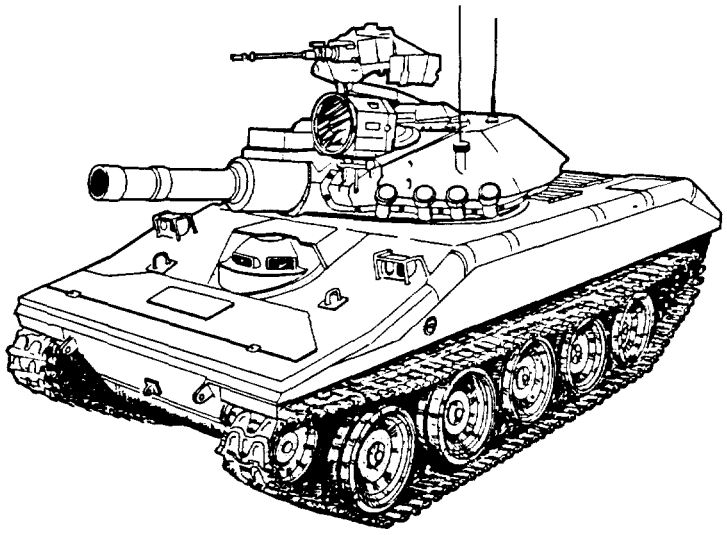
# OPERATOR'S MANUAL
# FOR
# MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)

## SIMULATOR SYSTEM, FIRING LASER: M67
## (NSN 1265-01-077-6081)

## FOR

## M551 VEHICLE



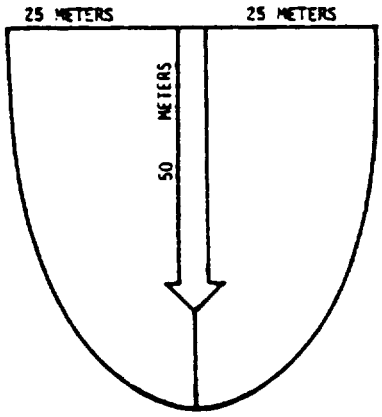
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

**HEADQUARTERS, DEPARTMENT OF THE ARMY**
**JULY 1988**

**WARNING**

WEAR YOUR EARPLUGS The MILES system for the M551 vehicle 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 M2 and Coax Machine Gun Operator's Manuals (TM 9-1005-213-10 and TM 9-1005-233-10) for information on the use of blank ammunition.

**DIRECTION OF FIRE**




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.

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 METERS ON EACH SIDE.
   - Firing within a RADIUS OF 150 METERS FROM BUILDINGS IS FORBIDDEN.

TECHNICAL MANUAL

TM9-1265-369-10-3

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

# OPERATOR'S MANAUL
# FOR
# MULTIPLE INTEGRATED LASER ENGAGEMENT SYSTEM (MILES)
# SIMULATOR SYSTEM, FIRING LASER: M67
# (NSN 1265-01.-077-6081)
# M551 VEHICLE

**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.

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## TABLE OF CONTENTS



*Supersedes TM 9-1265-359-10-3 dated 22 January 1982 including all changes.

**TABLE OF CONTENTS (Continued)**

**TABLE OF CONTENTS (Continued)**

**Skills Needed To Use This Manual**

Equipment Distribution:

The MILES Equipment for the M551 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.

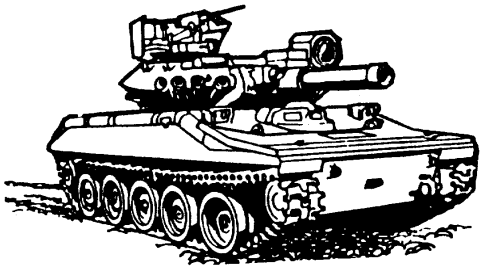
Special Instructions for Infrequently Used Equipment:

If M551 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 M551 AARV weapons (see TM 9-2350-230-10).
2. Install M2 machine guns (see TM 9-1005-213-10).
3. Install blank-fire adapters on M2 and Coax machine guns. (See TM 9-1005-213-10 and TM 9-1005-233-10).
4. Install Hoffman MGT/WESS firing device. Know how to interface with trigger cable assembly (see TM Simulator, Tank Gun Fire Device A17-61, Hoffman Werke Jan. 79 and 1 Apr. 79).
5. Complete DA Form 2402.



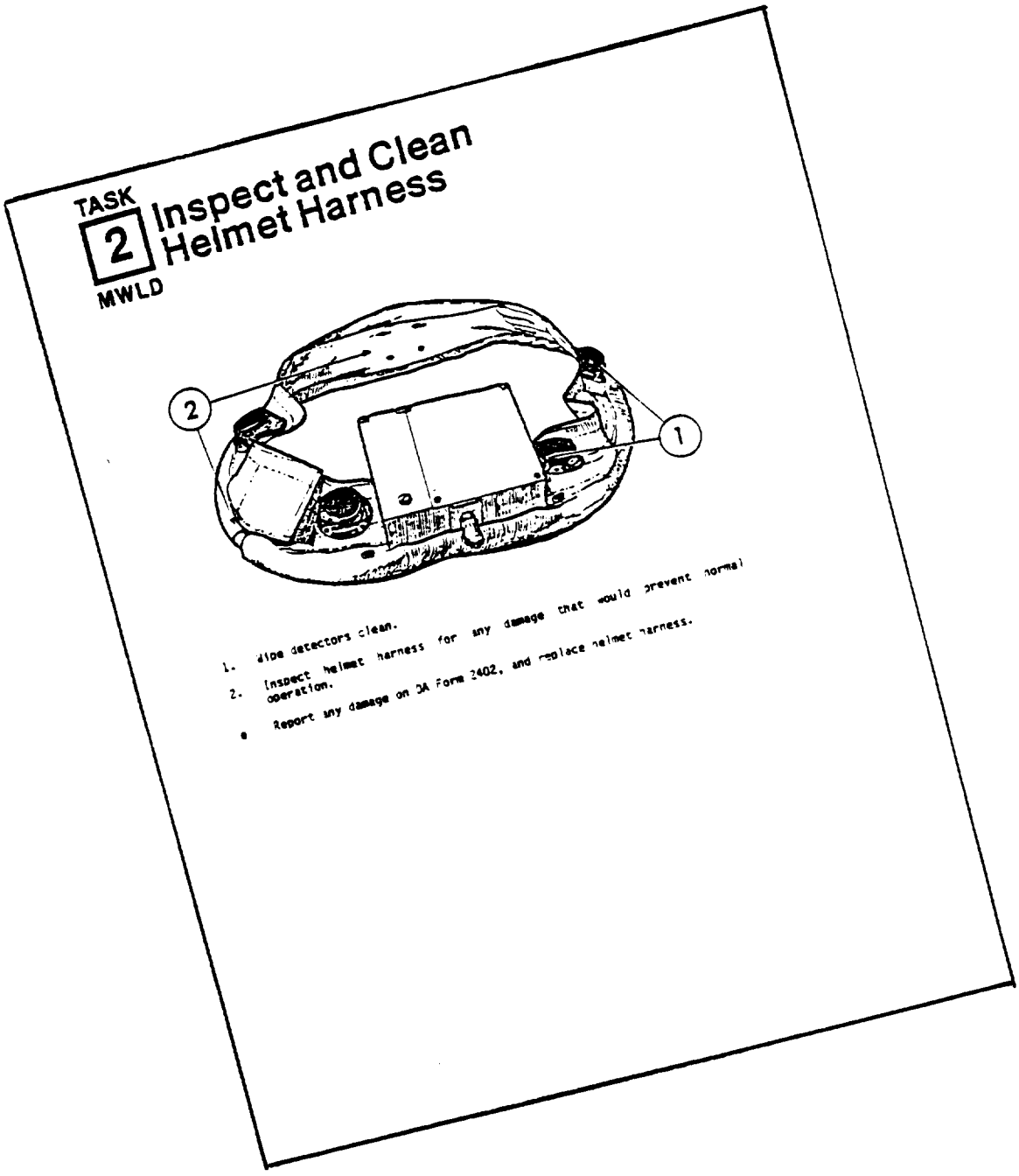
If you can not do these tasks, ask your NCO or instructor to show you how. When you can do all these tasks, proceed with the instructions in this manual.

**How to Use This Manual**

Before you use any M551 MILES-equipment, read this manual.

- The first part of the manual briefly explains the purpose of the equipment and how it is used.
- Then comes step-by-step guidance for every task you need to do with the M551 MILES equipment.

- The task pages look like this. Some 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 exactly the way you are instructed.



TASK 2
Inspect and Clean Helmet Harness
MWLD



1. Wipe detectors clean.
2. Inspect helmet harness for any damage that would prevent normal operation.

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

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 in this manual. If you read a word you don't understand, check pages 89 through 91 for an explanation.

**General Information**

This manual shows you how to operate and maintain the MILES equipment for the M551. MILES transmitters are installed in the breech of the main gun and on the cooling jacket of the M2 machine gun in the cupola. The operator tasks for the MILES equipment are listed in the Table of Contents.

Purpose of Equipment:

The MILES equipment for the M551 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 used 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 9-1265-369-10-3-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 cooling jacket of M2 machine gun in cupola.
c. Detector belt segments on all sides of the turret.
d. A combat vehicle kill indicator (CVKI) which mounts to the right front turret lifting eye. This device consists of a flashing light to indicate a vehicle kill, near miss, and hit.

Operates in temperatures from -350C (-310F) to 620C (144OF). 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:

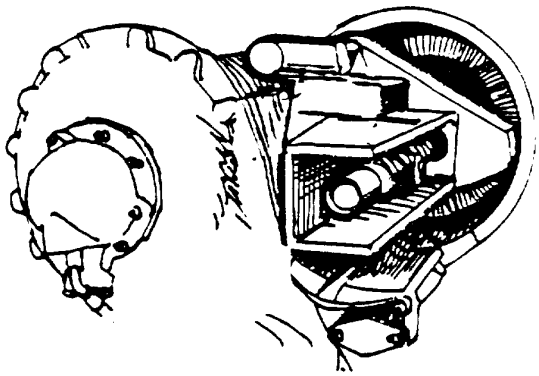
BA-200/U, 6V carbon zinc (2)
M2 Machine Gun Transmitter:

BA-3090/U, 9V alkaline !1)
Man Worn Laser Detector - Torso Harness:

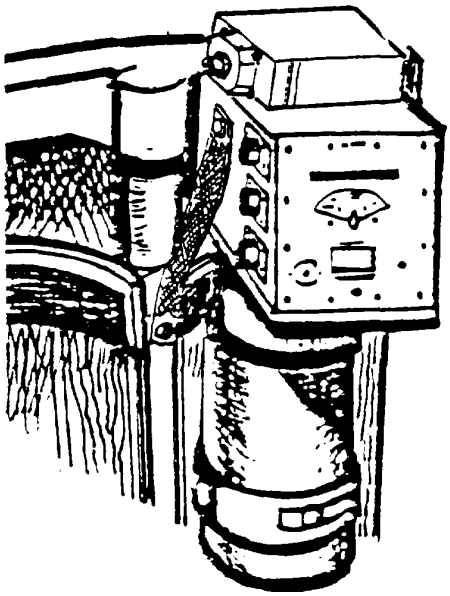
BA-3090/U, 9V alkaline (1)
Man Worn Laser Detector - Helmet Harness:

BA-3090/U, 9V alkaline (1)
Battery Life = 100 hours (approximate)

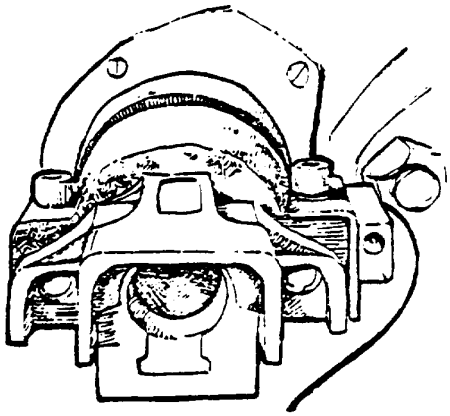
LOCATION OF COMPONENTS:



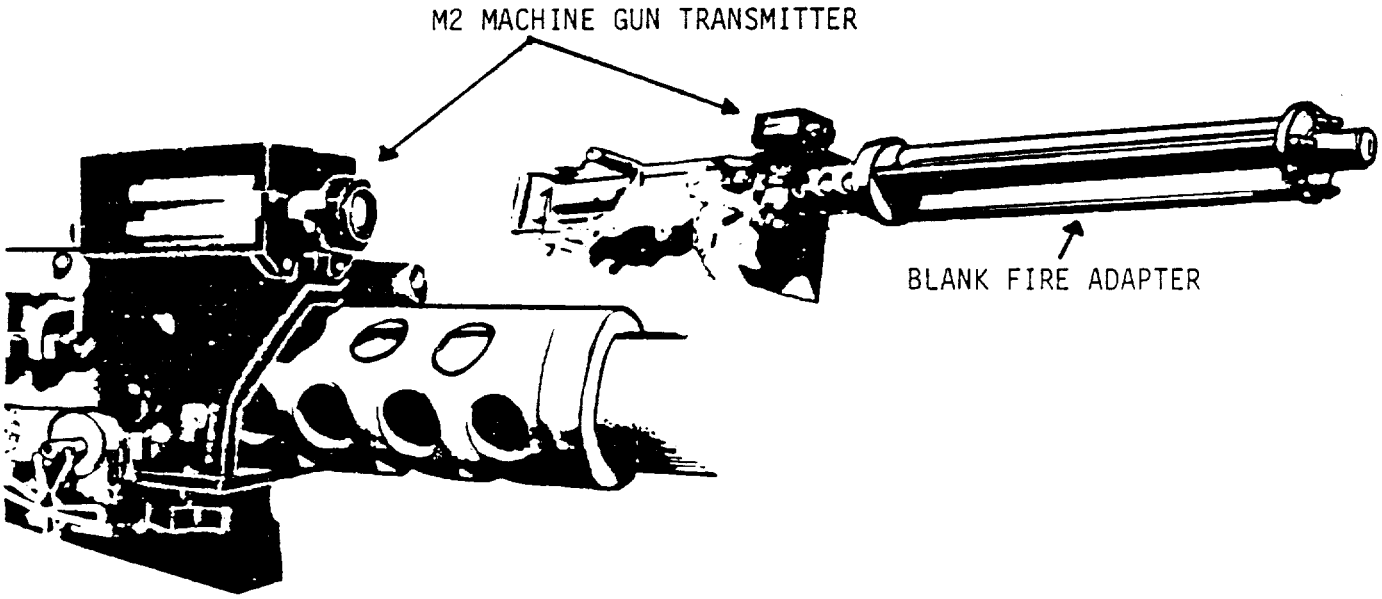
Main Transmitter. In breech of main gun.

