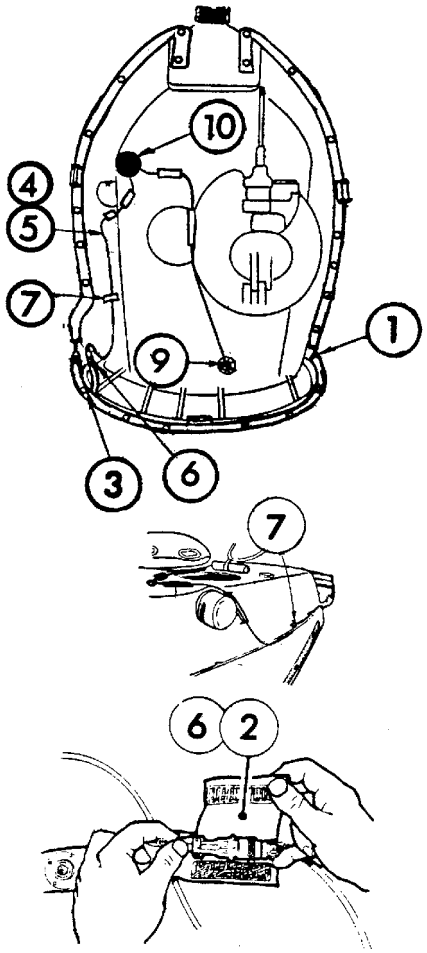


1. Find cable assembly labeled KILL INDICATOR.
2. Each connector should have a label showing where it goes.
3. Check all connectors for obvious damage.

- Report any damage on DA Form 2402, and replace CVKI cable assembly if unusable.

TASK
8 **Install CVKI Cable Assembly**

OUTSIDE



1. Verify that the cable from the right side of the rear belt segment is connected to the detector belt segment on the tank's right side.

2. Make sure the connector is under the Velcro flap.

3. Make sure the cable from the rear belt segment is connected to the detector belt segment on the tank's left side. The rear belt segment has 2 connectors on this side. Make sure the LOWER one is used. Put connector under the flap.

4. Find the cable labeled SIDE BELT.

5. Route the SIDE BELT cable from the forward antenna port, down and behind left range finder end housing to the infantry rail. Continue routing the cable under and along the infantry rail to the rear detector belt upper cable connector.

6. Connect the cable labeled SIDE BELT to the UPPER connector on the left rear belt segment. Put the connector under the Velcro flap.

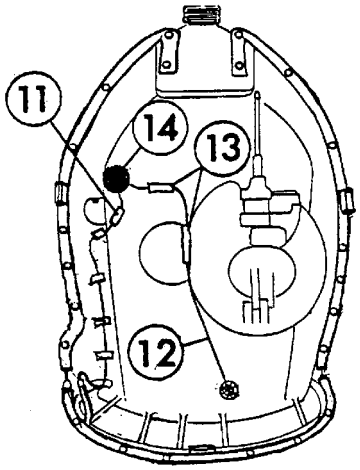
7. Secure the cable to the infantry rail using the Velcro tie.

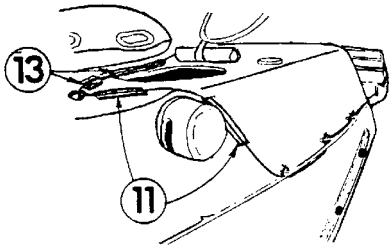
8. Find the cable labeled KILL INDICATOR.

9. Connect the cable labeled SILL INDICATOR to the CVKI light. Secure cable with a Velcro strap at the bottom of the lifting eye.

10. Open the forward antenna port.

TASK
8
OUTSIDE





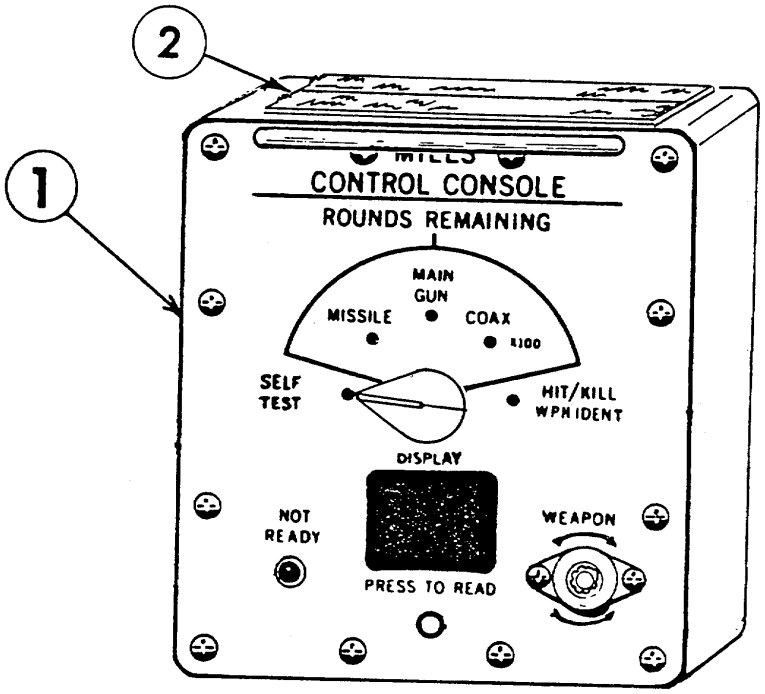
11. Secure the Velcro pads attached to cable to the Velcro strips mounted behind the rangefinder and on top of turret leading into the antenna port.

12. Route cable from the CVKI light along the left side of the cupola to the antenna port.

13. Secure cable to the 2 strips of Velcro as shown.

14. Feed the remainder of the cable into the antenna port.

TASK
1 **Inspect Control Console**
INSIDE



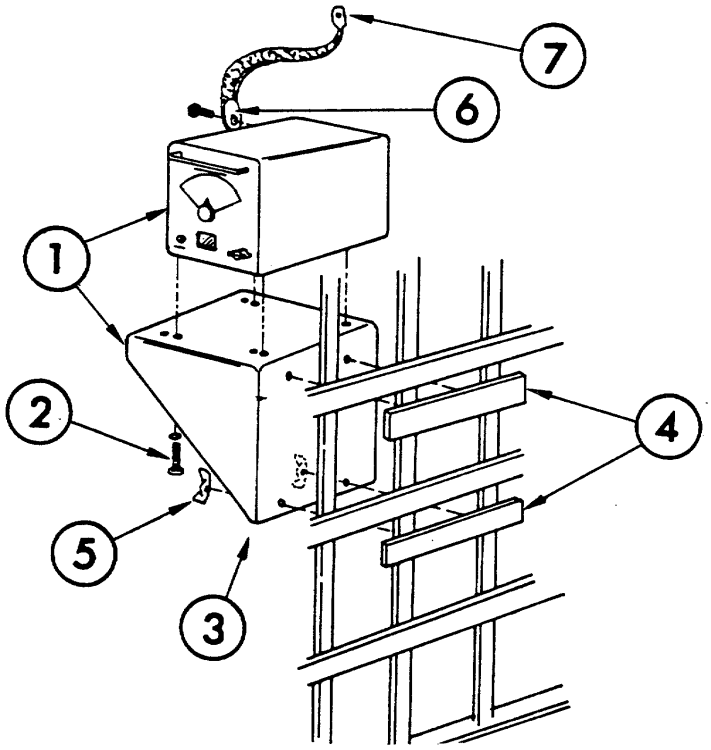
1. Inspect control console for any damage that would prevent normal operation.

2. Make sure Velcro tape is securely fastened to top of console.

   - If tape is loose or missing read the general instructions for installing Velcro tape on page 12 and replace the tape. Attach two strips of Velcro side-by-side as shown.

   - Report any damage on DA Form 2402, and replace console if inoperable.

TASK
2 **Install Control Console**
INSIDE



MOUNTED ON BACKSIDE OF RADIO GUARD RACK

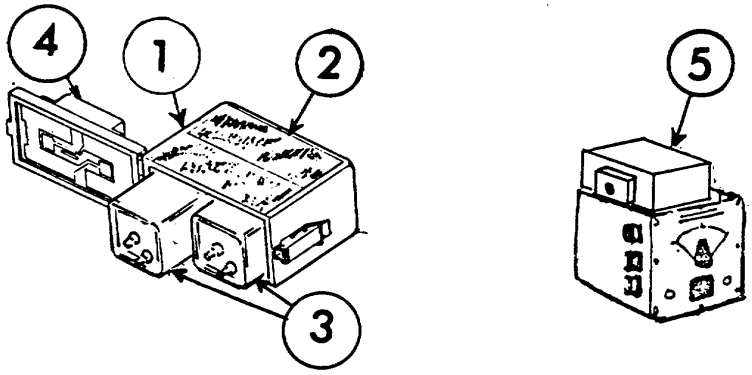
- Two men are required to install the control console.
- If mounting bracket is already installed, skip to step 3.
- Mount console so blower switch can be used.

1. Put mounting bracket on bottom of console so that the 4 bolts with lock washers go through the bracket and into the console.
2. Tighten bolts with a 7/16-inch open-end wrench or a 7/16-inch socket wrench.
3. Put bracket against radio guard rack, inside storage area, in approximately the position shown here.
4. While one man is holding the console against the radio rack, the other man bolts the mounting bracket to the radio guard rack using the two small brackets.
5. Tighten the thumbscrews securely.
6. Bolt the ground strap to the side of the control console.
7. Remove any convenient grounded bolt from turret ceiling. Slip the bolt through the hole in the other end of the ground strap and replace the bolt. Make sure the ground strap makes contact with bare metal. Tighten securely.

TASK

3 Inspect and Install
Battery Box and Batteries

INSIDE



1. Inspect battery box for damage that would prevent normal operation.

   - Report any damage on DA Form 2402. Replace only if not operable.

2. Make sure Velcro is attached to one side of battery box. If Velcro is missing, do not attempt to install new Velcro. Report on DA Form 2402, and replace battery box.

3. Insert two 6 volt batteries in the box.

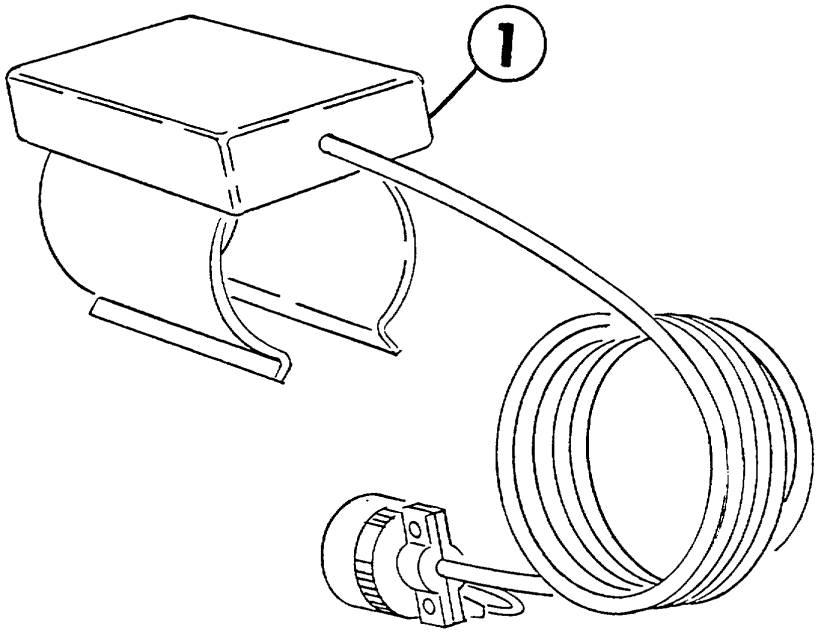
4. Close battery box cover.

5. Install battery box on top of control console with the connector facing the tank commander's position.

TASK

4 **Inspect Coax MG Microphone Assembly**

SIDE



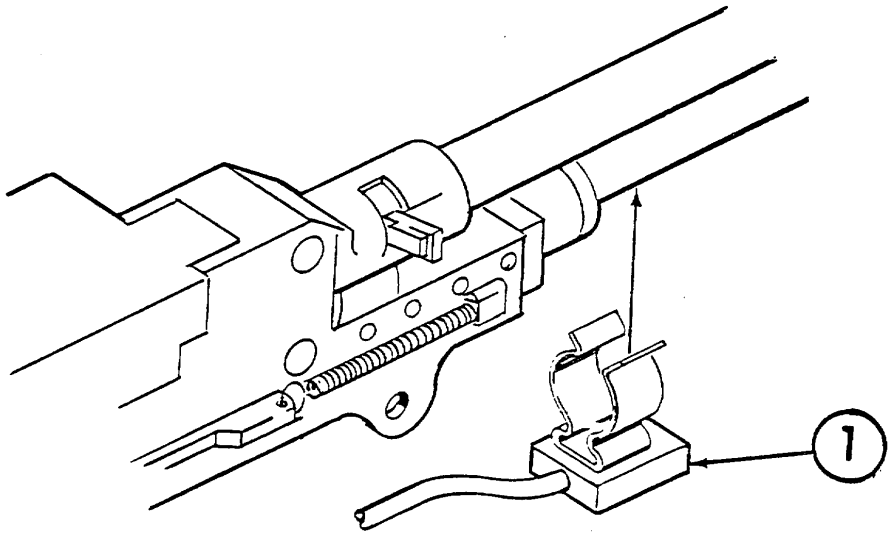
1. Inspect microphone assembly for any damage that will prevent normal operation.

- Report any damage on DA Form 2402, and replace assembly if inoperable.

TASK

5 **Install Coax MG Microphone Assembly**

INSIDE



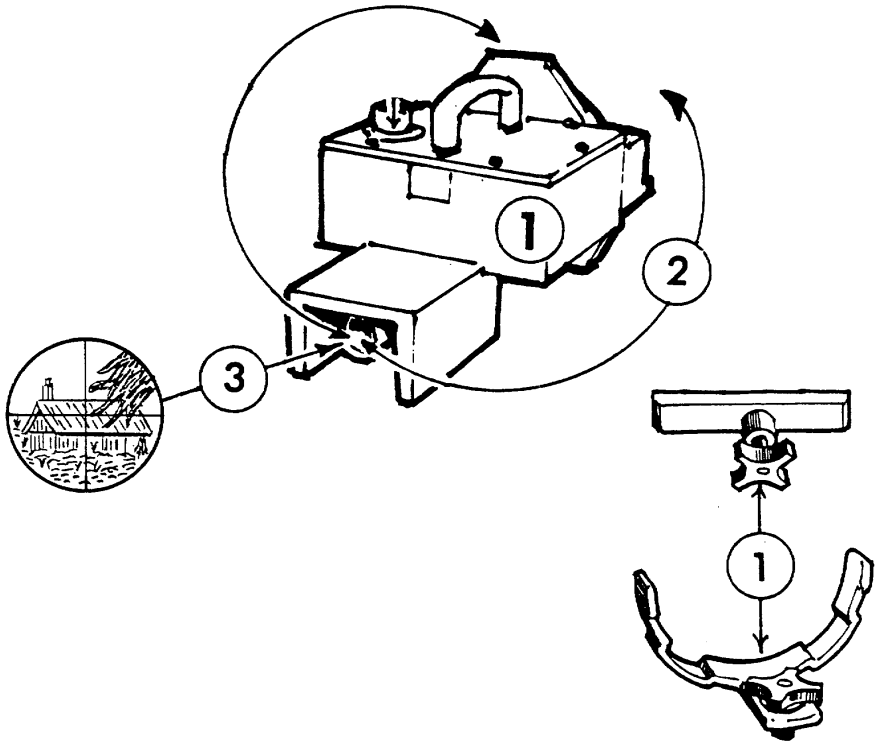
- The machine gun may be partially withdrawn from its mount to do this task.