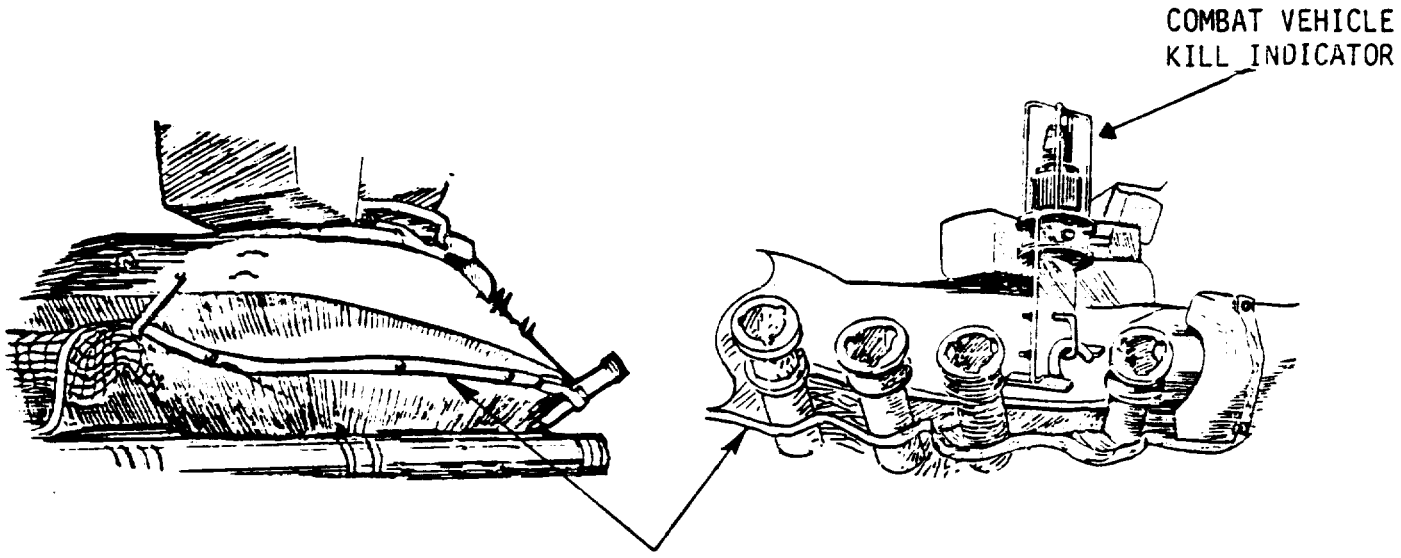


Control Console and Battery Box. Mounted in the 3-round vertical rack in the 152 mm conventional rounds storage area.



M240 Coax Machine Gun Microphone. On barrel jacket clamp.




DETECTOR BELT SEGMENTS, ONE ON EACH SIDE OF TURRET

How It Works:

MILES-equipped weapons work much like the real weapons. However, instead of firing missiles, 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 MILES-equipped main gun uses the Hoffman device. "Hoffman Device" is the common name for the Main Gun Weapons 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 M2 machine gun in the M551 is loaded with blank ammunition. The sound of blanks firing will cause the laser transmitter to fire. To use the MILES-equipped M2 machine gun, aim at your target and fire.

- The coax machine gun mounted in the turret works like the M2. The sound of blanks firing will trigger the laser transmitter.

- The main gun is fired using normal procedures. With this gun, a Hoffman device is used to simulate firing either a conventional or a Shillelagh missile round. When the trigger is operated, both the Hoffman device and the laser fire together.

- You must wait 10 seconds after firing the main gun and 15 seconds after firing the Shillelagh missile before you can fire again. This is to simulate the time normally required to reload the weapon.

- After firing the main gun as either a cannon or missile launcher, 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 either MAIN GUN or MISSILE, pressing the display button, and reading the displayed number of main gun or missile rounds remaining.

- The MILES system allows a basic load of 20 conventional rounds and 9 Shillelagh. missile rounds.

- Both the M2 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 (obtained from the controller) is used for dry-firing the coax machine gun.

How MILES Is Used, Continued:

- If the laser detector belt on the M551 is hit by laser fire, one of three things will happen:

1. Two tones will sound in the intercom and CVKI Light will flash two times. This means a "Near Miss."
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 sounds continuously and CVKI light flashes continuously. This means a "kill." To turn off tone, you must remove the orange key from the M2 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 track 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 a soldier has been "killed." He must use his yellow key to turn off 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 M551 are armored vehicles, but the M551 is effective against all MILES-equipped vehicles and personnel.

**Task Assignment**

- To speed up installation of the MILES equipment on the M551, 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 17-37.
  - Inside Tasks (1-8) are found on pages 38-49.
  - M2 Machine Gun Tasks (1-4) are found on pages 50-53.
  - MWLD Tasks (1-5) are found on pages 54-58.
  - Test Tasks (1-2) and troubleshooting procedures are found on pages 59-68.
  - Alignment Tasks (1-3) are found on pages 69-72.
  - Operation Tasks (1-7) are found on pages 73-83.

- The track 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 (MWLD) assemblies. Only the TC, gunner, and loader do the MWLD Tasks. MWLD Tasks are Velcro Mounting Instructions for Crew Helmets (page 16), 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:

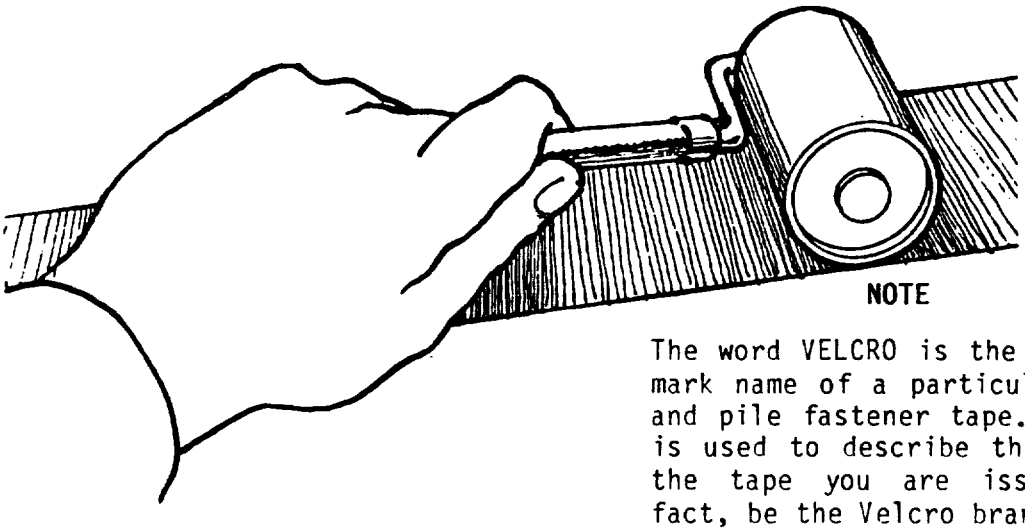
  1. MWLD Task 3 (Install Batteries in MWLD Harnesses).

  2. Test Task 1 (Test Operation of MWLD).

  3. Test Task 2 (Test MILES System).

  4. Alignment Task 3 (Align M2 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 the areas and cut Velcro to appropriate lengths.

**WARNING**

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

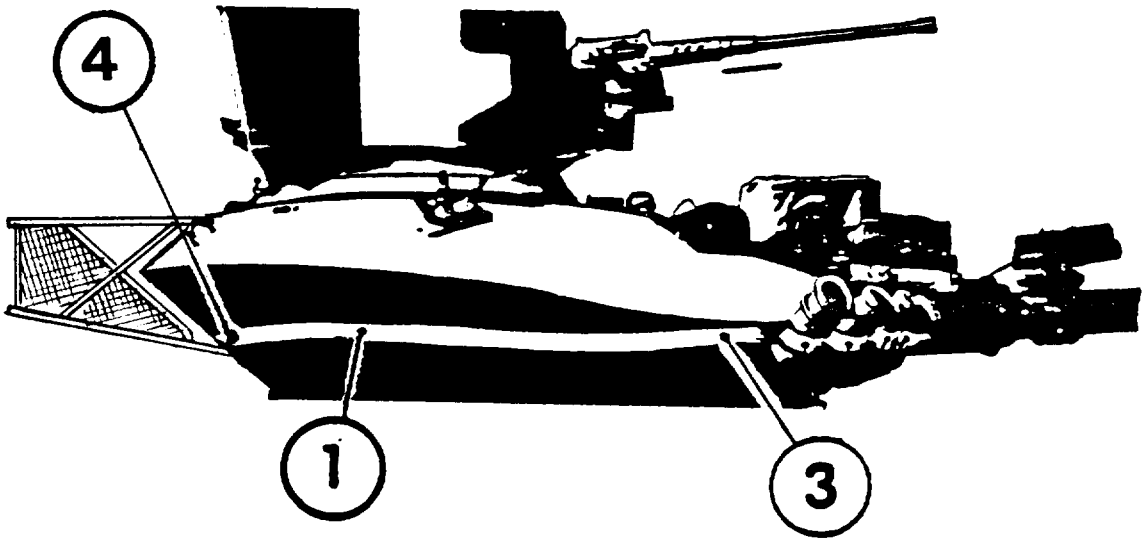
4. Spray tape primer on the areas where Velcro will be mounted. If Velcro is to be mounted on material other than metal (for example, fabric gun shield covers), apply two coats of spray, allowing 5 minutes of drying time between coats.
5. Mount the Velcro tape as instructed in the steps on the following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

- The Velcro tape has a plastic backing material 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.

6. 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.

VELCRO MOUNTING INSTRUCTIONS FOR VEHICLE



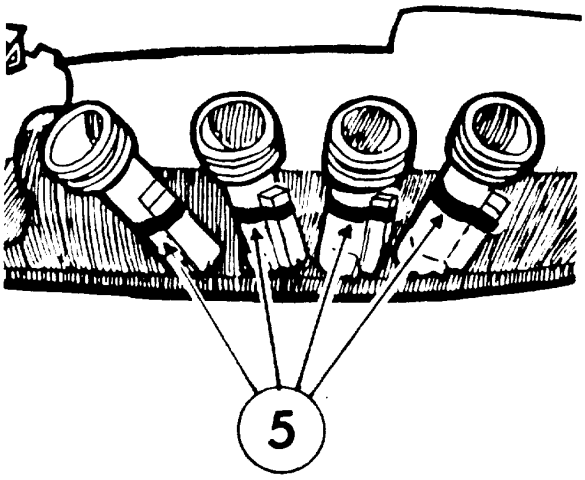

1. Make sure a heavy coat of tape primer is sprayed on all surfaces where Velcro is to be installed.

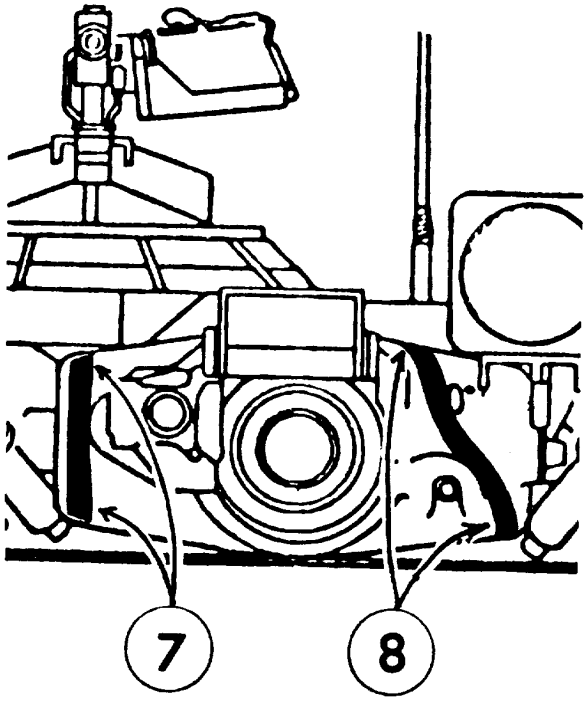
2. Unroll some Velcro tape.

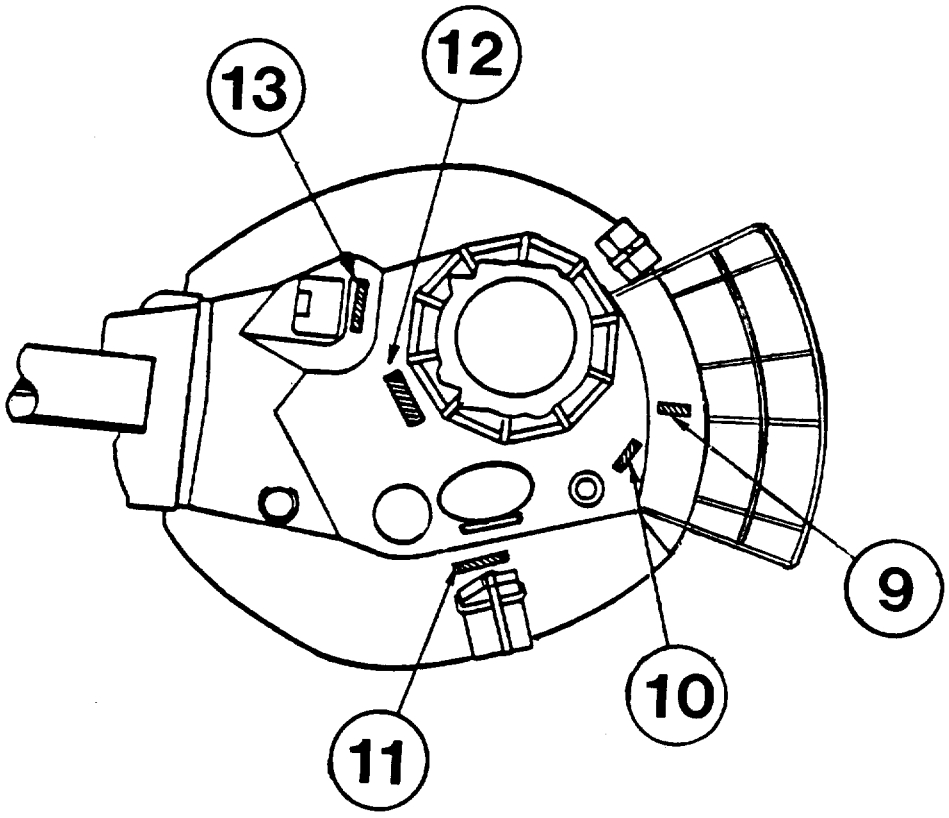
3. Remove the paper backing on the tape and start installing the tape right side up against the back of the grenade launcher on either side of the turret. Stick the tape on the turret just under the turret belt line. Be sure you put the tape on straight and level. A little bit of wrinkling in the tape is OK.

4. Keep sticking until the tape is continuous around the turret and just above the bustle rack structure. Then, cut the tape.

5. Wrap Velcro tape all the way around each grenade launcher across the middle of the connection box. do not overlap. Cut the tape and press down the ends.
6. Now, put Velcro on the other side of the turret. Follow Steps 1 through 5.
7. Stick pieces of Velcro on the gun shield beside the main gun. On the right side of the shield, put the tape straight up the shield at its edge.
8. Put Velcro on the left of the gun shield. Angle it down outside the coax machine gun port to the far lower outside corner.

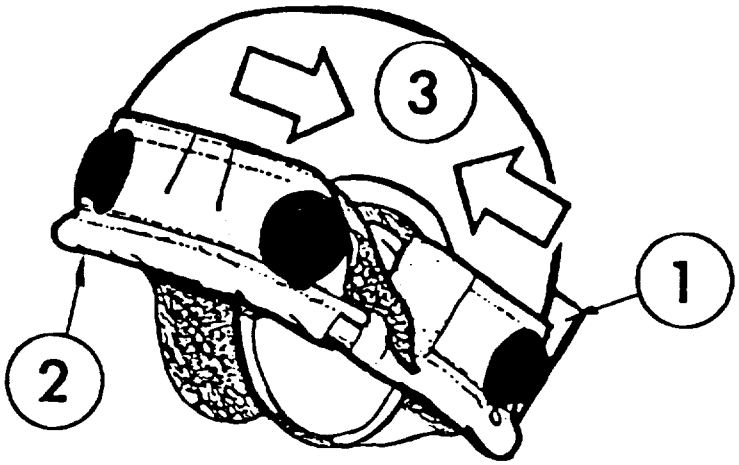





- Cut 5 pieces of Velcro each about 12 inches long. Place them at the locations shown in the following steps.

9. Place one piece of Velcro on the rear of the turret just above the bustle rack as shown.
10. Place another piece of Velcro near the antenna as shown.
11. Place the third piece of Velcro below hatch cover.
12. Place a piece of Velcro on top of turret as shown.
13. Place the last piece of Velcro behind the periscope.




VELCRO MOUNTING INSTRUCTIONS FOR CREW HELMETS

Crew helmets require three to five 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 three patches of Velcro which are attached to the harness.

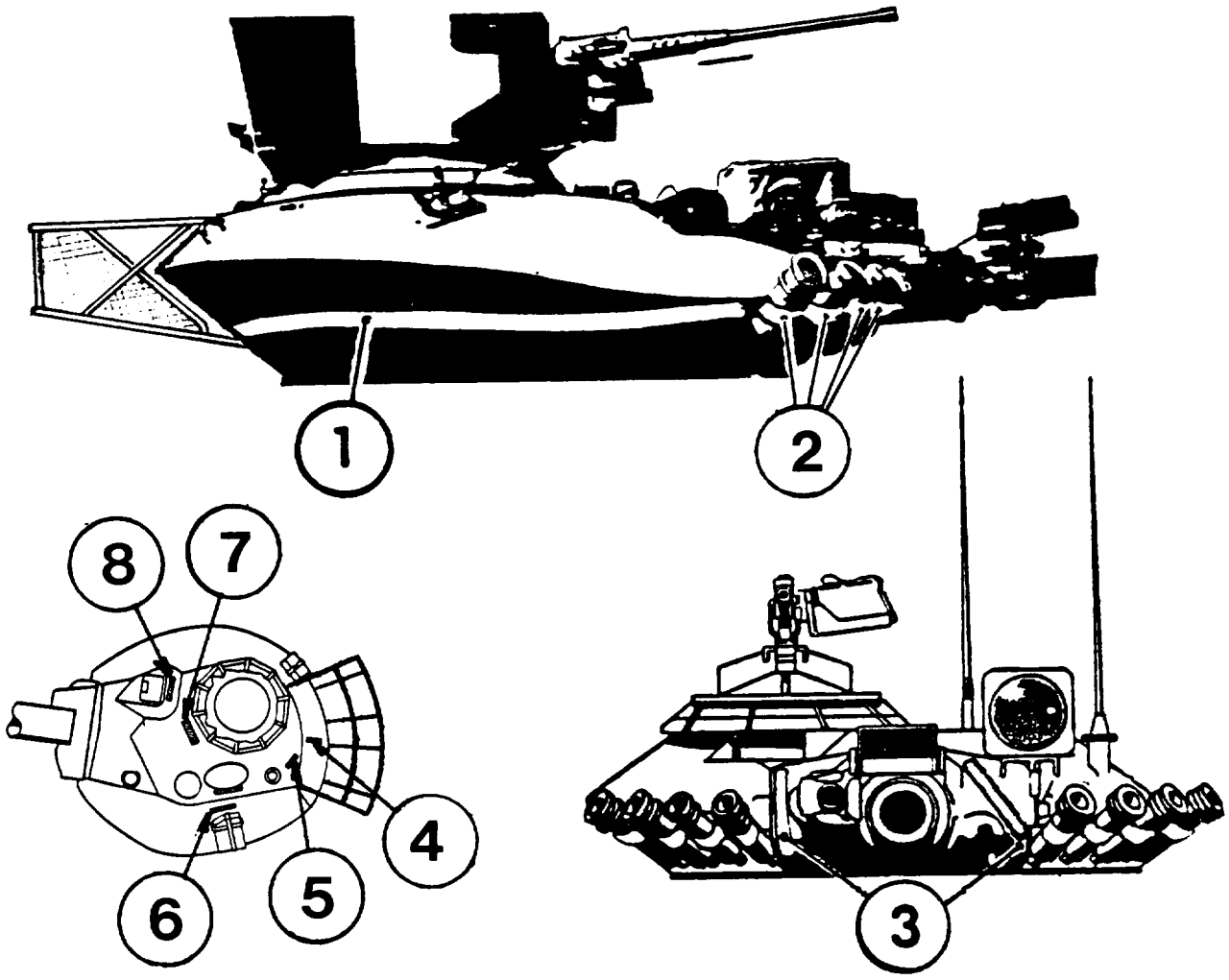
1. Slip the helmet harness over the helmet so that the electronics box is at the rear.
2. Make sure the thick bottom edge of the harness completely covers and overhangs the rim of the helmet.
3. Pull the harness tight and mark the helmet where the three to five Velcro patches on the harness touch the helmet. Remove the harness.

**WARNING**

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

4. Spray tape primer over the marked areas where the Velcro will be attached. Allow spray to dry.
5. Cut three to five patches of Velcro (approximately 2 inches long).
6. Remove backing paper and firmly press the patches onto the helmet.

**TASK 1 OUTSIDE Inspect Velcro Tape**

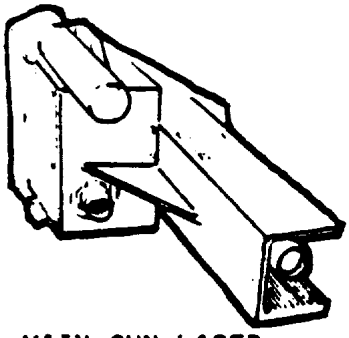



- Check that the vehicles have Velcro tape mounted in all the places shown here. If any Velcro segments are missing, use the instructions on pages 12 through 15 and put the missing segments on.

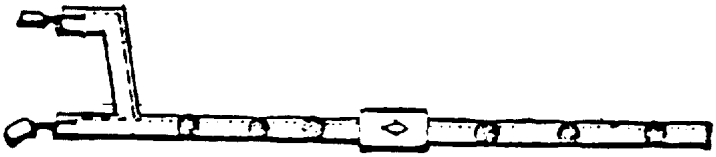
Check that the tape is:

1. Under the belt line of the turret, on both sides.
2. Wrapped around each grenade launcher.
3. On both sides of the front of the gun shield.
4. On the rear center of the turret.
5. Behind antenna.
6. Below hatch cover.
7. On top of turret.
8. Behind periscope.
9. On the vehicle crew helmets in three to five places.