1. Clip microphone assembly to machine gun as shown.

TASK

6 **Inspect Main Gun 'Coax MG Transmitter**

INSIDE



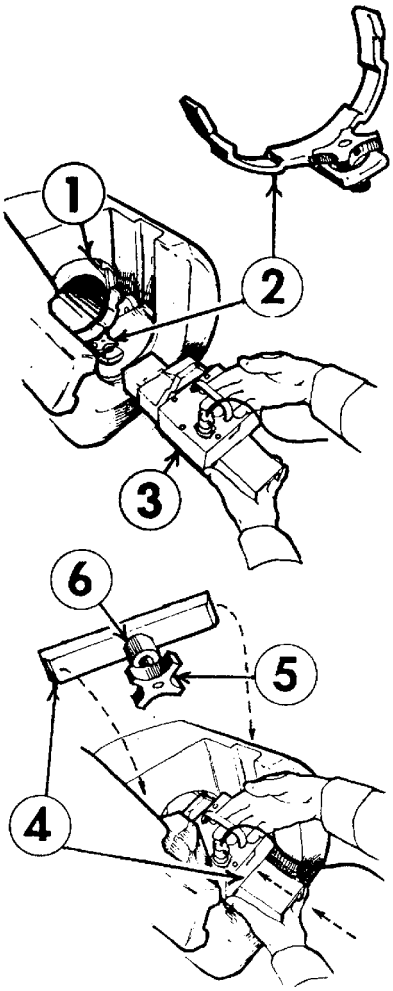
1. Inspect transmitter and mounting brackets for any damage that would prevent normal operation.
2. Remove any dirt or oil from lens with a lens paper (see page 86) or a soft dry cloth.
3. Look through the telescope. Be sure you can see distant objects clearly.

• Report any damage on DA Form 2402, and replace transmitter or mounting brackets as required.

TASK

7 Install Main Gun,' Coax MG Transmitter

INSIDE



1. Open main gun breech.

WARNING

Breech handle is under spring tension until breech block is fully opened and locked. Ask a crewmate to hold the breech handle until you complete Step 2.

2. Install stop assembly extractor, as shown. Tighten the knob.

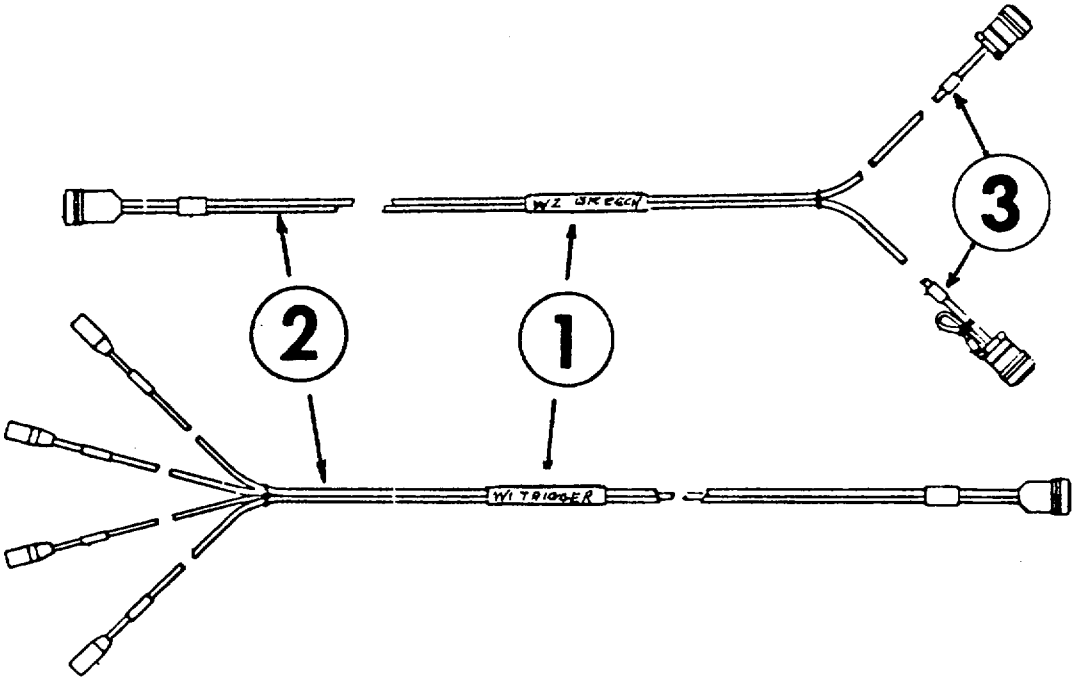
3. Slide transmitter into breech in the way shown. You may need to lift the transmitter slightly to clear the knob. Push transmitter forward until it is flush against the breech. Rock the transmitter from side to side until it is in place.

4. Hold the transmitter in the breech. Slide the retainer assembly into the breech block grooves.

5. Hand tighten the knob. The transmitter should now be locked in place.

6. Hand tighten the jam nut on the retainer assembly.

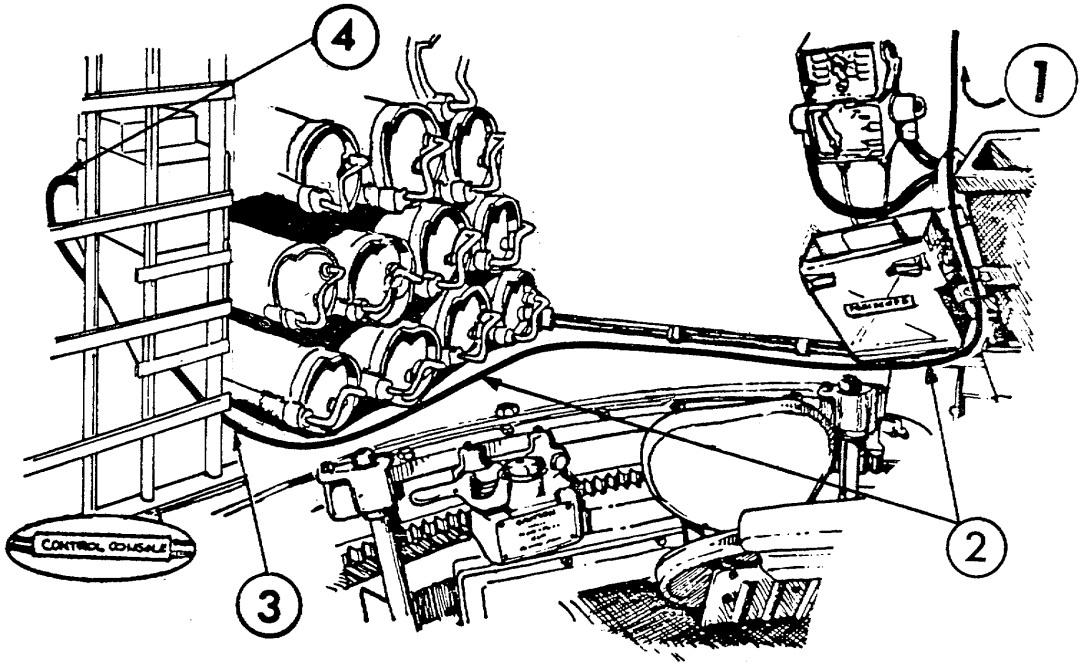
TASK
8 **Inspect MILES Cables**
INSIDE



1. Find cable assemblies labeled W1 TRIGGER and W2 BREECH.
2. Check each cable assembly for worn insulation and bare wires.
3. Each connector should have a label showing where it goes.

- Check all connectors for obvious damage.
- Report any damage on DA Form 2402, and replace cable assemblies if unusable.

TASK 9 INSIDE **Install MILES Cables**



SUBTASK 1: COMPLETE INSTALLATION OF CVKI CABLE

- Before doing this task, check with the TC to make sure Outside Task 8 has already been done.

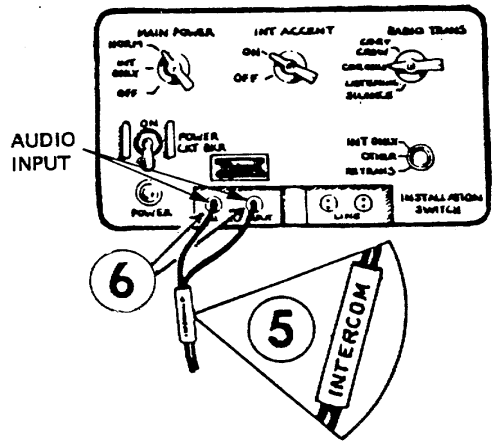
1. CVKI cable should be inside the turret, hanging through the forward antenna port.

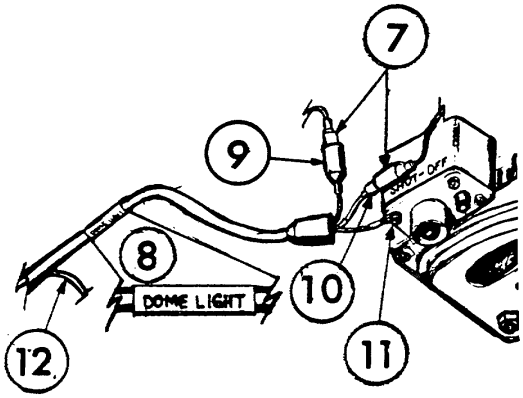
2. Route the cable down the turret wall between the loader's periscope box and the coax MG ammunition ready box. Continue routing under the loader's periscope box, along the turret wall, and under the turret ammunition rack to the radio guard rack.

3. Route cable behind the radio guard rack and to the control console.

4. Plug the cable connector labeled CONTROL CONSOLE into J3 on the control console.

TASK
9
INSIDE





5. Locate cable end labeled INTERCOM. It has two connectors labeled P5 and P6.

6. Plug connectors P5 and P6 into the AUDIO INPUT jacks as shown. Either plug can go in either jack.

7. Pull apart the plug labeled 138. It is located by the TC STAB shut-off control box.

8. Locate MILES cable labeled DOME LIGHT. It has three connectors labeled P7, P8, and El.

9. Plug the MILES connector P8 into the female end of cable labeled 138.

10. Plug the MILES connector P7 into the male end of cable labeled 138.

11. Remove the closest screw on the STAB shut-off control box. Slip MILES connector labeled E1 through the screw and replace the screw. Make sure El makes contact with bare metal.

12. Secure the MILES cable to any convenient support using the Velcro tie.

SUBTASK 2: MILES TRIGGER CABLE INSTALLATION

WARNING

Failure to follow these steps exactly may result in hazardous Hoffman device reloading conditions.

NOTE

In order to install the MILES TRIGGER CABLE you must (1) unplug the main gun safety - switch trigger cable connections 1138 and 113C, and (2) the coax machine gun trigger cable connections 1038, and (3) the coax machine gun power solenoid.

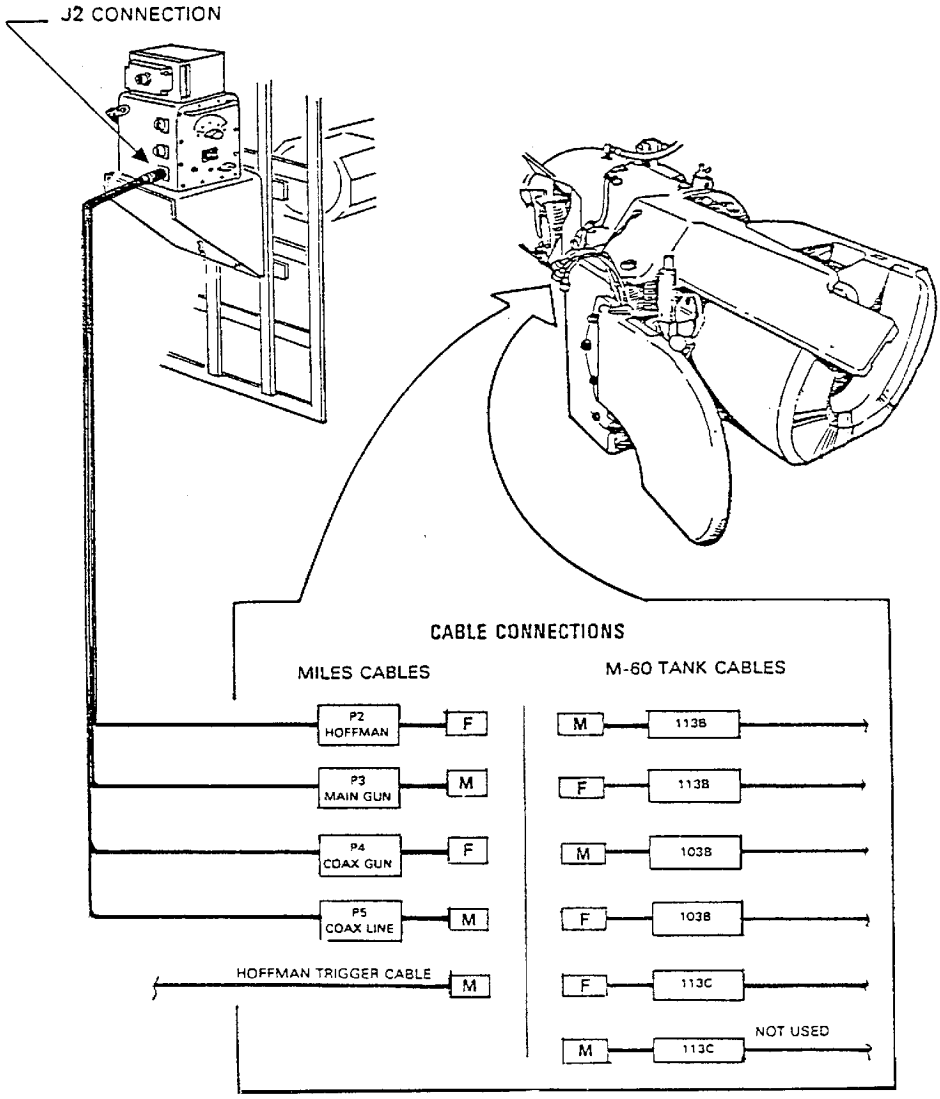
After disconnecting cable leads indicated in the note above, install the MILES TRIGGER CABLE per the following steps (see illustration on page 48:

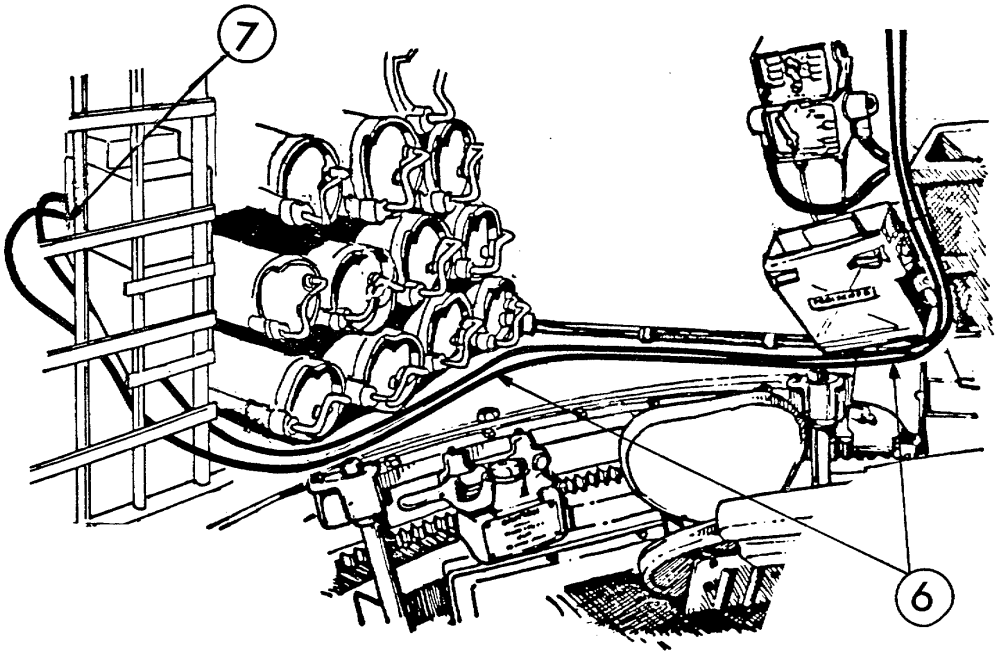
1. Connect female end of MILES cable P2 HOFFMAN to male end of M-60 tank cable 113B.
2. Insert male end of MILES cable P3 MAIN GUN into female ’end of M-60 tank cable 113B.
3. Connect female end of MILES cable P4 COAX GUN to male end of M-60 tank cable 103B.
4. Insert male end of MILES cable P5 COAX LINE into female end of M-60 tank cable 103B.
5. Insert male end of HOFFMAN TRIGGER CABLE into female end of M-60 tank cable 113C.