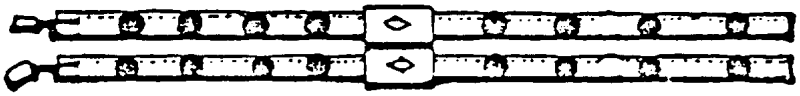
**TASK 2 OUTSIDE Get This Equipment From Your NCOIC**



MAIN GUN LASER TRANSMITTER

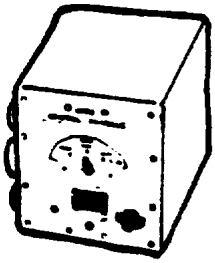


DETECTOR BELT SEGMENT LABELED NUMBER 4

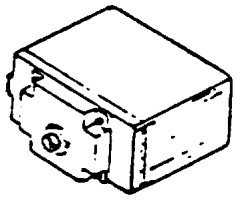


2 DETECTOR BELT SEGMENTS LABELED NUMBER 3

16 MOUNTING BLOCKS



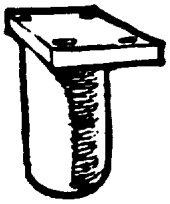
CONTROL CONSOLE



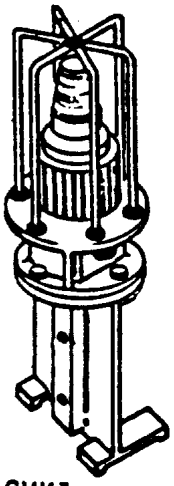
BATTERY BOX

GROUND STRAP

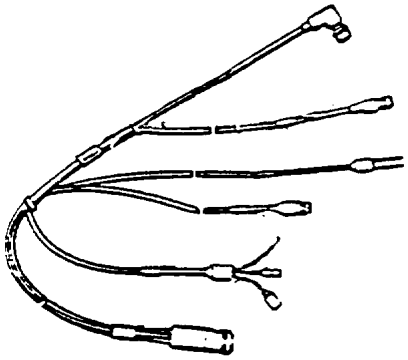
MOUNTING BOLTS AND WASHERS



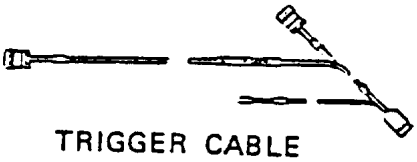
CONTROL CONSOLE MOUNTING BRACKET



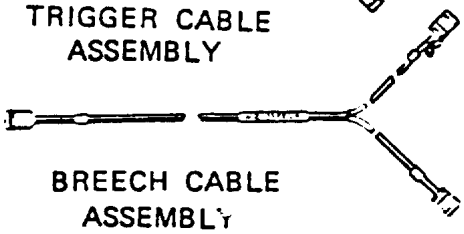
CVKI



KILL INDICATOR CABLE ASSEMBLY



TRIGGER CABLE ASSEMBLY

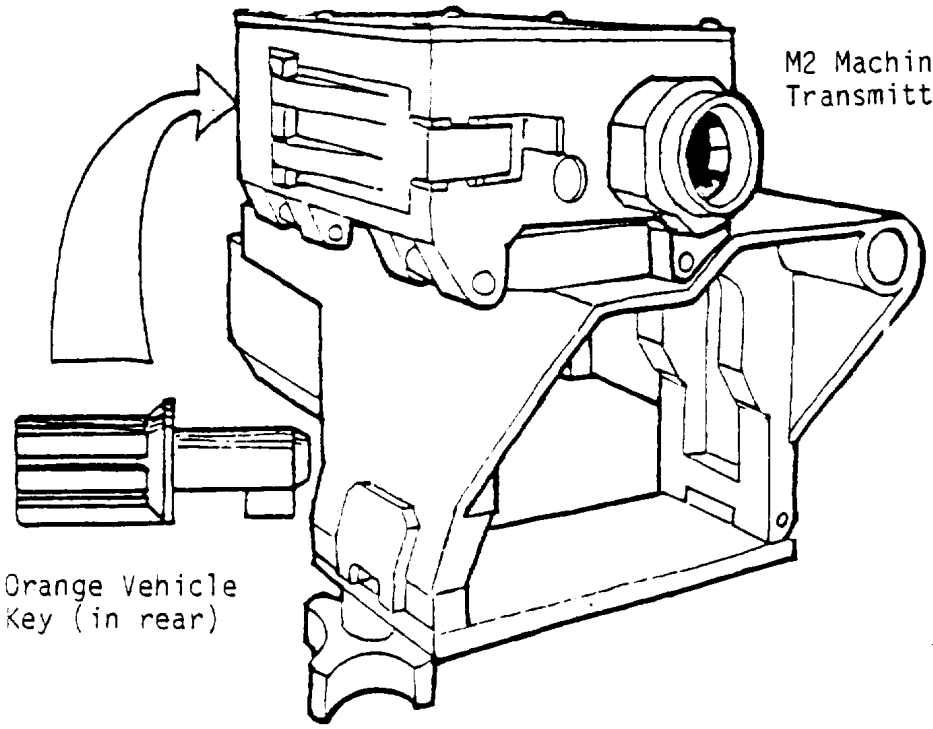


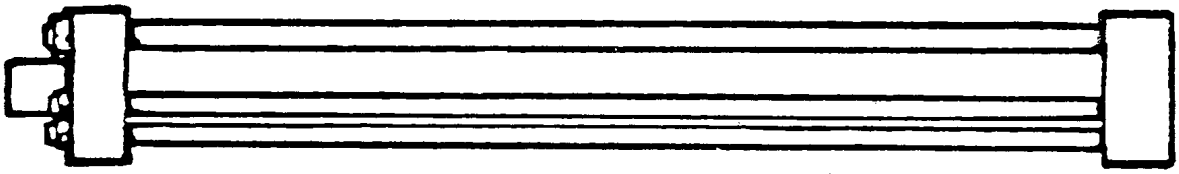
BREECH CABLE ASSEMBLY

- Make sure you have everything.
- Get anything that is missing from your NCOIC.

**TASK 2 OUTSIDE**

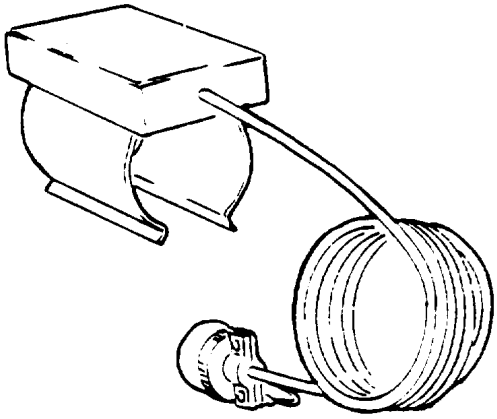
M2 MACHINE GUN EQUIPMENT:



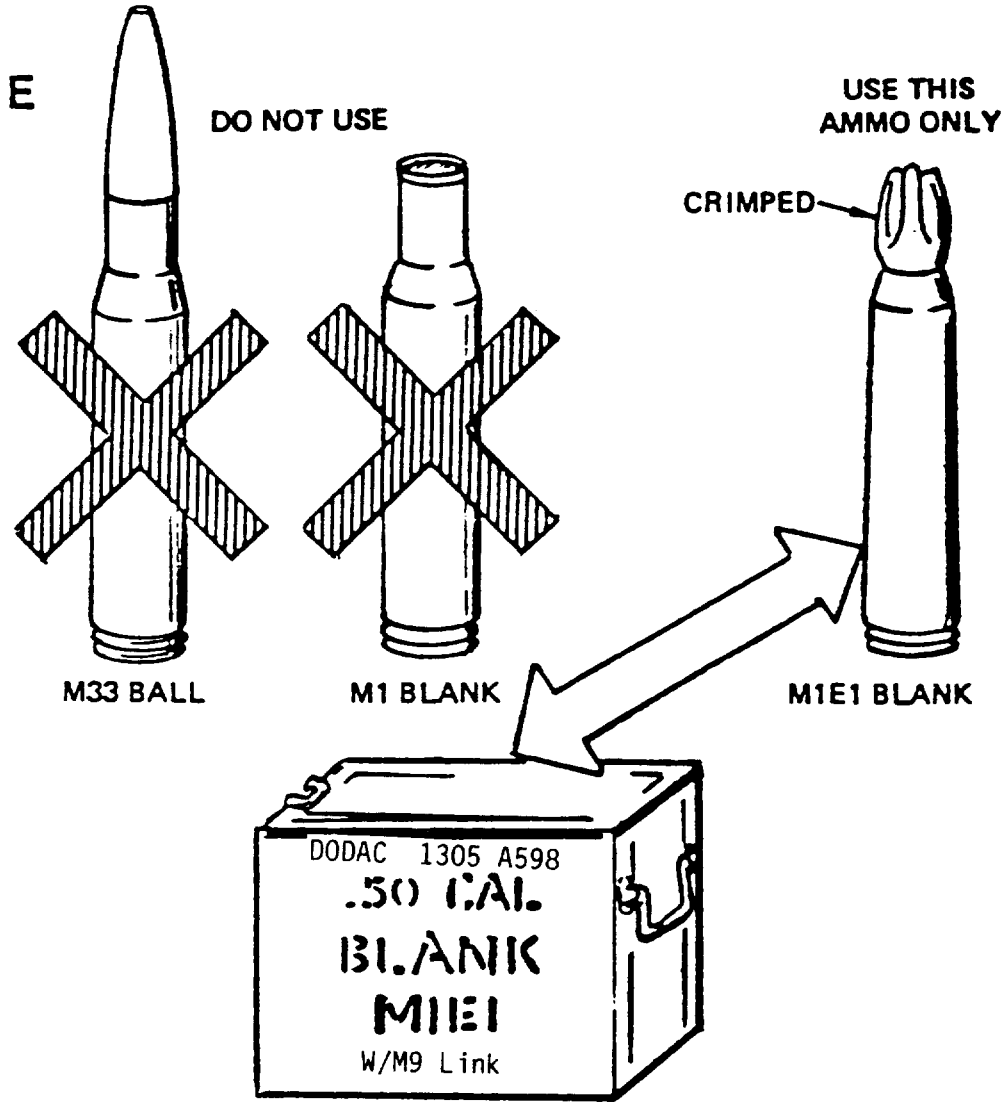



Blank-Fire Attachment for M2 Machine Gun

Blank-Fire
Feed Tray Spacer
for M2 Machine Gun

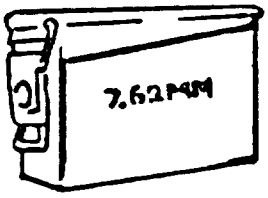


Microphone Assembly



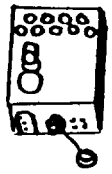

BLANK AMMUNITION FOR M2 MACHINE GUN

HOFFMAN CARTRIDGES



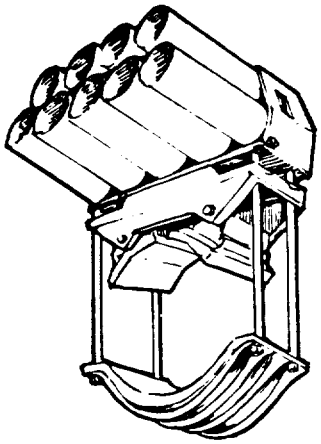

BLANK AMMUNITION FOR COAX MACHINE GUN

## HOFFMAN COMPONENTS

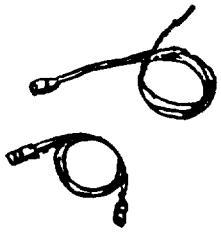


FIRING DEVICE

TEN-POLE CONNECTING CABLE

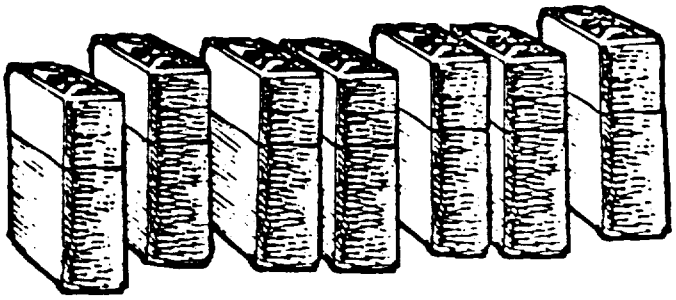


SIMULATOR BODY



GUN CONNECTING CABLES

VEHICLE POWER SUPPLY CABLE

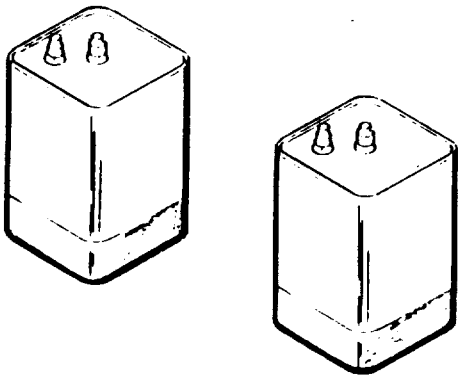


BATTERIES:

For the 3 MWLDS and M2 transmitter

7 - 9V BATTERIES

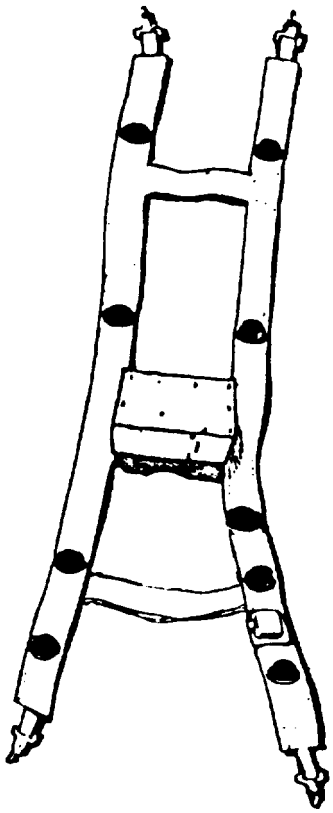
BA-3090/U



For the battery box

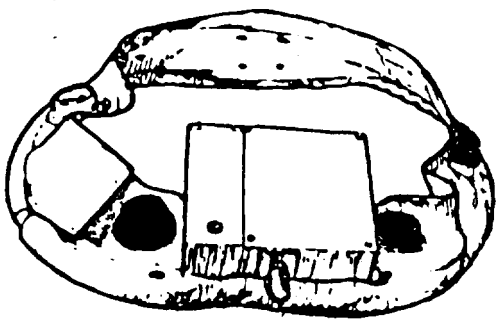
2 - 6V CARBON ZINC BATTERIES

MILES MAN WORN LASER DETECTOR EQUIPMENT (MWLD):

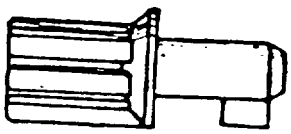


- The MWLD equipment is worn by the track commander, gunner, and loader.