NOTE

The male end of M-60 tank cable labeled 113C is not used.

TASK
9
INSIDE





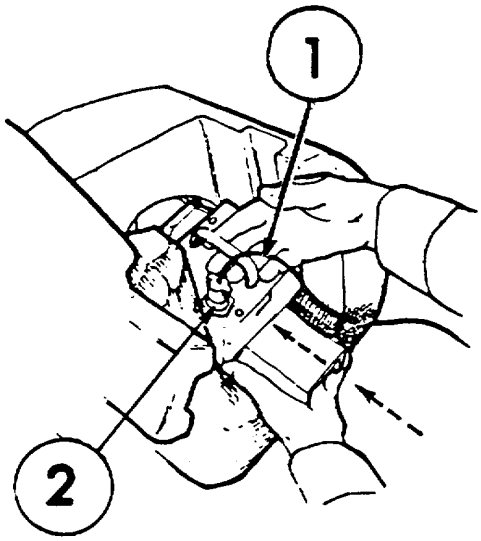
SUBTASK 2: MILES TRIGGER CABLE INSTALLATION (Continued)

6. Route the trigger cable between the loader's periscope box and coax ammunition box together with the CVKI Cable. Continue routing trigger cable along and against the turret wall (next to the CVKI cable) and behind the radio guard rack.

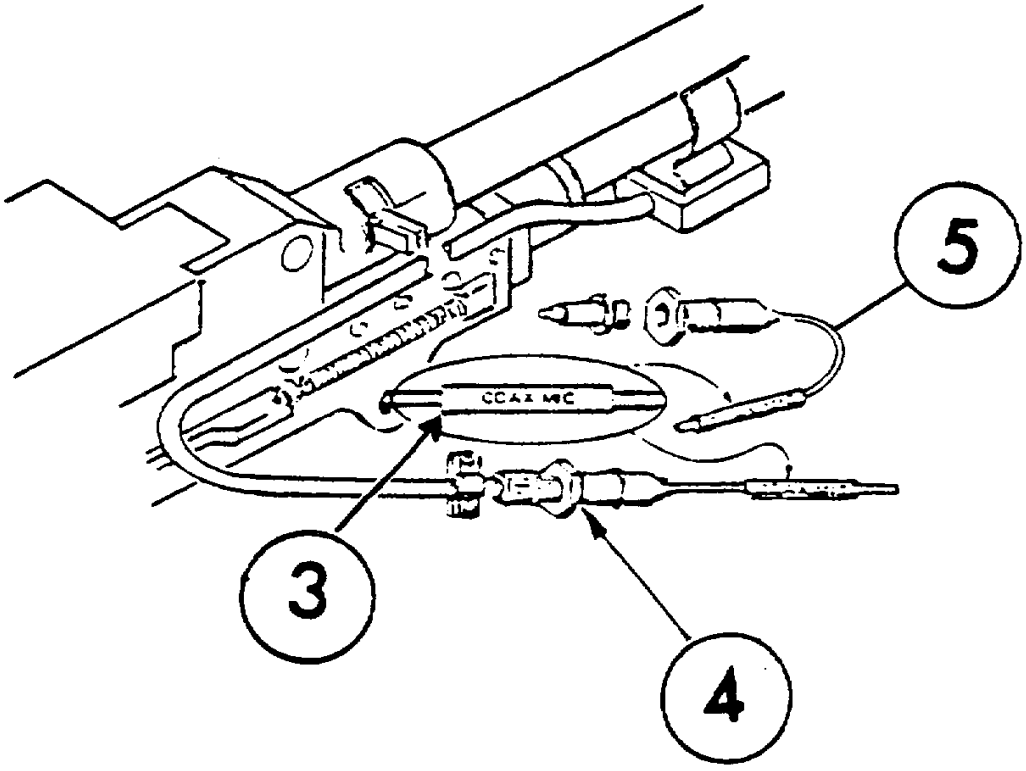
7. Plug the trigger cable into connector J2 on the control console.

TASK
9
INSIDE

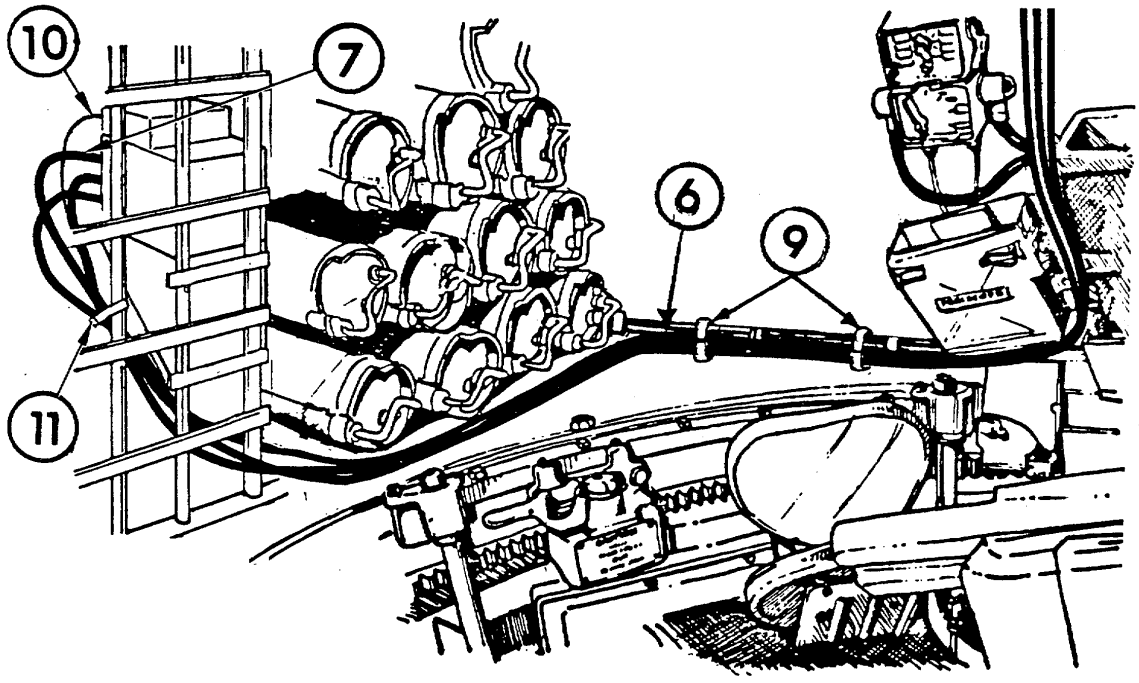
SUBTASK 3: INSTALL BREECH CABLE ASSEMBLY



1. Find cable connector labeled BREECH XMTR.
2. Plug connector into transmitter.
3. Find connector labeled COAX MIC.
4. Connect COAX MIC to cable from coax machine gun microphone.
5. For dry-fire operation, disconnect the microphone, obtain dry-fire plug from controller, and plug it into the COAX MIC connector.



TASK
9
INSIDE



6. Route BREECH XMTR cable along the path followed by the trigger cable.

7. Plug breech cable into J1 on the control console.

8. One final check; slowly elevate and depress the main gun insuring that enough cable slack was allowed for gun movement. If not, adjust cable until enough slack is obtained.

NOTE

Perform Step 8 only after all cable belts are installed.

9. Using the Velcro ties, tie all of the MILES cables to the existing cable at the turret wall.

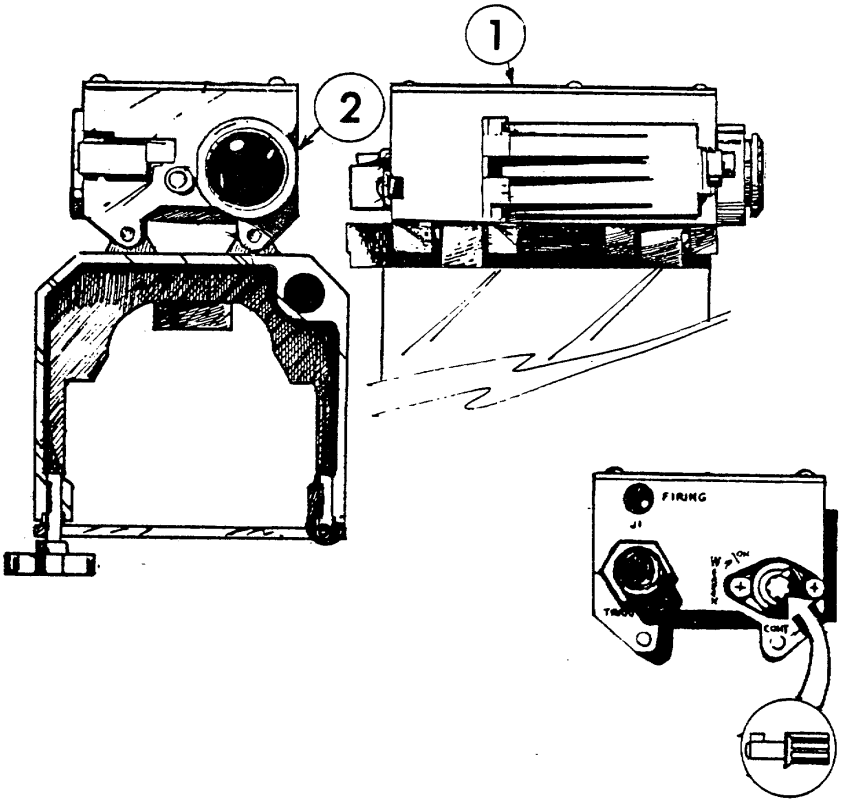
10. Connect cable labeled BATTERY into the connector on the Battery Box.

11. Securely tie all of the cables from the Control Console to the radio rack with the Velcro ties on the CVKI cable.

TASK

1 **Inspect and Service M85 Machine Gun Transmitter**

M G

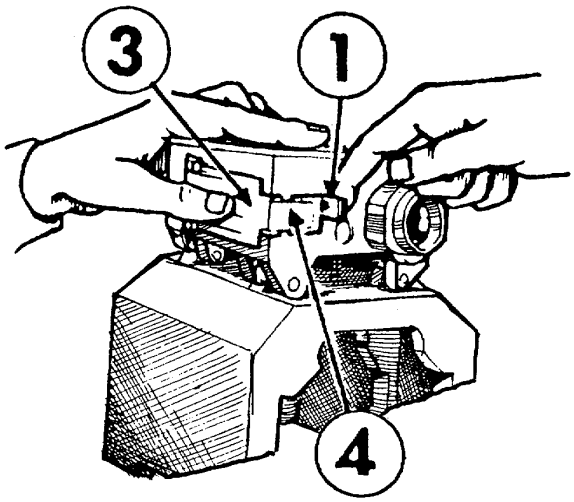


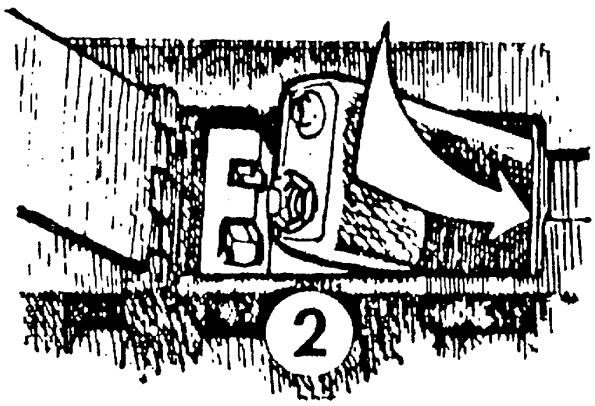
1. Inspect transmitter for any damage that would prevent normal operation.

2. Remove any dirt or oil from lens with a lens paper (see page 84) or a soft, dry cloth.

• Report any damage on DA Form 2402, and replace transmitter if inoperable.

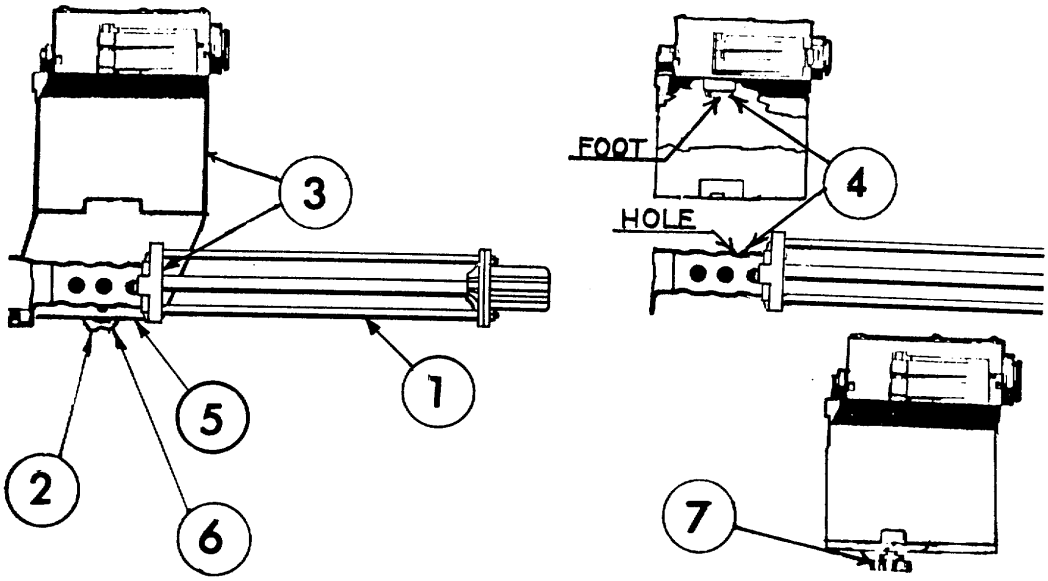
TASK 2 M G **Put Battery in Transmitter**





1. Flip open the latch.
2. Open the battery door and put in a battery as shown.
3. Press the door closed with one hand.
4. Press the latch closed with the other hand.

TASK
13 Attach Transmitter
M G



1. Attach blank firing attachment. See instructions in TM 9-6920-444-12&P, Operators and Organizational Maintenance Manual for Blank Firing Attachment (BFA) M20 for .50 Cal M85 Machine Gun, August 1979.

2. Unscrew knob on side of transmitter bracket. Swing plate down.

3. Put the transmitter on the barrel support, outside the cupola.

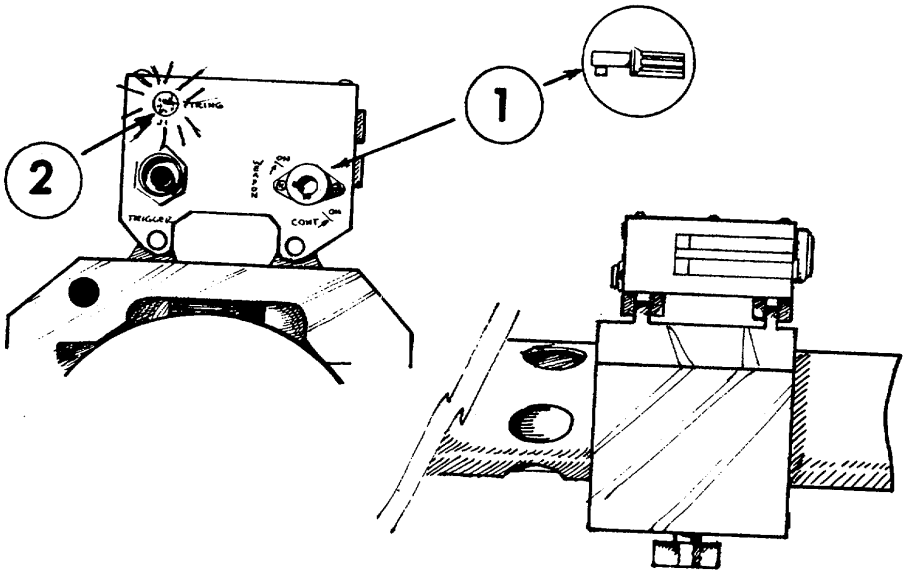
4. Slide the transmitter until the foot on transmitter mounting bracket drops into the front hole on the cooling jacket. Be sure transmitter is in the place shown.

5. Swing plate up under the cooling jacket.

6. Attach the plate to the transmitter bracket using the knob.

7. Securely tighten the knob with your hand.

TASK
4 Blank-Fire Operation
MG



- Make sure Task 3 has been completed.
- Ask Controller to reset transmitter.

1. Turn orange weapon key to WEAPON ON.
   - Load the M85 with blank ammunition.
2. Watch the firing light on the transmitter as you fire a short burst. The lamp should light.

NOTE

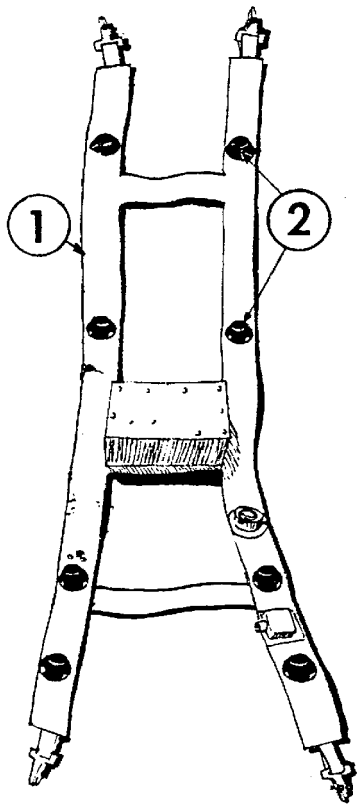
If no light, remove and reinsert the same battery. Ask Controller to reset the transmitter and test again. If still no light, replace the battery. Ask Controller to reset the transmitter, and test again. If still no light, report on DA Form 2402, and replace the transmitter. If the lamp stops fighting during the exercise, replace the transmitter battery, and ask the Controller to reset the transmitter.

- The M85 is ready to fire. The sound of blanks firing will trigger the transmitter. The transmitter will operate only when blank ammunition is fired.

TASK

1 **Inspect and Clean Torso Harness**

MWLD



1. Inspect torso harness for any damage that would prevent normal operation.

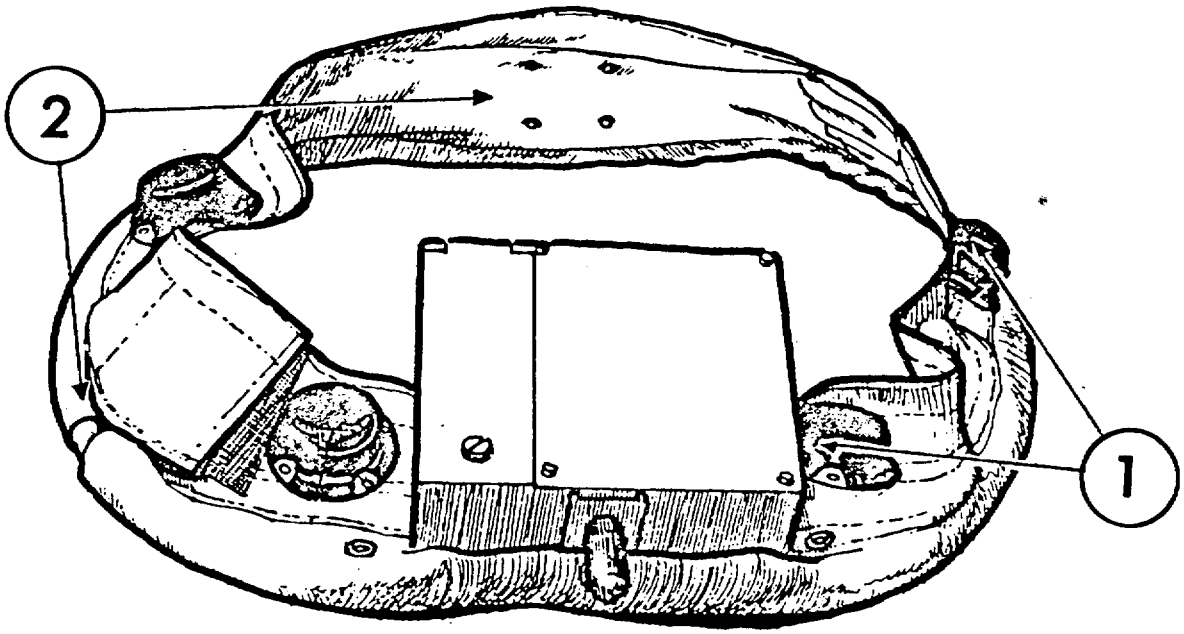
2. Wipe detectors clean (clean all 8).

- Report any damage on DA Form 2402, and replace torso harness if inoperable.

TASK

2 **Inspect and Clean Helmet Harness**

MWLD



1. Wipe detectors clean. (Clean all 5.)

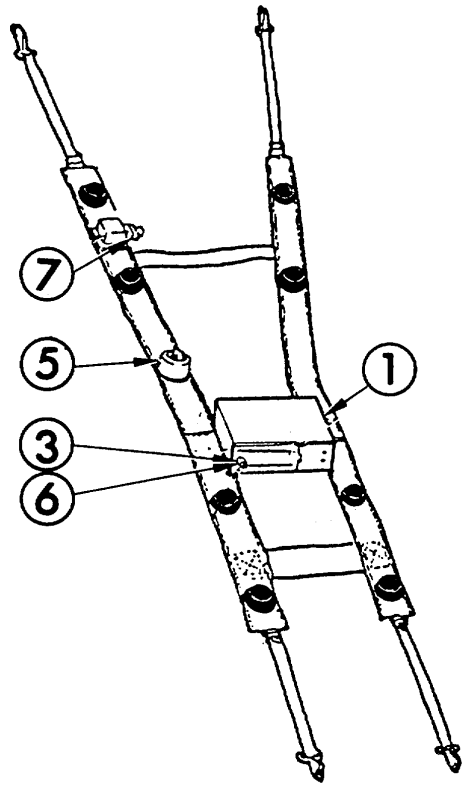
2. Inspect helmet harness for any damage that would prevent normal operation.

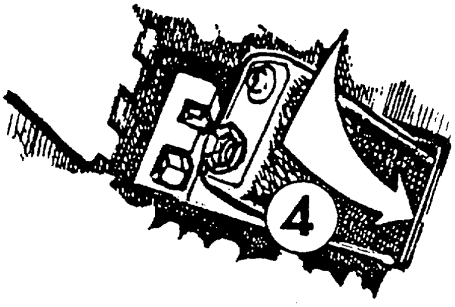
- Report any damage on DA Form 2402, and replace helmet harness if inoperable.

TASK

3 **Install Batteries in MWLD Harnesses**

MWLD





1. Locate battery boxes on both helmet and torso harnesses.

2. Put a battery in the helmet harness first.

3. Loosen thumbscrew and open door.

4. Put in battery as shown.

5. When you put a battery in the torso harness, an alarm should sound.

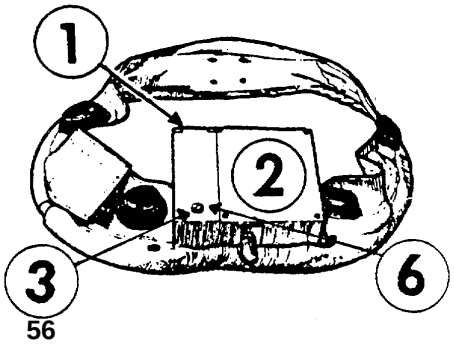
NOTE

If no alarm, remove and reinsert the same battery and try again. If still no alarm, get a new battery from your NCOIC and try again. If still no alarm, report on DA Form 2402, and replace the torso harness.

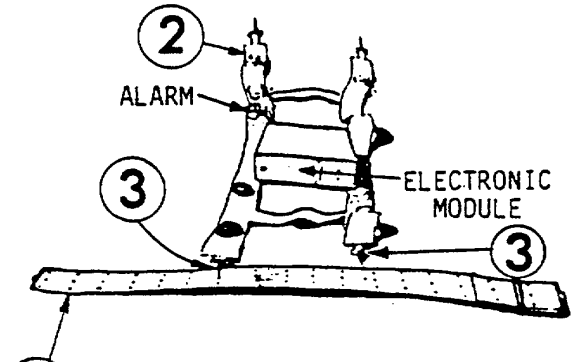
6. Close door and tighten thumbscrew.

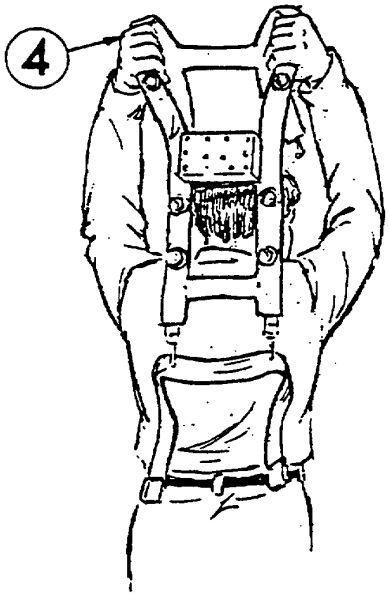
7. Ask controller to insert his green key in key receptacle and turn off alarm.

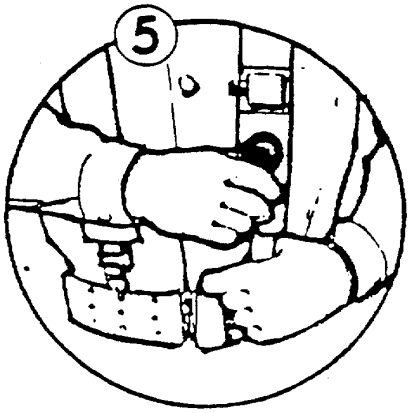
- BE SURE TO PUT BATTERIES IN BOTH THE TORSO AND THE HELMET HARNESSES.



TASK
4 **Put on Torso Harness**
MWLD







- If you are wearing them, remove the suspenders from your web gear.

1. Remove your web belt and lay it next to the harness as shown.

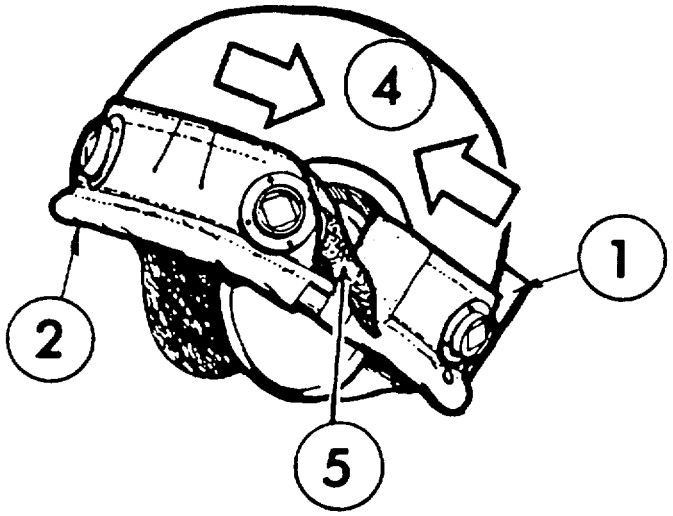
2. The harness should look like this with the alarm above the electronic module.

3. Fasten both clips to the belt.

4. With your web belt at the bottom, raise the harness and then lower it over your head.

5. Connect the harness to your web belt. Adjust harness so battery box is at the back of your collar, at the collar line.

TASK 5 MWLD **Put Helmet Harness on Helmet**



- Your helmet must have three patches of Velcro installed on the outside. If you do not have any Velcro on your helmet, turn to page 15 for instructions on installing the Velcro.