3. MWLD TORSO HARNESSES



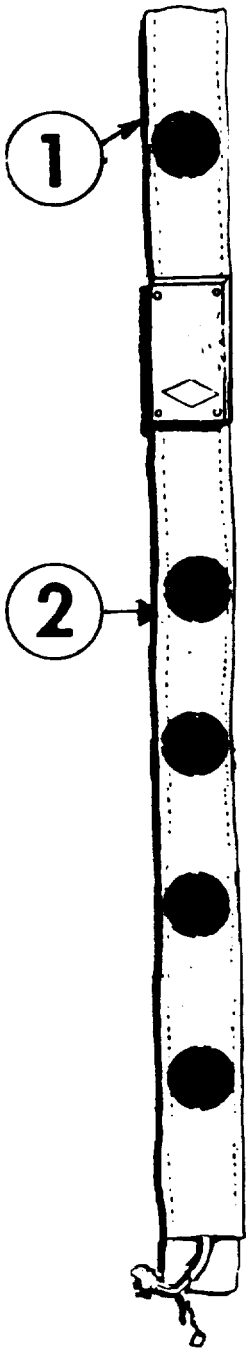
3. MWLD HELMET HARNESSES



3. YELLOW KEYS

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

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



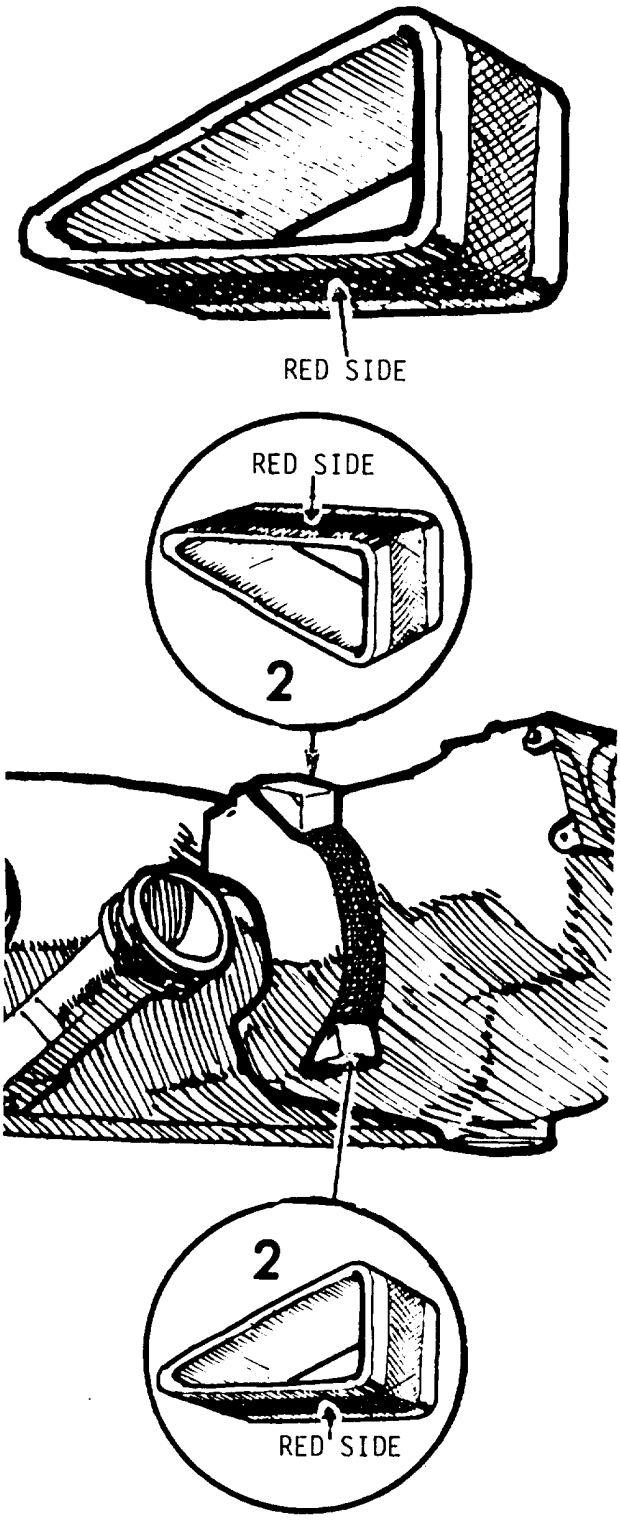

Check Both Detector Belt Segments

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 unusable.

**TASK 4 OUTSIDE Install Detector Belt Segments**




SUBTASK 1: INSTALL DETECTOR BELT ON RIGHT SIDE

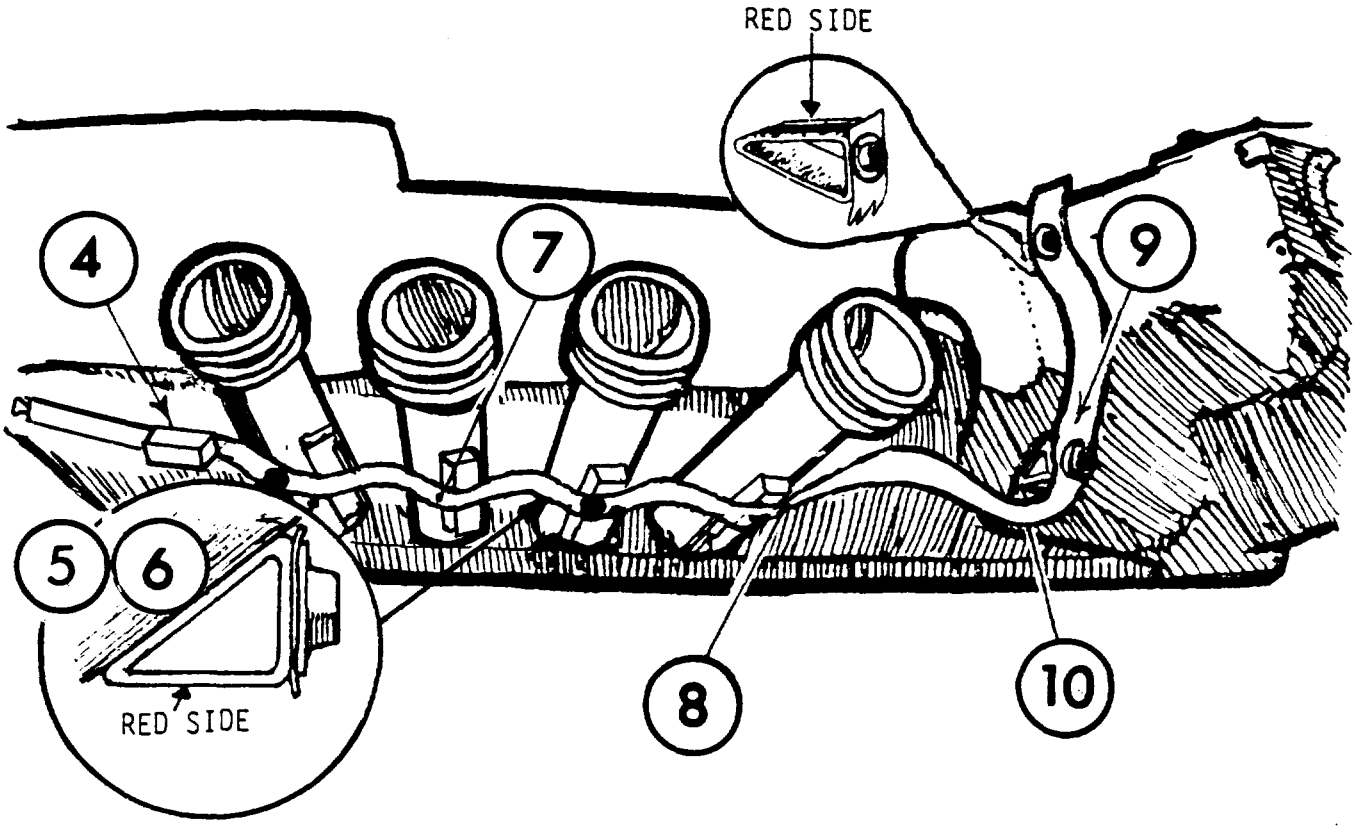
1. Use the Velcro covered mounting blocks to install the detector belts. Notice that one side of the blocks is painted red and that one of the sides is much shorter than the other two. The mounting blocks are used behind the detectors and should be positioned to make detectors face straight out.

2. Mounting blocks will stick to the Velcro tape. Put the blocks at the top and bottom of the right side of the gun shield. Don't worry about their placement. They will be repositioned later. Place the blocks with the red sides out and the short sides facing each other.

   Remember, you can move the blocks around to make the detectors point straight out.

3. Standing on the right side of the vehicle, lay out one of the detector belts with the end without the connector toward the front of the turret. The method of installation will be to start at the electronics box and work forward. Then return to the electronics box and work toward the rear.

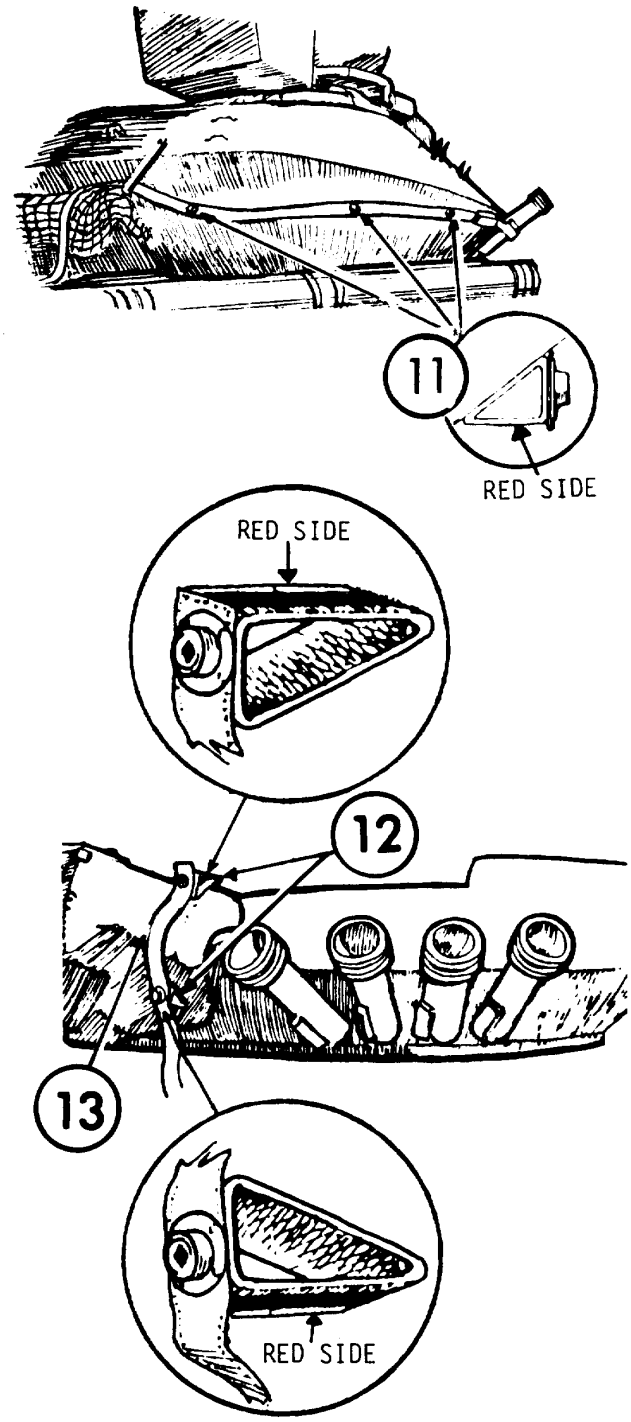
**TASK 4 OUTSIDE**




4. Starting with the electronics box, install the box on the Velcro immediately behind the fourth grenade launcher from the front. Make sure the box is as close to the grenade launcher as possible and still securely fastened to the Velcro.

5. Put the belt segment on the fourth grenade launcher so the detector rests on the mounting block. Adjust the block so the detector points straight out.
6. Put the belt segment on the second grenade launcher so the detector rests on the mounting block. Adjust the block so the detector points straight out.
7. Secure the belt to the Velcro on the third grenade launcher.
8. Secure the belt to the Velcro on the first grenade launcher.
9. Secure the remaining two detectors to the two blocks which were installed on the gun shield in step 2.
10. Leave the belt loose between the first grenade launcher and the gun shield. This is to prevent the detector belt from being torn loose during main gun movement. Move the blocks and belt further down the gun shield if more slack is needed.

**TASK 4 OUTSIDE**

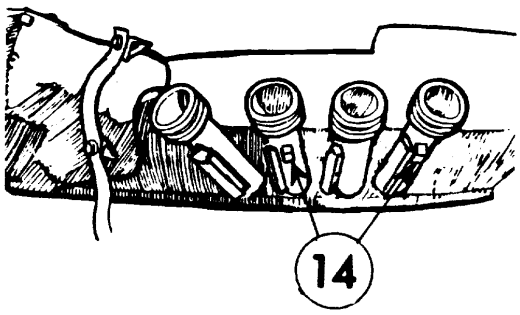


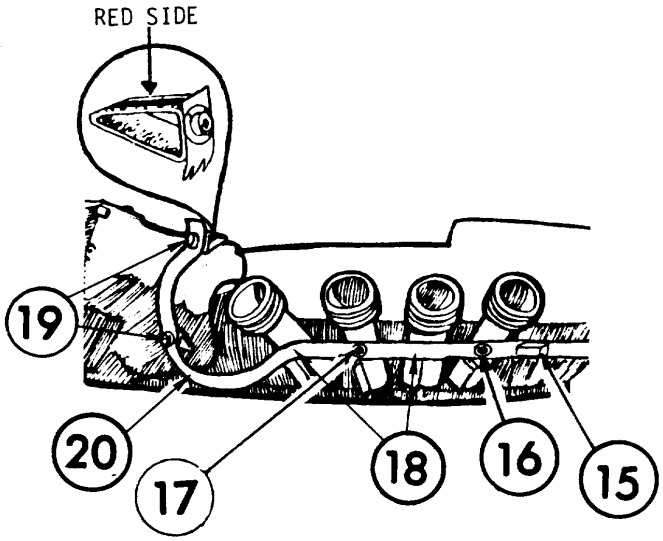

11. Install the rear half of the detector belt on the Velcro along the side. of the turret. The connector on the end of the detector belt should be behind the bustle. PUT A MOUNTING BLOCK BEHIND EACH DETECTOR with red side facing down.

SUBTASK 2: INSTALL DETECTOR BELT ON LEFT SIDE

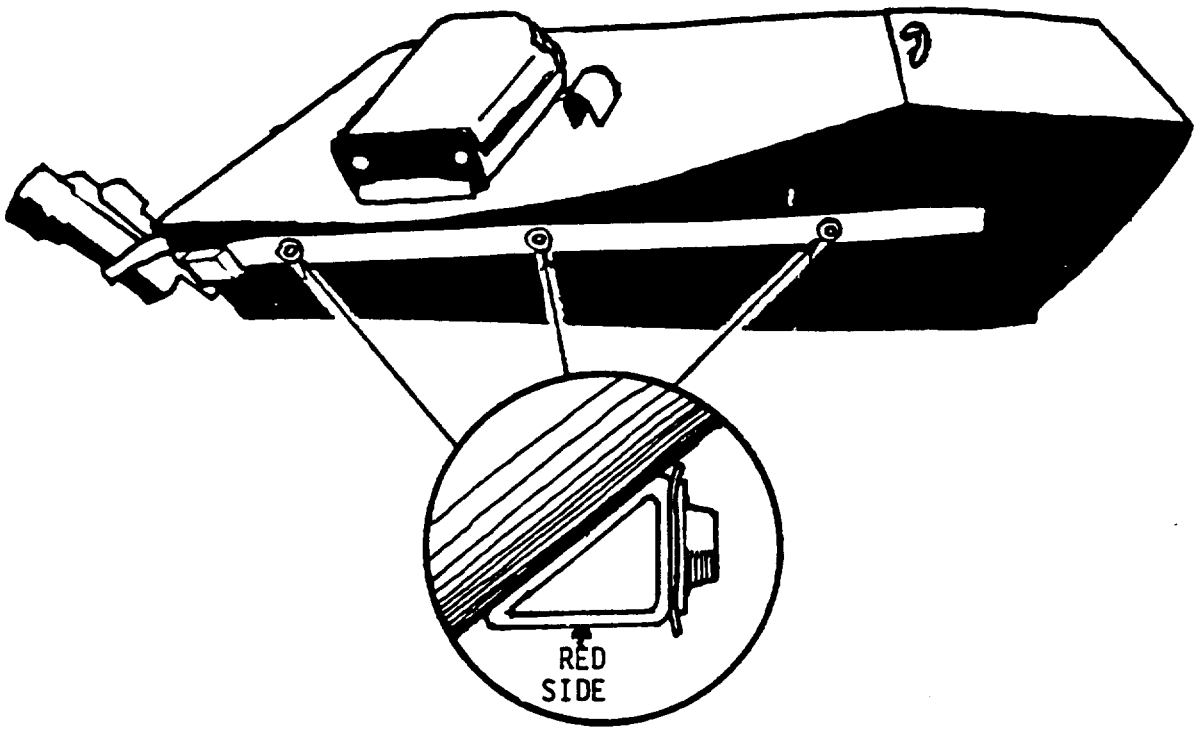
12. Put two mounting blocks on the gun shield in the positions shown.

13. Put the non-connector end of the belt segment on the gun shield. BE SURE THE DETECTORS ARE IN THE POSITIONS SHOWN. MOVE THE BLOCKS UNTIL DETECTORS POINT STRAIGHT FORWARD.



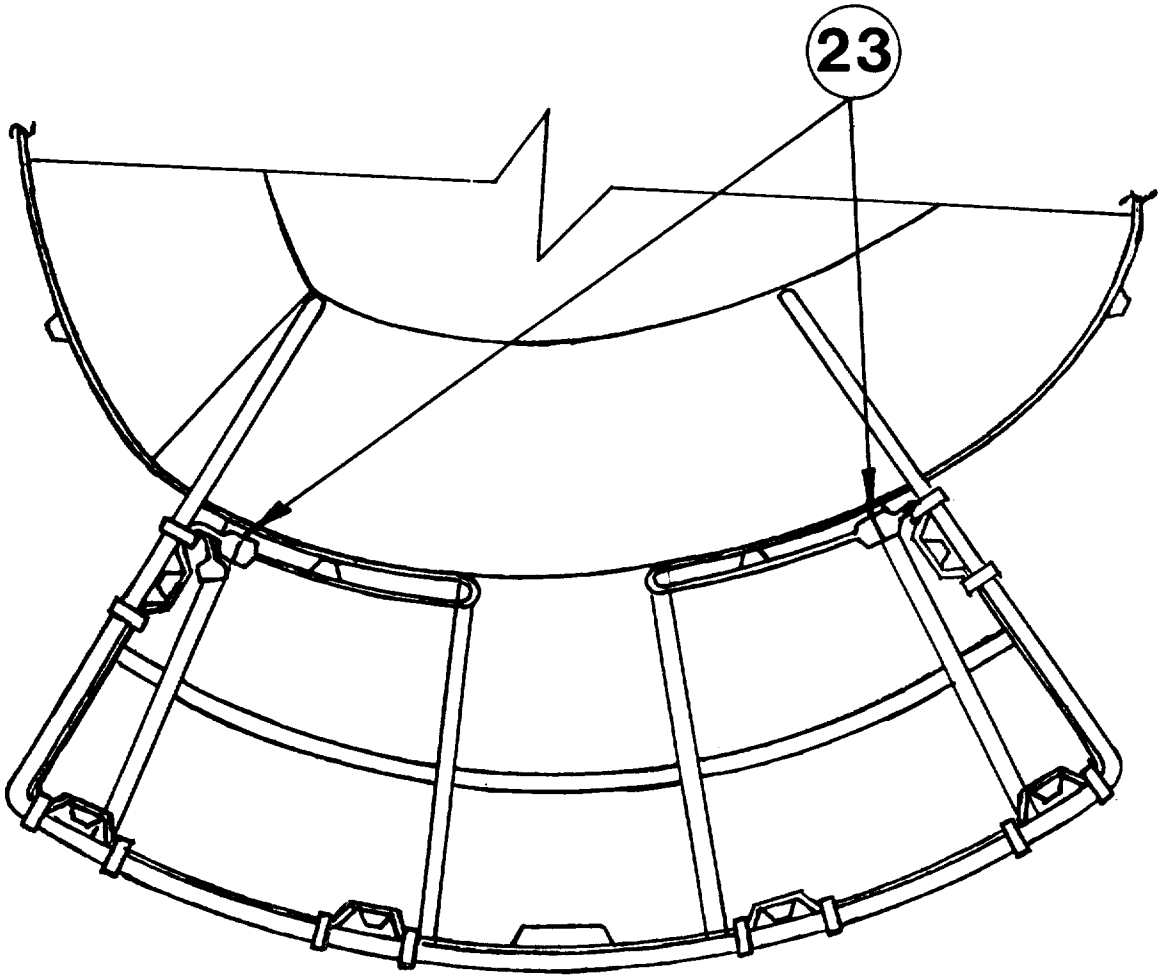




14. Put mounting blocks on the second and fourth grenade launchers. Stick the blocks next to the connector box. Put the blocks in approximately the position shown.
15. Starting with the electronics box, install the box on the Velcro immediately behind the fourth grenade launcher. Make sure the box is as close to the launcher as possible and still securely fastened to the Velcro.
16. Put the belt segment on the fourth grenade launcher so the detector rests on a mounting block. Adjust the block so that the detector points straight out.
17. Put the belt segment on the second grenade launcher so the detector rests on a mounting block. Adjust the block so the detector points straight out.
18. Secure the belt to the Velcro on the first and third grenade launchers.
19. Install the two remaining detectors on the gun shield so that each detector rest on a block. Adjust blocks so detectors point straight out.
20. Make sure there is some slack in the belt between the gun shield and the first launcher. Move the blocks and belt further down the gun shield if more slack is needed.




21. Put the rest of the detector belt segment 3 on the turret. Put a mounting block behind each detector in the position shown. Adjust the blocks until the detectors point STRAIGHT OUT from the turret side.

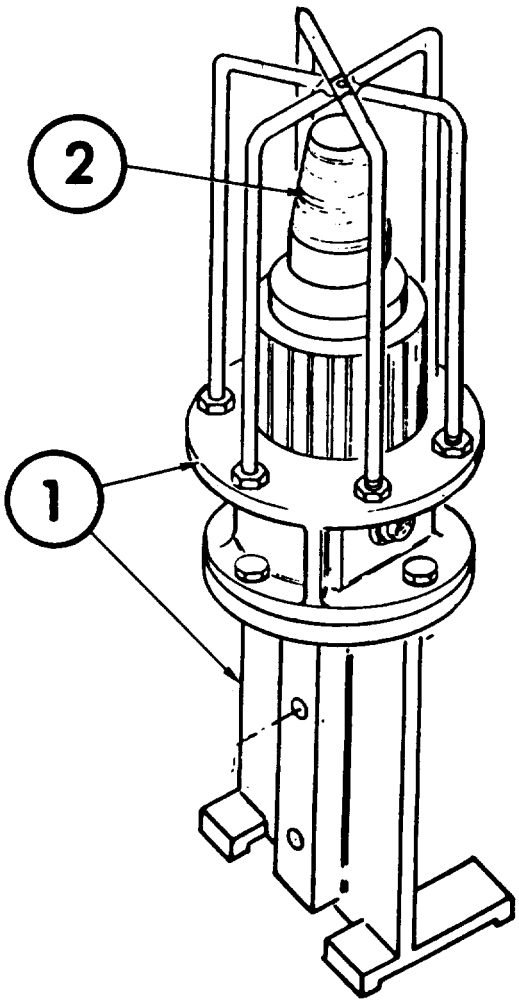
**TASK 4 OUTSIDE**




22. Install Segment 4 Belt on Bustle Rack behind the expanded metal screen at approximately the same height as the Segment 3 Belts. Center the electronics module in the back of the rack and attach the sensors to the screen with the Velcro straps on the belt.

23. Connect Segments 3 and 4 Belts as shown.

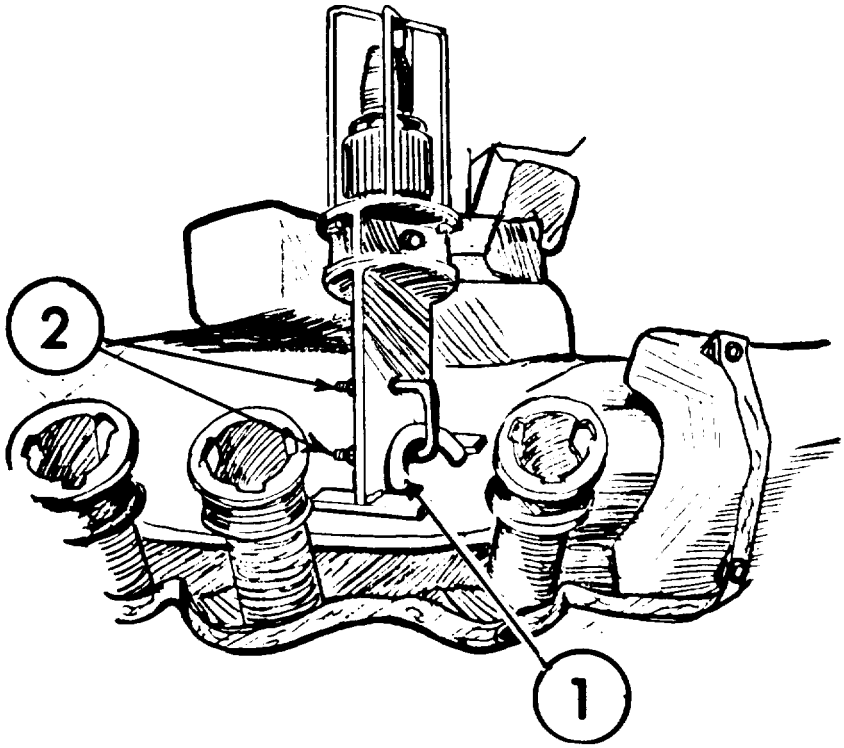
**TASK 5 OUTSIDE**
**Inspect and Service CVKI**




1. Inspect CVKI and CVKI adapter for any damage that would affect proper installation or operation.
2. Inspect yellow lens for cracks.