1. Slip harness over helmet so that the electronics box is at the rear.

2. Make sure the heavy cable overhangs the lip of the helmet.

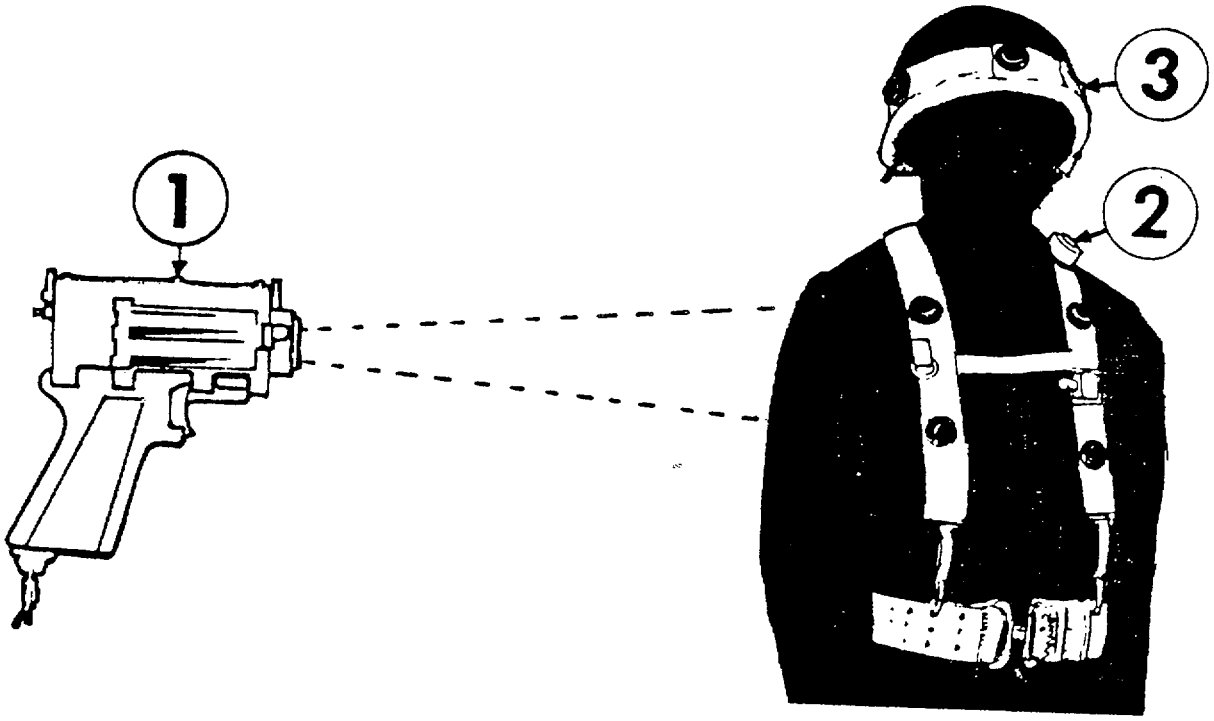
3. Adjust the harness so that the three pieces of Velcro on the inside of the harness line up with the Velcro pieces attached to-the outside of your helmet.

4. Pull the harness ends in the direction of the arrows to tighten the harness.

5. Fasten the Velcro flap tightly.

- When you wear your helmet, fasten the chinstrap. The added weight of the harness makes this necessary.

TASK 1 TEST **Test Operation of MWLD**



1. Ask controller to test your torso harness, using "NEAR MISS" on his controller gun.

2. When he fires, your alarm should sound briefly.

NOTE

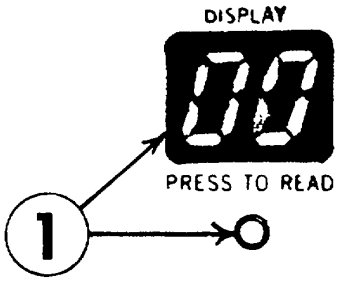
If no alarm, remove and reinsert the same battery in the torso harness and test again. If still no alarm, replace the battery in the torso harness (See MWLD Task 3) and test again. If still no alarm, report on DA Form 2402, and replace the MWLD.

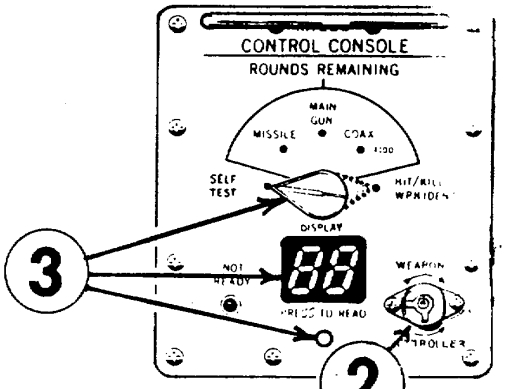
3. Ask controller to test helmet harness for an alarm.

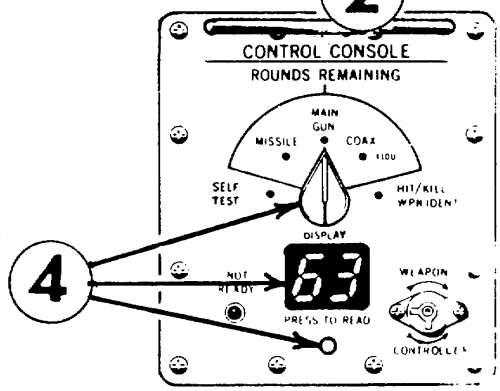
NOTE

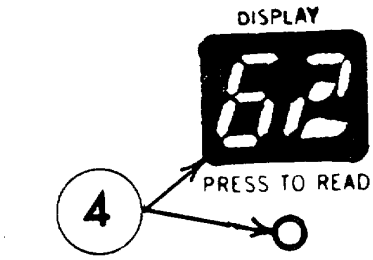
If no alarm, make sure that the bottom of the harness overhangs the entire rim of the helmet and test again. If still no alarm, remove and reinsert the same battery and test again. If still no alarm, place helmet on another soldier who is wearing an operating torso harness and test again. If still no alarm, replace the battery in the helmet harness (See MWLD Task 3) and test again. If still no alarm, report on DA Form 2402, and replace the MWLD.

TASK
2 Test MILES System









Before doing this task, check with your TC TEST to make sure all Outside, Inside, MG, MWLD tasks, and Test Task 1 have already been done.

Turn MASTER VEHICLE POWER to ON.

Control Console Test

1. Push PRESS TO READ button on control console. Display should show 00.

NOTE
If display does NOT show 00, go to page 63.

2. Ask the controller to reset the system by inserting his green key in key receptacle on control console. Turn to CONTROLLER. Turn back and remove key.

3. Turn console switch to HIT/KILL WPN IDENT Then turn to SELF-TEST. Press display button. Display should show 88.

NOTE
If display does NOT show 88, go to page 63.

4. Turn console switch to MAIN GUN. Push PRESS TO READ button. Display should show 63.

NOTE
If display does NOT show 63, go to page 63.

5. Insert orange weapon key into control console receptacle, turn, then turn key back and remove. Verify that a tone sounds in the vehicle's intercom and that the CVKI light flashes continuously.

NOTE
If no intercom tone, go to page 64. If CVKI does not flash, go to page 65.

o Ask controller to reset the control console.

Trigger Interface Test

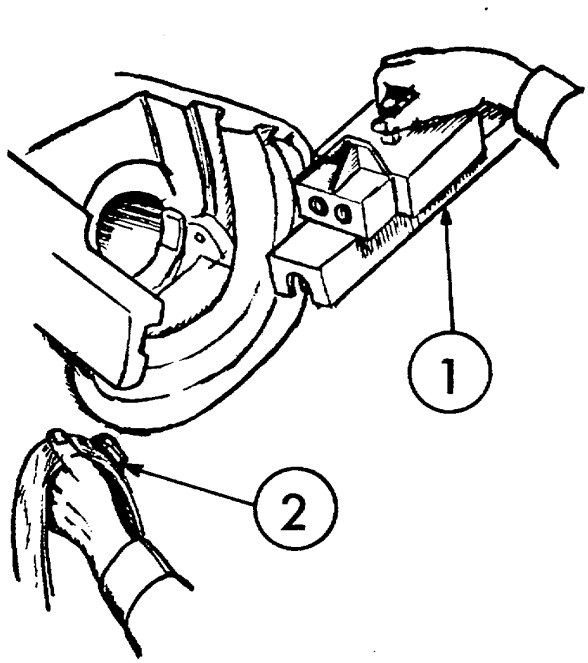
1. Set MAIN GUN SWITCH on GUNNER'S CONTROL PANEL TO ON.

2. Set MAIN GUN SAFETY on OFF, and fire the main gun.

3. Push PRESS TO READ button. Display should show 62.

NOTE
If display does NOT show 62, go to page 63.

TASK
2
TEST



Main Gun Transmitter Test

1. Temporarily remove the 105 mm transmitter from the main gun breech.

2. Hold torso harness in front of the transmitter. Fire the main gun trigger and listen for a kill indication. Make sure the torso harness used for the test has a battery installed and has been tested for proper operation.

NOTE
If no indication, go to page 64.

Coax Machine Gun Transmitter Test

1. Make sure coax is loaded with blank ammunition.

2. Turn MAIN GUN SWITCH on GUNNER'S CONTROL PANEL to OFF. Turn MACHINE GUN SWITCH to ON.

3. Take the coax off SAFE.

4. Hold a man worn torso harness in front of the main gun transmitter and fire the coax machine gun. Listen for a kill or near miss indication.

NOTE
If no indication, go to page 64.

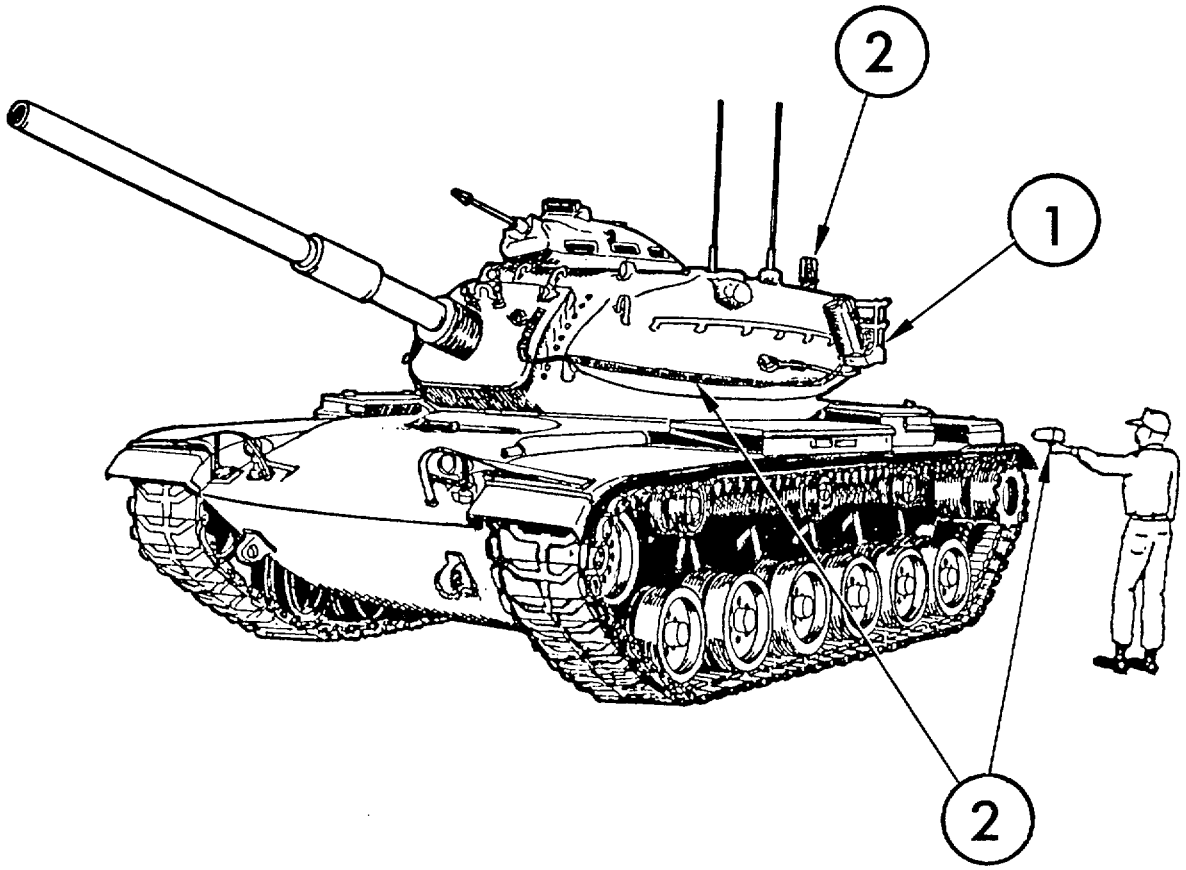
5. Ask the controller to reset your system.

6. Turn machine gun switch on gunner's control panel to OFF.

7. Place coax machine gun on SAFE.

8. Place main gun transmitter in the breech of the main gun (See Inside Task 7).

TASK 2 TEST



BELT TEST

- Make sure MASTER VEHICLE POWER is ON.

1. Check that all cable connections to the detector belt segments are tight. Ask a crewmate to check that the CVKI cable connections to the control console and the No. 138 power connection are also tight. Make sure ground wires make contact with bare metal.

2. Ask the controller to test your belt segments by setting his controller gun on "Near Miss." He will aim his gun at each detector and fire at them. Each time he does, the CVKI light should flash.

    - If the CVKI fails to flash for some or all of the detectors, go to page 65.

        - It is OK for one detector on each belt segment to be bad.

    - If no intercom tone, go to page 64.

TROUBLESHOOTING PROCEDURES:

NO 00

If the display shows a number OTHER THAN 00 or is blank:

A. Disconnect and reconnect cable connectors labeled Control Console and Battery.

- Check for 00 by pushing PRESS TO READ button on control console.
- If display shows 00, go to Step 2 on page 60.

B. If display is still blank, ask the controller to check out the equipment using the vehicle test set.

NO 88

If the display does not show the number 88:

A. Turn console switch to HIT/KILL WPN IDENT and back to SELF TEST.

- If display shows 88, go back to Step 2, page 60.

B. If display still does not show 38, ask controller to check out the equipment using the vehicle test set.

NO 63

If the display does not show the number 63:

A. Ask controller to check out the system using the vehicle test set.

NO 62

If the display does not show the number 62:

A. Make sure all MILES trigger cable connections are tight (see Inside Task 9).

- Fire the main gun.
- Check for 62.
- If display shows 62, go to Main Gun Transmitter Test on page 61.

B. If still no 62, ask controller to check out the system using the vehicle test set.

TROUBLESHOOTING PROCEDURES:

NO INDICATION, MAIN GUN HIT

If kill indication when fired at MWLD torso harness:

A. Make sure all MILES breech cable connections are tight (see Inside Task 9).

- Fire the main gun at a man worn torso harness held in front of the transmitter inside the turret.
- If a kill indication occurs, go on to test the coax MG on page 61.

B. If still no kill indication, ask the controller to check out the system using the vehicle test set.

INDICATION, COAX MACHINE GUN HIT

- hit indication when fired at a target:

A. Make sure the coax microphone cable connections are tight (see Inside Task 9).

- Fire coax machine gun at a target.
- If hit indication occurs, go on to Step 5 on page 61.

B. If still no hit indication, ask the controller to check out the system using the vehicle test set.

NO INTERCOM TONE

1. Make sure vehicle intercom is turned on.
2. Make sure the intercom cable connections are tight at the intercom terminals.
3. If still no tone, ask controller to check out the equipment using the vehicle test set.

TROUBLESHOOTING PROCEDURES:

NO CVKI FLASH

1. Make sure CVKI cable connection is tight.
2. Make sure No. 138 power connections are tight.
3. If still no flashing, ask controller to check out the equipment using the vehicle test set.