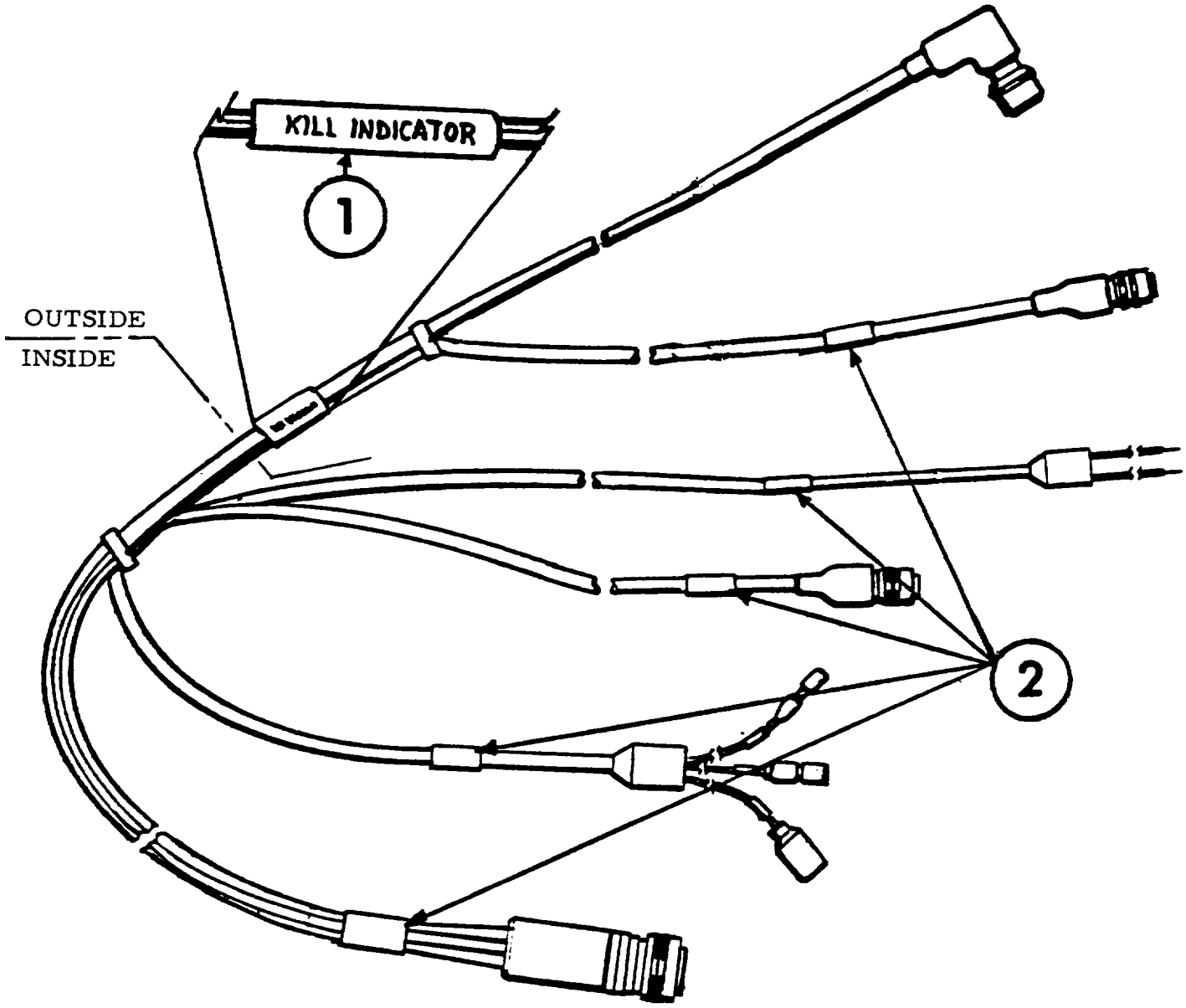
- Report any damage on DA Form 2402, and replace lens if unusable.

**TASK 6 OUTSIDE**
**Install the CVKI**




1. Mount the CVKI to the right front turret lifting eye as shown. Make sure mounting adapter is flush against the eye and securely fastened.
2. Tighten mounting nuts with adjustable wrench.

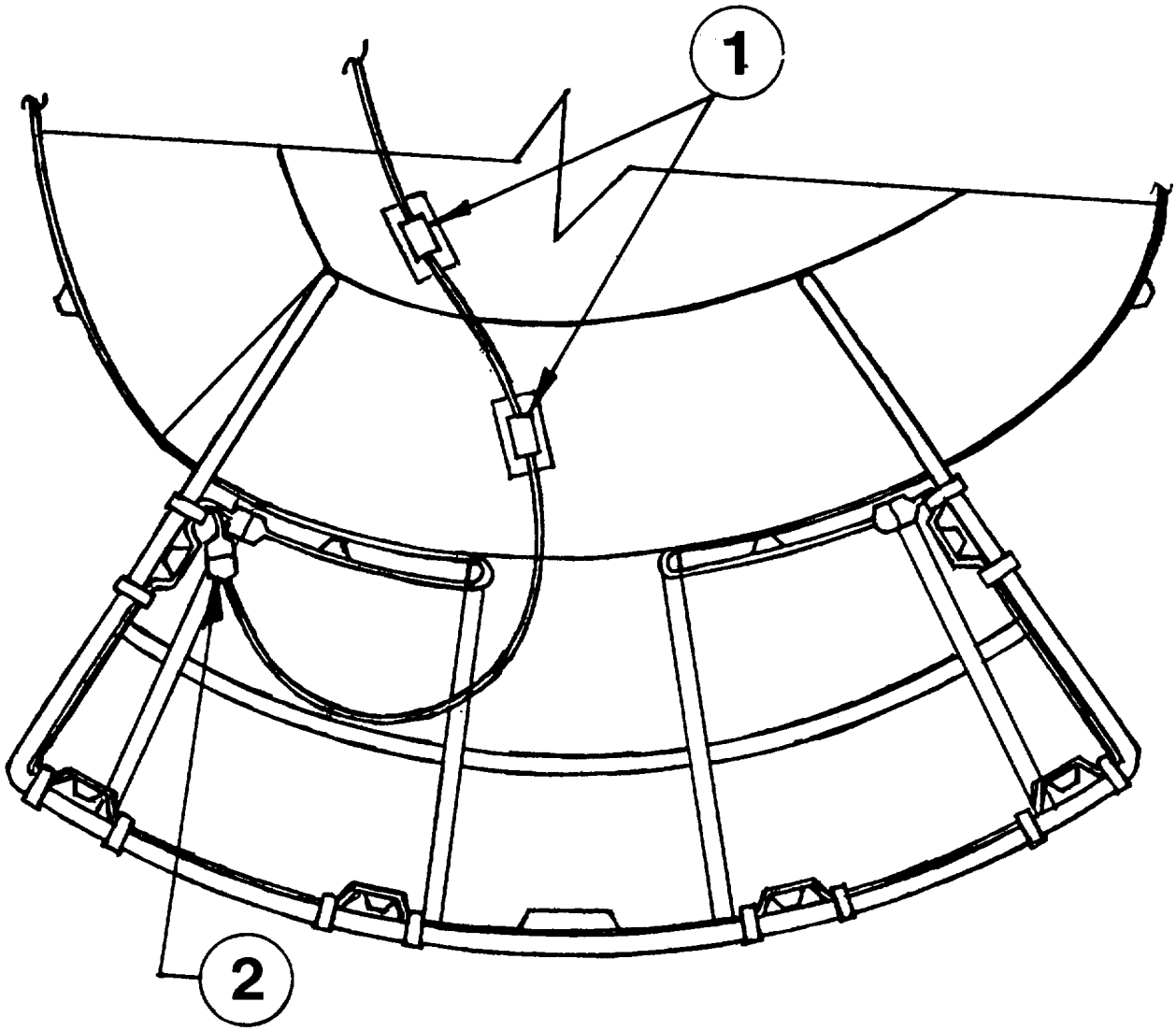
**TASK 7 OUTSIDE**
**Inspect CVKI Cable Assembly**




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 OUTSIDE Install CVKI Cable Assembly**