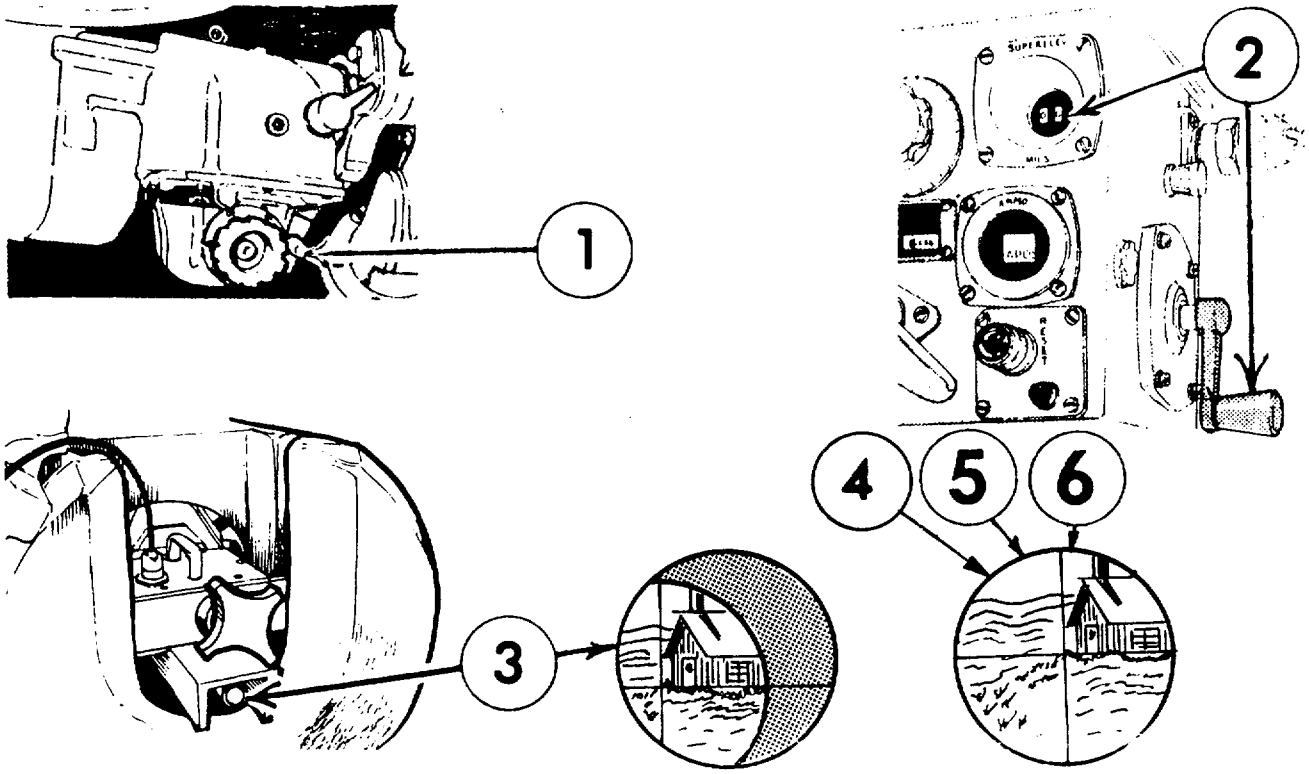
FAULT DETECTOR BELT SEGMENTS

1. Check cable connections at the detector belt segments.
2. If detector belt segments are still faulty, ask controller to check out the equipment using the vehicle test set.

TASK

1 Align Main Gun/
Coax MG Transmitter

ALIGN



- Target must be selected and set up before beginning this task.

1. Turn the ballistic computer OFF.

2. Manually, crank out superelevation until counter reads zero.

3. Align main gun transmitter using telescope in transmitter housing. The side of the barrel may be seen through the telescope. That is OK as long as the center of the crosshairs can be seen in the muzzle opening.

4. Align the gunner's primary direct fire sight to match crosshairs on transmitter telescope.

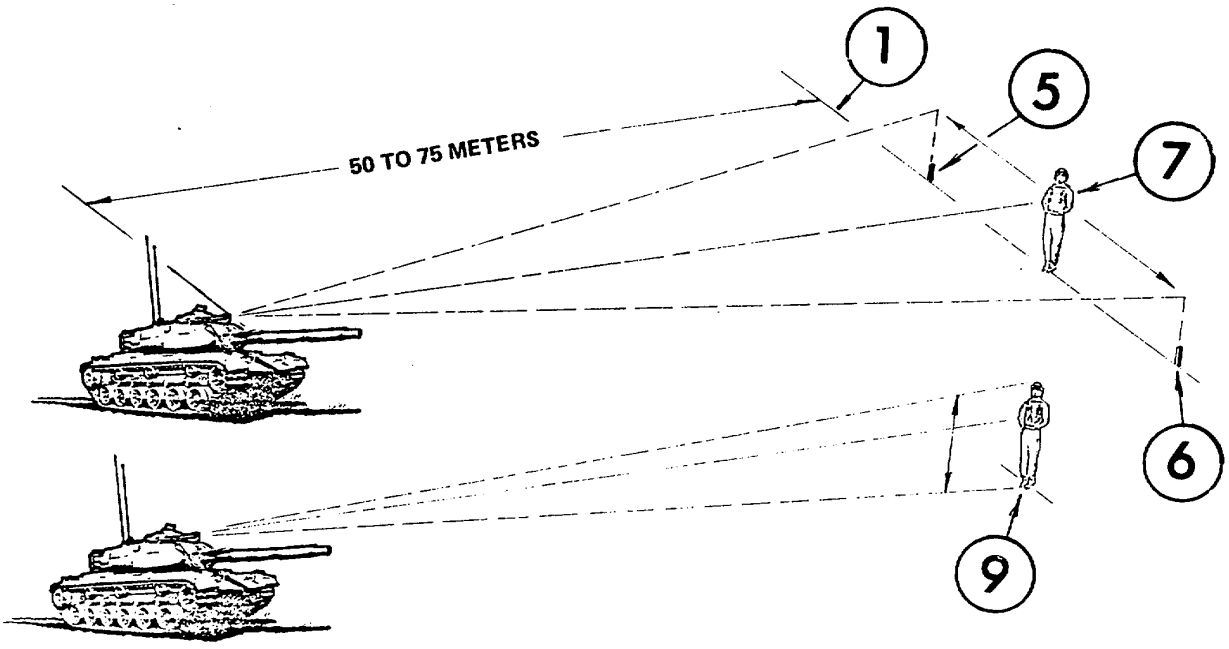
5. Align the 105D telescope to match the transmitter crosshairs.

6. Align the commander's rangefinder sight to match crosshairs on the transmitter telescope 7. Fire at target with the main gun. Verify that target was hit. If not, check alignment.

8. Leave the ballistic computer turned OFF while using MILES equipment. Tape the computer ON/OFF switch in the OFF position.

9. This procedure also aligns the coax machine gun.

TASK
2 **Align M85 Mac line Gun**
ALIGN



The M85 transmitter must be aligned in the dry fire mode using the dry fire trigger cable. Ask the controller for a cable and, if necessary, instructions for installing and using it.

To align the M85 machine gun you will need a soldier with a helmet and torso harness on.

1. Send the soldier out about 50 to 75 meters away from the tank. He should have a green controller key in his key receptacle. The key should be in the Controller position. This will allow the MWLD to be continuously fired upon and will only give a "near miss" indication.

2. Connect dry fire cable assembly. Ask controller to initialize the system.

3. Insert an Orange Weapon Key in the transmitter receptacle and turn to WEAPON ON.

4. Fire at the soldier while scanning side-to-side and up and down until the soldier's buzzer sounds a "near miss." Once a near miss sounds, hold the M85 machine gun in that position.

5. While continuing to be "fired" upon, the soldier now moves to his right to the point where his buzzer stops. He marks this point on the ground.

6. While continuing to be "fired" upon, the soldier now moves to his left to the point where his buzzer stops. He then marks this point on the ground.

7. The soldier then estimates the center between the two marks and stands there.

8. The tank commander now adjusts his sights on the soldier.

9. The tank commander, continuing to fire, moves his aim point up and down noticing where the buzzer stops. He estimates the center and boresights the crosshairs to that point.

10. Next the tank commander should practice reaiming and firing a few times to insure his weapon is properly aligned.

TASK 1 OPER **Hoffman Device Safety Measures**

WARNING

1. ATTENTION! BEFORE LOADING, RELOADING OR UNLOADING REMOVE THE KEY.

   The device shall only be loaded, reloaded or unloaded in the "LOADING POSITION." THE GREEN SIGNAL LIGHT MUST SHINE.

2. When loading, reloading or unloading, do NOT stand IN FRONT of the device.

3. When the device is loaded, the protective cover must NOT be drawn over the firing drums.

4. "Readiness for firing" shall not be established until the commander has given the order to do so. "Readiness for firing" as follows:

   - SWITCH ON THE IGNITION LOCKOUT
   - RED SIGNAL LIGHT MUST SHINE

5. "SETTING TO SAFETY" occurs by switching off the security lockout switch and removing the key. Gun loader to report: "DEVICE SET AT SAFE."

6. Should stoppages occur, further firing and reloading are permitted. The following points must, however, be observed.

   - Subsequent and still loaded pyro charges must first be fired off.
   - Do NOT make preparations for reloading until a security interval of 15 minutes has elapsed.
   - When reloading, LEAVE THE NON-IGNITED DUDS IN THE FIRING DRUMS. Cut the non-ignited dud(s) out of circuit by pulling out the plug of the ignition leads belonging to the dud(s) and by placing a short-circuit cap over the plug.
   - Pull tight the ignition leads and plug with short-circuit cap and secure them again on the ignition leads retainer.
   - Reload the device.
   - After completion of the training practice, pyro experts shall be called in to unload and destroy the ignition dud(s).
   - SAFETY DISTANCES when FIRING: 50 METERS IN FRONT: 25 METERS ON EACH SIDE.
   - Firing within a RADIUS OF 150 METERS FROM BUILDINGS IS FORBIDDEN.

TASK

1 **Place Hoffman Device into Ready Fire Operation**

OPER

PREPARATION FOR FIRING

1. Press the yellow contact button and adjust the automatic firing-device to the "LOADING POSITION." The green signal light must be on.

2. When loading, do NOT stand in front of the firing-device. Load either from the side or from behind. Make sure the lockout switch is off and the key is removed.

3. Preparing the pyro charges for loading:

   - Remove the adhesive tape
   - Remove the cover
   - Pull the ignition leads and plug taut

4. Insert the pyro charges into the firing drums down to the base.

5. Draw the ignition leads over the rim of the drum to the rear, pull taut, and wrap them firmly around the retainer in such a way that the plug can be inserted in the corresponding socket after removal of the short-circuit cap. The short-circuit caps are to be kept for a possible unloading.

6. READINESS FOR FIRING (to be carried out on the orders of the commander)

   - Insert the key into the lockout safety switch, press down, and turn to the left.
   - The switch clicks into position. The red signal light shines.
   - The "Readiness for Firing" is established.
   - The gun-loader reports: "Ready to fire."

7. SETTING TO SAFETY

   On the command "SET TO SAFETY," the gun-loader removes the key from the lockout safety switch by turning it to the RIGHT. The RED SIGNAL LIGHT must EXTINGUISH. The device is now safeguarded against inadvertent firing.

8. When the firing drums are loaded, the protective cover must not be drawn over the device. Weather conditions have no adverse effect on the functioning of the pyro charges.

FIRING

9. On the command of the tank commander, the automatic firing device is to be made ready for firing. When the "order to fire" is given by the tank commander, the pyro charges are individually fired off by the tank cannon firing mechanism.

RELOADING

10. For safety reasons, the following procedure is to be followed on reloading:

- Switch off the lockout safety switch, and remove the key.
- Press the yellow contact button, and bring the device into the "loading position." Green signal light must shine.
- Remove the remains of the ignition leads and also the plug belonging to the fired-off pyro charges.
- With the aid of the cleaning tool, brush out all residue left in the firing drums, removing the coarser residue with the scraper.
- Reload pyro charges.

11. Reloading is to be carried out in the same way regardless of whether the Hoffman device is partially reloaded or fully reloaded.

UNLOADING

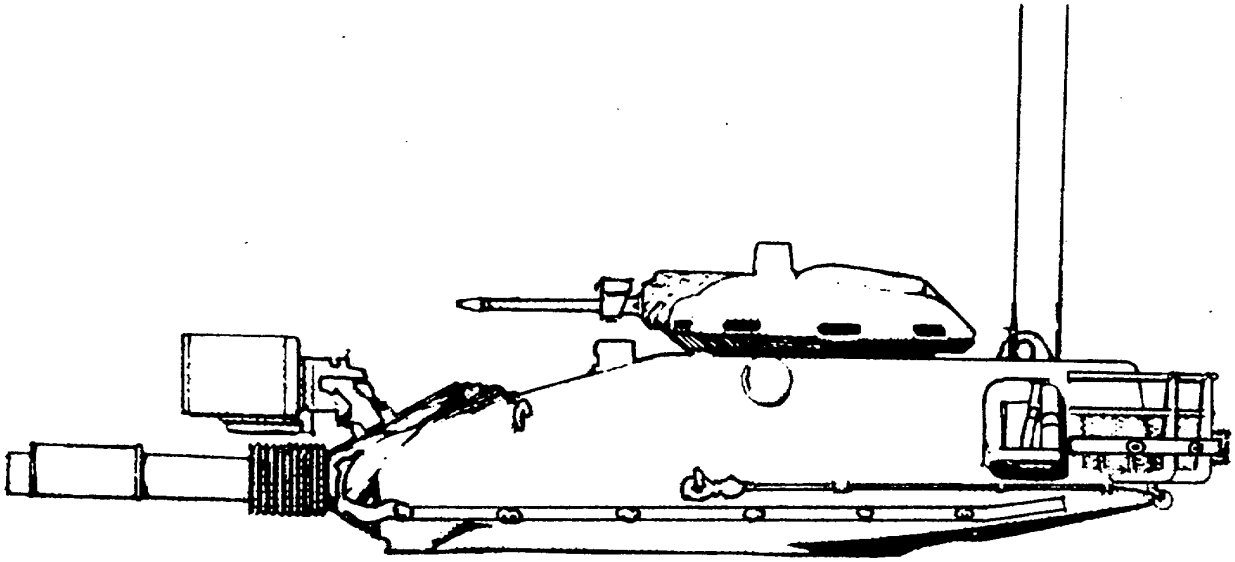
12. The following procedure is to be observed when unloading the Hoffman device:

- Switch off the ignition lockout of the automatic firing device. Remove the key.
- Unscrew the power supply coupling on the automatic firing device. Disconnect the plug.
- Withdraw the plugs of the pyro ignition leads from the sockets. Attach the short-circuit caps to the plugs and unwrap the ignition leads from the retainers.
- Withdraw from the firing drums the pyro charges attached to the ignition leads.
- Place the protective caps on the pyro charges and pack the charges away.

TASK

2 Fire Main Gun or Coax MG

OPER



1. Both the main gun and the coax machine gun are fired using normal procedures.

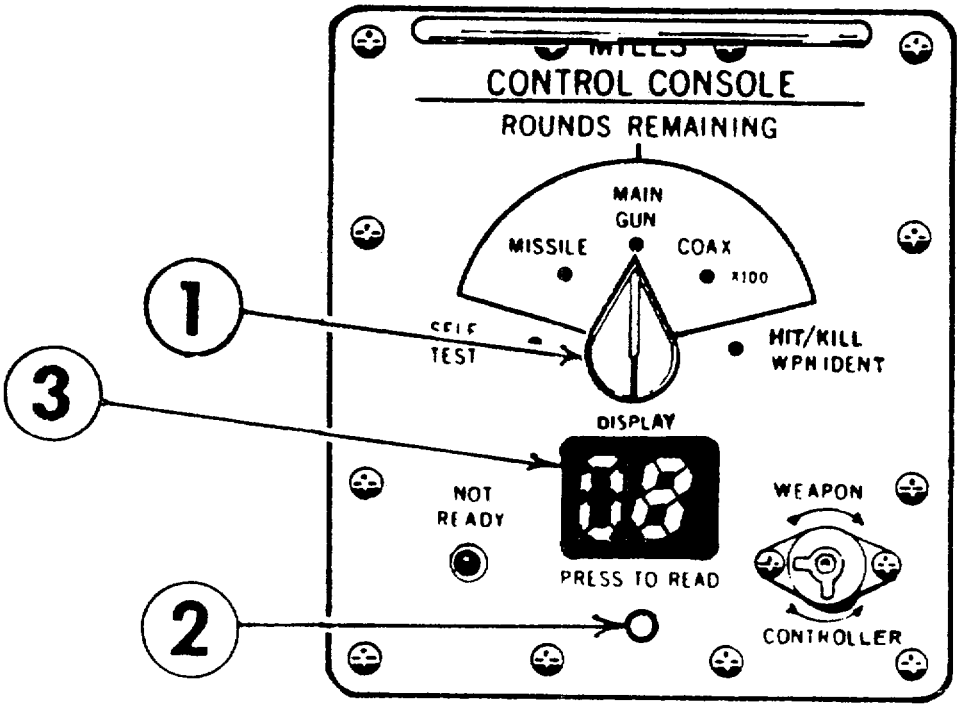
CAUTION

Both transmitters will fire if both switches on the GUNNER'S CONTROL PANEL ARE ON.

2. When firing the main gun, you must wait five seconds between "rounds" before you can fire again. This delay simulates loading time. When the gun is ready to fire again, the NOT READY light on the control console will go out.

3. The coax transmitter operates when blanks are fired. The transmitter will not operate when blank ammunition is gone.

- Do NOT attempt to use the ballistic computer.



- If you wish to see how many rounds are left in your weapons:

  1. Set the switch to the weapon of interest (main gun or coax). Do not set the switch to MISSILE your tank does not fire missiles.

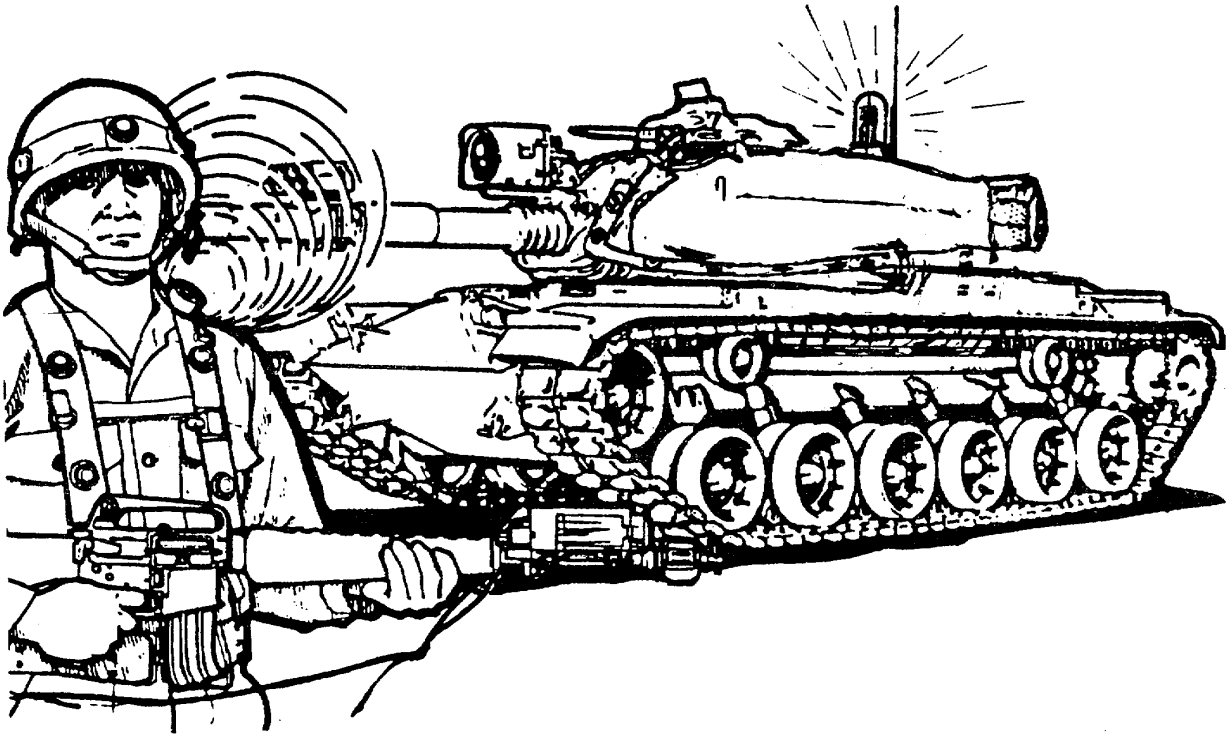
  2. Push PRESS TO READ button.

  3. With the button held down, read the display for rounds remaining.

- The display shows the rounds remaining. If the display shows 00, you have no rounds left.

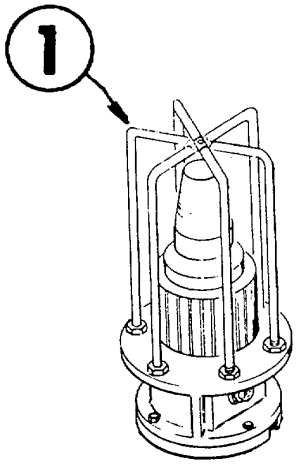
- The number of coax rounds remaining is 100 times the number displayed.

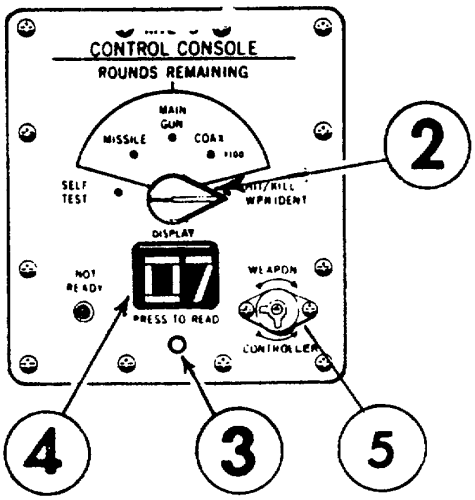
TASK 3 OPER **Observe Your Target**



- If detectors are hit by laser fire, alarms on vehicle CVKIs will flash and personnel MWLDs will sound. Usually, you will not be close enough to hear the alarm.
- If you "kill" a vehicle; the CVKI light flashes continuously.
- If a vehicle is "hit" but not "killed," the CVKI light flashes four to six times.
- If a vehicle is "near missed," the CVKI light flashes twice.
- If you "kill" personnel, soldiers remove yellow weapon keys from laser transmitters to turn off buzzers.

TASK
4 **Recognizing Enemy Fire**
OPER





1. If you are hit by laser fire, the CVKI light will flash. You will also hear tones of the intercom unit. A brief alarm (2 CVKI flashes and 2 intercom beeps) means a "NEAR MISS." Repeated 4 to 6 intercom tones and 4 to 6 CVKI flashes mean a "HIT." A continuous alarm means a "KILL".

2. To determine what kind of weapon has fired on you, turn the switch on the control console to the HIT/KILL WPN IDENT position.

3. Push PRESS TO READ button.

4. The display will show a number. Use the chart below to match the number on the display with the type of weapon firing on you.

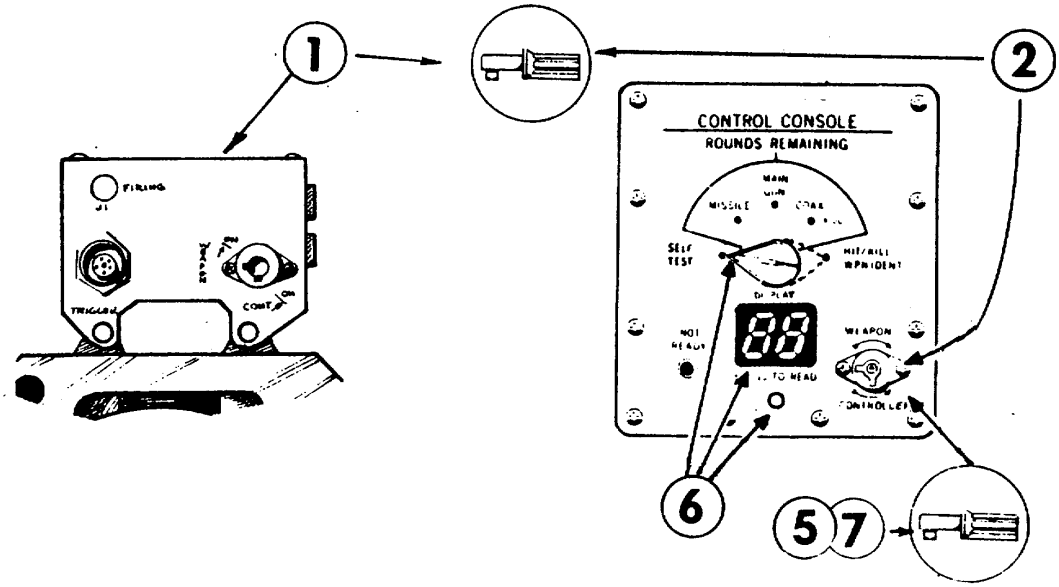
Display Number	**Weapon**
00	Controller Gun
07	TOW or Shillelagh
08	DRAGON
12	105 mm
13	152 mm
14	2.75 in. Rocket
15	VIPER
16	120 mm
99	Self-Kill

NOTE

If any other codes appear other than those listed, call a controller immediately.

5. "Self-Kill" results when the orange weapon key is put in the control console when you have not been "killed" by laser fire. When the key is inserted and turned to WEAPON position, the 99 will show, and the CVKI light will flash continuously. When key is removed, a continuous tone will be inserted in the intercom. You must then call the controller to reset your system.

TASK
5 **Reset After a 'Kill'**
OPER



- If your tank is "killed," the main gun and coax machine gun transmitters are automatically turned off.

1. To silence your intercom alarm after a "KILL," remove the orange weapon key from the M85 machine gun transmitter. THE M85 TRANSMITTER WILL NO LONGER FIRE.

2. Insert the orange key in the control and turn off the intercom alarm. IF YOU REMOVE KEY FROM THE CONSOLE, THE ALARM WILL BEGIN AGAIN. The CVKI light continues to flash. It can be turned off only by the controller.

3. To reset: Remove orange weapon key. Alarm will sound. Ask the controller to turn off your intercom alarm and CVKI light. This resets control console.

4. Turn control console switch to HIT/KILL WPN IDENT. Then turn to SELF TEST. Push the PRESS TO READ button. Display should show 88. If no 88, turn to page 63 and do the troubleshooting procedure.

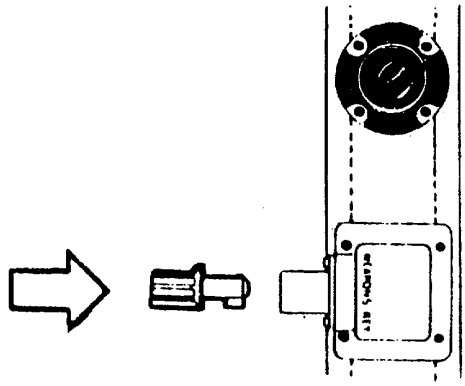
5. Put your orange weapon key back in the M85 transmitter and turn it to WEAPON ON.

- The controller will determine when to reset your system.

TASK

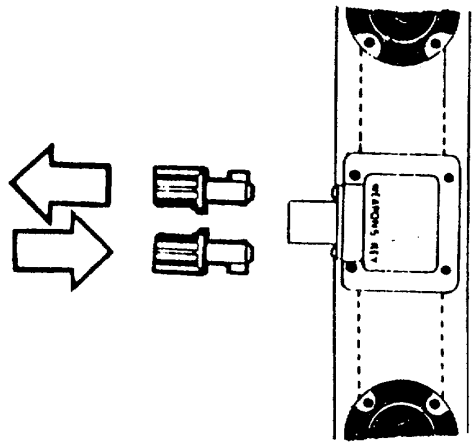
6 OPER

Turn Off and Reset MWLD Alarm



To turn off alarm:

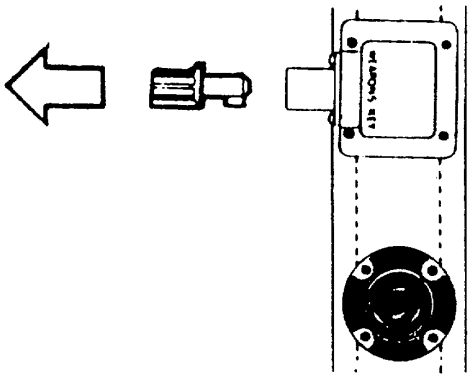
1. Insert yellow weapon key in receptacle on torso harness. Turn off alarm.



To reset alarm, you must call the controller.

2. Remove yellow weapon key from receptacle. (Alarm will sound).

3. Ask controller to put green controller key in and turn off alarm.



4. Ask controller to remove green key. Alarm is reset.

TASK
7 Remove, Inspect, Service and
OPER Return all MILES Equipment

Use the checklist below to do this task. If you need help doing a step, refer o the tasks listed beside it.

Outside Tasks:

1. Remove and inspect CVKI cable assembly. See Outside Task 6. (Do this after Inside Step 2 has been done.)

2. Remove and inspect the CVKI. See Outside Task 5.

3. Remove and inspect detector belt segments and mounting blocks. Leave the Velcro tape on the vehicle. See Outside Tasks 3 and 4.

4. Remove, inspect, and service Hoffman device simulator body with mount.

M85 MG Tasks:

1. Remove the M85 transmitter. See MG Task 3.

2. Remove the battery from the M85 transmitter and close battery compartment door. See MG Task 2.

3. Inspect and service M85 MG transmitter. See MG Task 1.

4. Remove, inspect, and service M85 MG blank firing attachment.

Inside Tasks:

1. Remove and Inspect MILES Inside cables. See Inside Tasks 8 and 9.

2. Remove battery box. Remove batteries from battery box and inspect battery box. See Inside Task 3.

3. Remove and inspect control console. See Inside Tasks 1 and 2.

4. Remove and inspect the main gun/coax MG transmitter. See Inside Task 7.

5. Remove and inspect coax microphone assembly. See Inside Tasks 4 and 5.

MWLD Tasks:

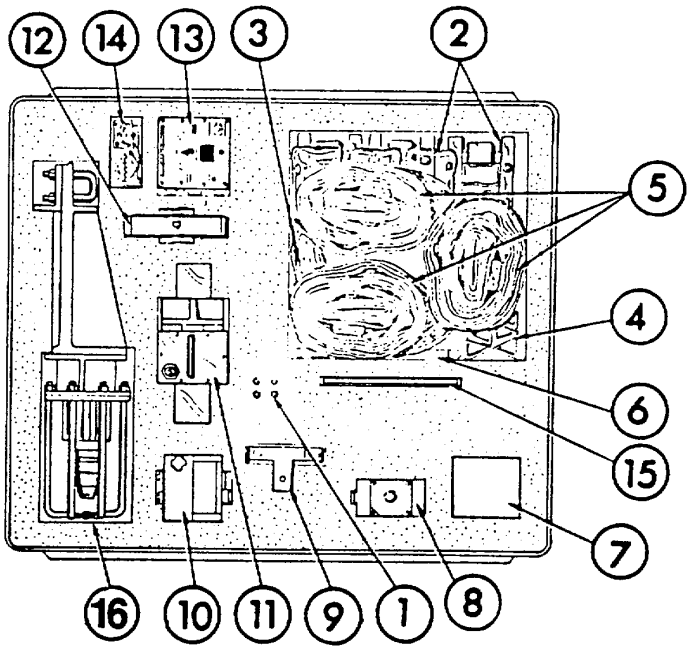
1. Remove MWLD Harnesses. See MWLD Tasks 4 and 5.

2. Remove batteries from MWLD harnesses and close battery doors. See MWLD Task 3.

3. Inspect and service the MWLD. See MWLD Tasks 1 and 2.

Return all MILES equipment, unused blank ammunition and Hoffman device cartridges to your NCOIC. You may be asked to return your MILES equipment to its transmit case. If so, follow the instructions on the next page.

TASK
7
OPER



Transmit Case Loading Instructions

1. Place orange weapon key from the M85 transmitter and the three yellow MWLD Keys in the spaces provided.
2. Fold up the three MWLD torso harnesses and place them in the large space, as shown. Place the three helmet harnesses on top of the torso harnesses.
3. Roll up the vehicle cables and place them next to the MWLD harnesses.
4. Place the 10 triangle-shaped mounting blocks next to the cables.
5. Roll up the three detector belts and place them on top of the cables.
6. Lay ground strap and the coax machine gun microphone assembly next to the MWLD harnesses.
7. Make sure the two mounting bars are attached to the control console bracket with the wing nuts. Place the bracket in its proper place.
8. Place the battery box with the connector facing up in the space provided.
9. Place the stop assembly extractor with its knob facing down into the space provided.
10. Place the M85 transmitter on its side in the space provided.
11. Place the main gun transmitter with its handle up in its space.
12. Place the retainer assembly, handle down, into its space.
13. Insert the control console, face up, into its space.
14. Place miscellaneous hardware in space next to control console.
15. Insert the Operator's Manual in the slot next to the weapon keys.
16. Place CVKI in space provided.

APPENDIX A

REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, and technical manuals referenced in this manual.

A-2. FORMS

SF 368	Quality Deficiency Report
DA Form 2028-2	Recommended Changes to Equipment Technical Publications
DA Form 2062	Hand Receipt
DA Form 2402	Exchange Tag
DA Form 2404	Equipment Inspection and Maintenance Work Sheet

A-3. FIELD MANUALS

FM 21-11	Field Manual: First Aid for Soldiers

A-4. TECHNICAL MANUALS

TM 9-1005-231-10	Operator's Manual: M85 Machine Gun
TM 9-1005-313-10	Operator's Manual: M240 Machine Gun
TM 9-2350-257-10	M60A1/A3 Operator's Manual
TM 9-2350-215-10	Operator's Manual: M60A1 Tank
TM 9-6920-444-12&P	Operator's and Organizational Maintenance Manual: Blank Firing Attachment (BFA) M20 or Cal .50 M85 Machine Gun
Hoffman-Werke, 1 April 1979	Operator's and Maintenance Manual: Cannon, Fire Simulator
TM 9-1265-369-10-1-HR	Hand Receipt for Simulator System, Firing, Laser: M65 for M60A1/A3 Tank

A-5 MISCELLANEOUS PUBLICATIONS

AR 310-2	Identification and Distribution of DA Publications
SB 11-6	Dry Battery Supply Data
DA PAM 738-750	The Army Maintenance Management System (TAMMS)

APPENDIX B

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

SECTION I. INTRODUCTION

This appendix lists integral components of the M60A1/A3/MILES system. All items, except for the expended items in the installation Kit, must be returned to your NCOIC, following a training exercise.

Explanation of Columns:

National Stock Number: Stock requisition number.

Description: Lines 1 and 2 give a brief item description.

U/M: Unit of Measure

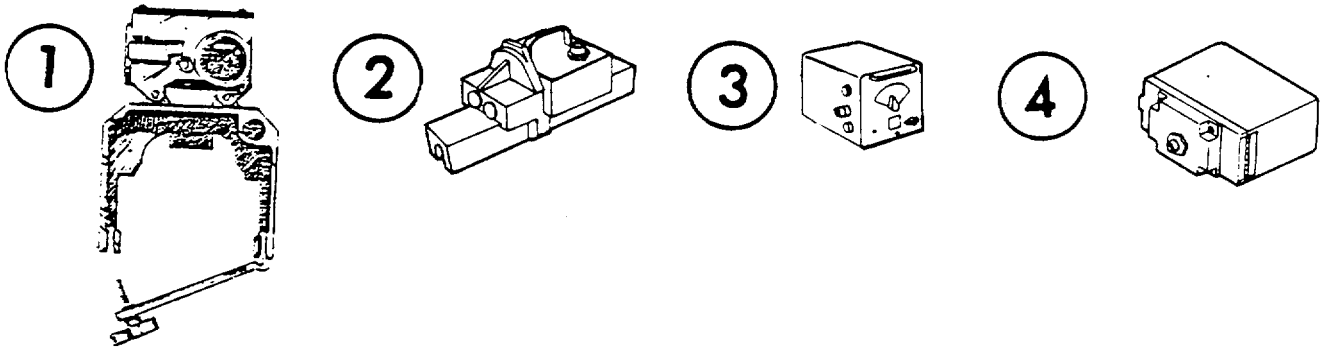
Qty: Quantity of item furnished for each piece of equipment.

Illustration Number: Number of the illustration in which the item is shown.

SECTION II. COMPONENTS OF END ITEM

National Stock Number	Description FSCM & Part Number	U/M	Qty	Illustration Number
1265-01-078-4042	M85 Machine Gun Transmitter Assembly 1920-11748804	ea.	1	1
1265-01-077-3768	105 mm/Coax Transmitter Assembly 19200-1748805	ea.	1	2
1265-01-076-2028	Control Console 19200-11749396	ea.	1	3
*	Battery Box 19200-117490	ea.	1	4

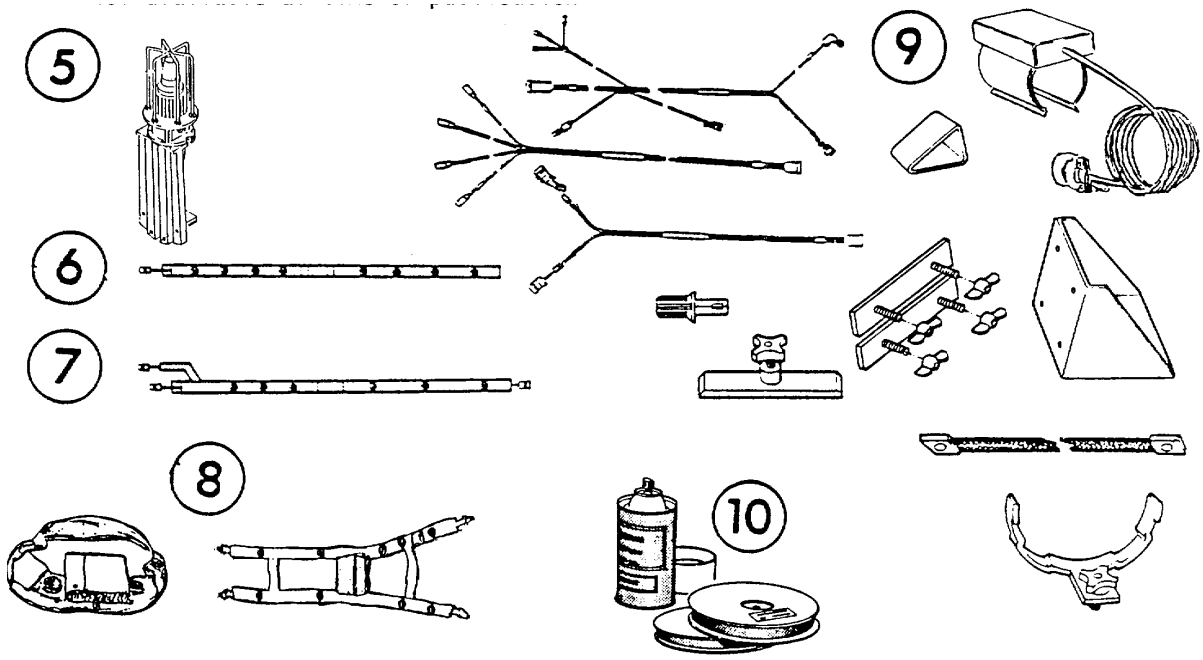
*Not available at time of publication



SECTION II. COMPONENTS OF END ITEM (Cont'd)

National Stock Number	Description FSCM & Part Number	U/M	Qty	Illustration Number
*	CVKI Adapter Assembly 19200-11749728-3	ea.	1	5
1265-01-076-6522	Detector Belt Assembly Segment Number 3 19200-11749300	ea.	1	6
1265-01-076-2035	Detector Belt Assembly Segment Number 4 19200-11749296	ea.	1	7
1265-01-075-4893	Man Worn Laser Detector Assembly 19200-11748808	ea.	3	8
1265-01-077-6391	Adapter Set 19200-11748813	ea.	1	9
1265-01-081-5608	Installation Kit 19200-11749418	ea.	1	10

*Not available at time of publication



SECTION III. BASIC ISSUE ITEMS

1 ea. TM 9-1265-369-10-1 Operator's Manual f/ Simulator System, Firing Laser: M65 f/ M60A1/A3 Tank

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

This appendix lists additional items you will need to operate the 60A1/A3/MILES system.

Explanation of Columns:

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you will need to operate the 60A1/A3/MILES.

National Stock Number	Description FSCM & Part Number	U/M	Qty	Illustration Number
6135-01-063-1978	*Battery, 9 volt 80058 BA-3090/U	ea.	7	Outside Task 2
6135-00-643-1310	*Battery, 6 volt 80058 BA-200/U	ea.	2	Outside Task 2

*Dry battery listed is used with the equipment. It will not be preshipped automatically but is to be requisitioned in quantities necessary for the particular organization in accordance with SB 11-6.

APPENDIX D

SPECIAL TOOLS AND TEST EQUIPMENT

This appendix lists the special tools and test equipment which are used with M60A1/A3/MILES system.

Explanation of Columns:

National stock numbers and descriptions are provided to help you identify and request the special tools and test equipment used with the M60A1/A3/MILES system.

National Stock Number	Description FSCM & Part Number	Illustration
5120-00243-9401	Hand Roller	Page 12

APPENDIX E

EXPENDABLE SUPPLIES AND MATERIALS LIST

This appendix lists the expendable supplies and materials you will use to operate and maintain the M60A1/A3/MILES system.

Explanation of Columns:

National stock numbers, descriptions, and quantities are provided to help you identify and request the expendable supplies and materials you will use to operate and maintain the M60A1/A3/MILES system.

National Stock Number	Description FSCM & Part Number	U/M	Qty
8315-01-111-7170	Velcro Tape 19200-11749428	roll	1
8010-01-040-0947	Tape Primer 19200-11749034	16oz.	1
6640-00-240-5851	Paper, Lens 81349-NNN-P-40	pk.	1

REFERENCE INFORMATION

This section includes the nomenclature cross reference list, list of abbreviations, and explanations of terms (glossary) used in this manual.

A. NOMENCLATURE CROSS REFERENCE LIST

Common Name	Official Nomenclature
Control Console	Console, Simulator System, Laser: For M60 Tank.
Controller Gun	Controller's Gun, Simulator System, Laser.
CVKI	Indicator Simulator System, Laser: Combat Vehicle Kill/Hit/Miss.
Detector Belts Segments	Detector Belt Assembly, Segment No. 3 and Segment No. 4
Dry Fire Plug	Plug Assembly, Dry Fire.
Helmet Harness	Detector Assembly, Simulator system, Laser: Man Worn.
Hoffman Device	Main Tank Gun Weapons Effects Signature Simulator.
M85 Machine Gun Transmitter	Transmitter Assembly, Simulator System, Laser: For M85 Machine Gun.
Torso Harness	Detector Assembly, Simulator system, Laser: Man Worn.
105 mm/Coax MG Transmitter (Main Gun Transmitter)	Transmitter Assembly, Simulator System, Laser: For 105mm/Coax.

B. LIST OF ABBREVIATIONS

CVKI	Combat Vehicle Kill Indicator.
MILES	Multiple Integrated Laser Engagement System.
MWLD	Man Worn Laser Detector.

C. GLOSSARY

Control Console	The MILES device used in vehicles to turn equipment on/off.
Controller	The umpire or referee in a MILES training exercise.
Controller Gun	The device used to test MILES detector systems. May also be used to disqualify soldiers or vehicles from an exercise.
Controller Key	The green key used by the controller to reset MILES transmitters.
Combat Vehicle Kill Indicator	The MILES device attached to provide external flashing light to indicate that the vehicle has been "killed."
Helmet Harness	The part of the laser detector assembly worn on a combat helmet.
Hit	A beep alarm in intercom and flashing external light repeated four to six times means your vehicle has been hit by laser fire.
Kill	In a MILES training exercise, a continuous alarm in intercom sounds and external light flashes indicating the detector assembly was hit by laser fire. If the target was a vehicle, the main gun transmitter is automatically disabled. The orange weapon key is removed from the machine gun transmitter and put in the control console to silence the intercom alarm. MG transmitter will not operate with key removed. If the target was personnel, the yellow key is put in the key receptacle on the MWLD to silence the alarm.
Laser Beam	In MILES, a harmless, invisible beam of light which simulates weapon fire.
Laser Detector Assembly	A device which senses the laser beam directed at it.

Laser Transmitter	A device that sends the laser beam.
Man Worn Laser Detector	The helmet and torso assembly worn by personnel which senses a laser beam directed at it.
Near Miss	A 1 second alarm from the MWLD buzzer or vehicle intercom alarm repeated two times indicates laser fire directed toward you.
Simulator	A training device which takes the place of real equipment and which has many of its characteristics.
Torso Harness	The part of the laser detector assembly worn on the upper body.
Orange Weapon Key	This orange key has two uses: 1. Turns on the M85 machine gun transmitter. 2. When continuous intercom alarm sounds and external light fl ashes, removed from MG transmitter and put in control console to silence intercom alarm.
Velcro Tape	A particular brand name for hook and pile fastener tape. It is used to hold vehicle detector belts and other MILES equipment in place.
Yellow Key	Carried by vehicle personnel wearing MWLDs. When continuous alarm sounds, it is put in the MWLD key receptacle to silence alarm.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

R. L DILWORTH
Brigadier General United States Army
The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-37, Operator's Maintenance requirements for MILES Simulator Sys, Firing, Laser, M65 (for M60A1/A3 Tank).

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

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

WEIGHTS

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

LIQUID MEASURE

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

SQUARE MEASURE

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

CUBIC MEASURE

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

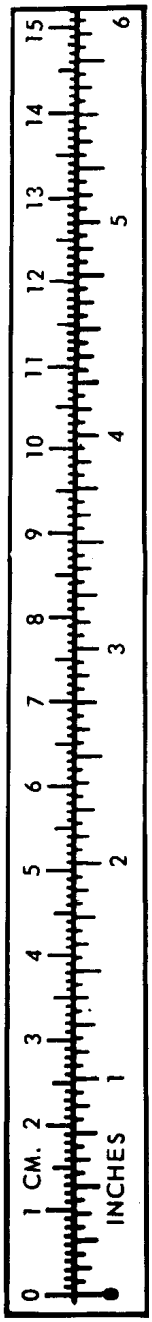
TEMPERATURE

5/9 (°F - 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 (°C + 32) = F°

APPROXIMATE CONVERSION FACTORS

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

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



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