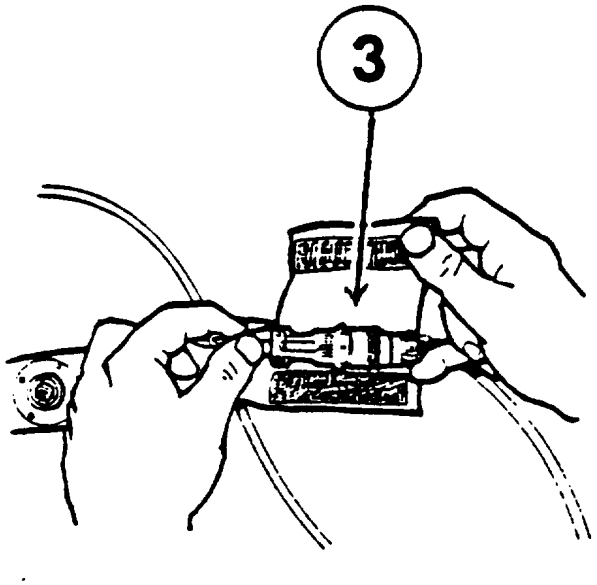


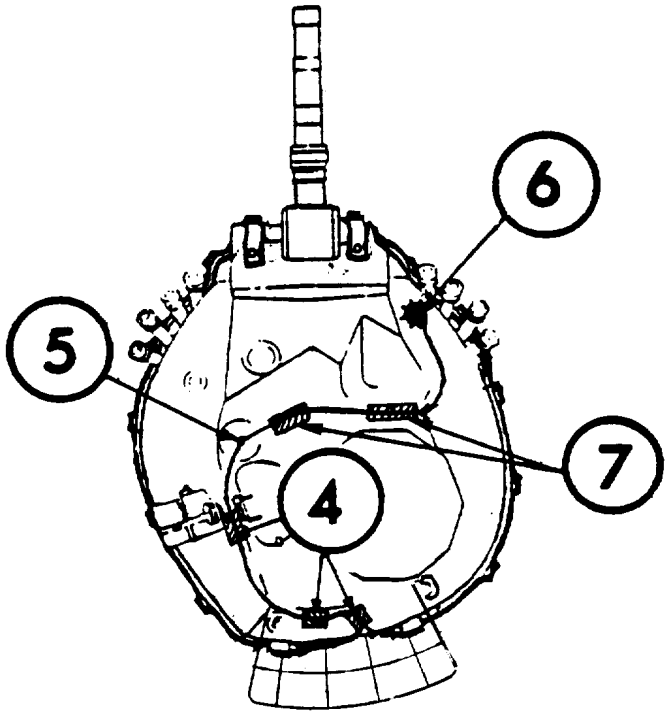

- Find the cable labeled KILL INDICATOR

1. Route end of cable marked P2 to the Segment 4 Detector Belt Connector in the Bustle.

2. Connect P2 to the unused plug on the Segment 4 Belt.

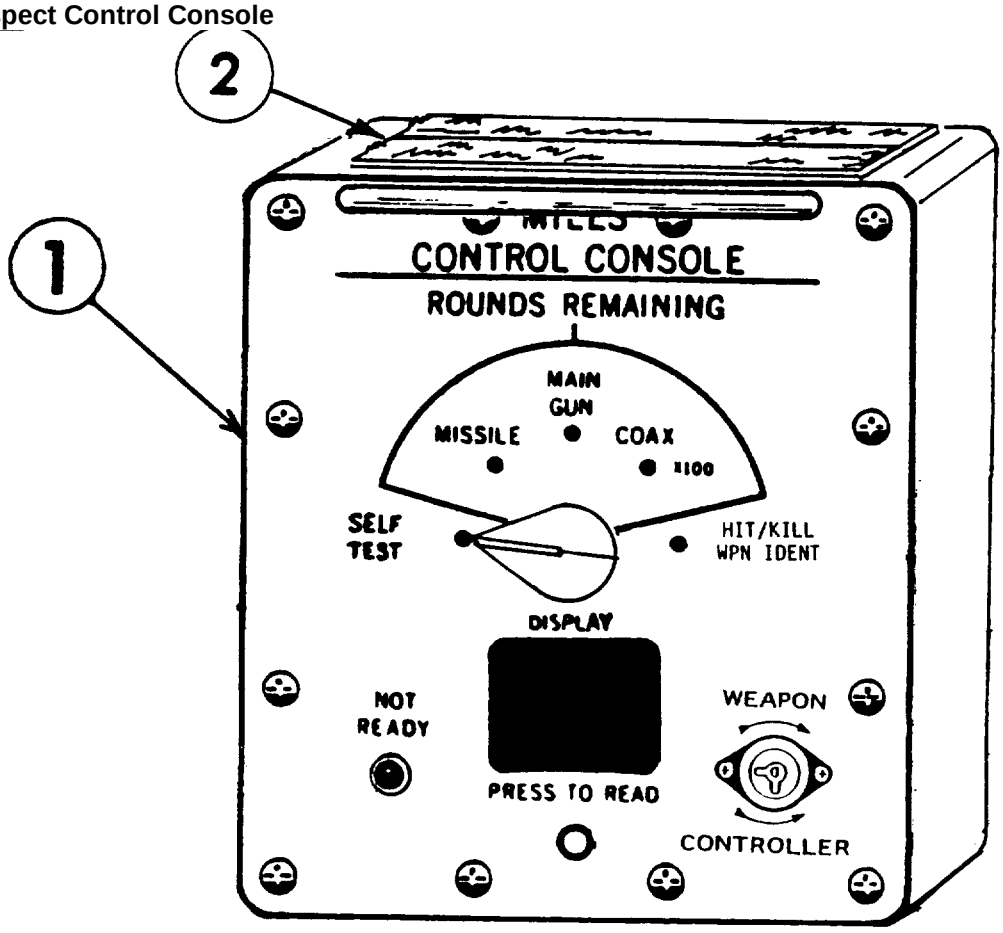
**TASK 8 OUTSIDE**



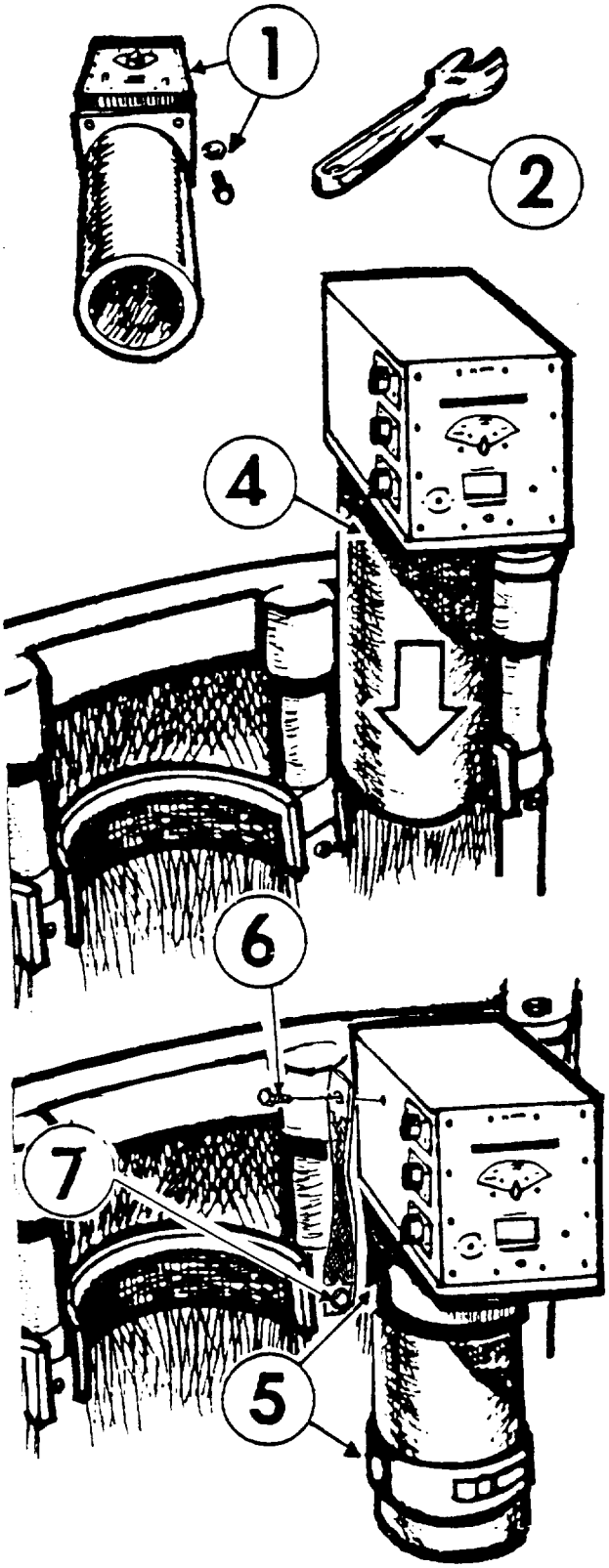

3. Put the connectors under the Velcro flaps on the detector belts.
4. Attach the Velcro pad on the cable to the three Velcro patches located at the rear of the turret, behind the antenna, and, below hatch cover.
5. Locate right-angled connector labeled KILL INDICATOR and temporarily set it aside. Take the remaining cables and drop them through the loader's periscope hatch. Turn the periscope hatch handle so hatch cannot completely close.
    - If your M551 has a Hoffman device, the Hoffman cable runs through the coax machine gun port. Disconnect the Hoffman cables from their connections inside the tank and pull them out of the coax port. Then reroute the Hoffman cables through the periscope hatch with the MILES cables.
6. Route cable labeled KILL INDICATOR behind the driver's periscope and connect to the CVKI.
7. Attach the Velcro pads on the cable to the two Velcro patches located behind the driver's periscope and on top of turret leading to periscope hatch.

**TASK 1 INSIDE Inspect Control Console**




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 INSIDE Install Control Console**

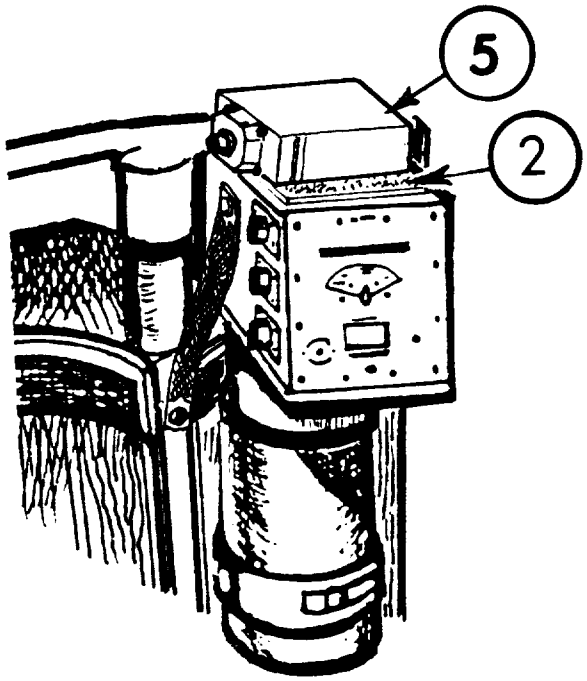


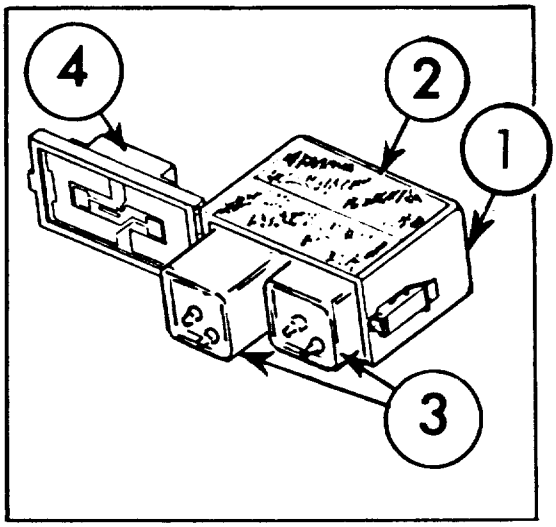

1. Attach console to bracket using bolts and lock washers.
2. Tighten bolts with adjustable wrench.
3. If your vehicle has them, remove the plastic spacers from the bottom of the loader's side ammunition rack.

4. Slide bracket into the rack. Use the round holder shown.

5. Tighten straps around the bracket.
6. Bolt ground strap to the side of the control console.
7. Remove the bolt from the ammunition rack. Slip the bolt through 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.

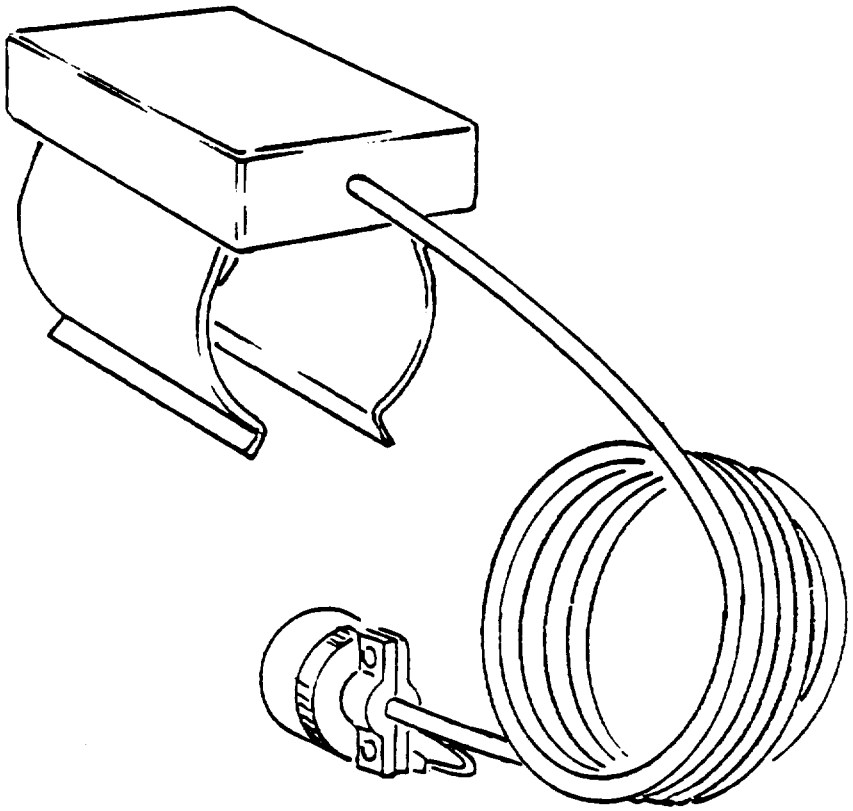
**TASK 3 INSIDE Inspect and Install Battery Box and Batteries**



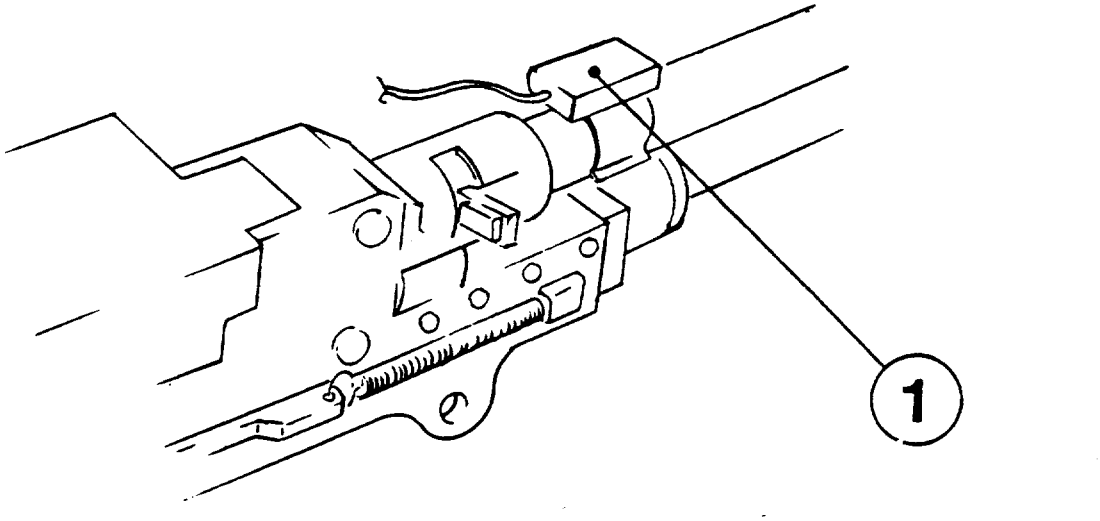

1. Inspect battery box for damage that would prevent normal operation.
    - Report any damage on DA Form 2402, and replace battery box if unusable.
2. Make sure Velcro is attached to one side of battery box. If Velcro is missing, do not attempt to install new Velcro. Report on DA Form 2402, and replace 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 toward the rear.

**TASK 4 INSIDE Inspect Coax MG Microphone Assembly**



1. Inspect microphone assembly for any damage that will prevent normal operation.
    - Report any damage on DA Form 2402, and replace assembly if unusable.

**TASK 5 INSIDE Install Coax MG Microphone Assembly**




**NOTE**

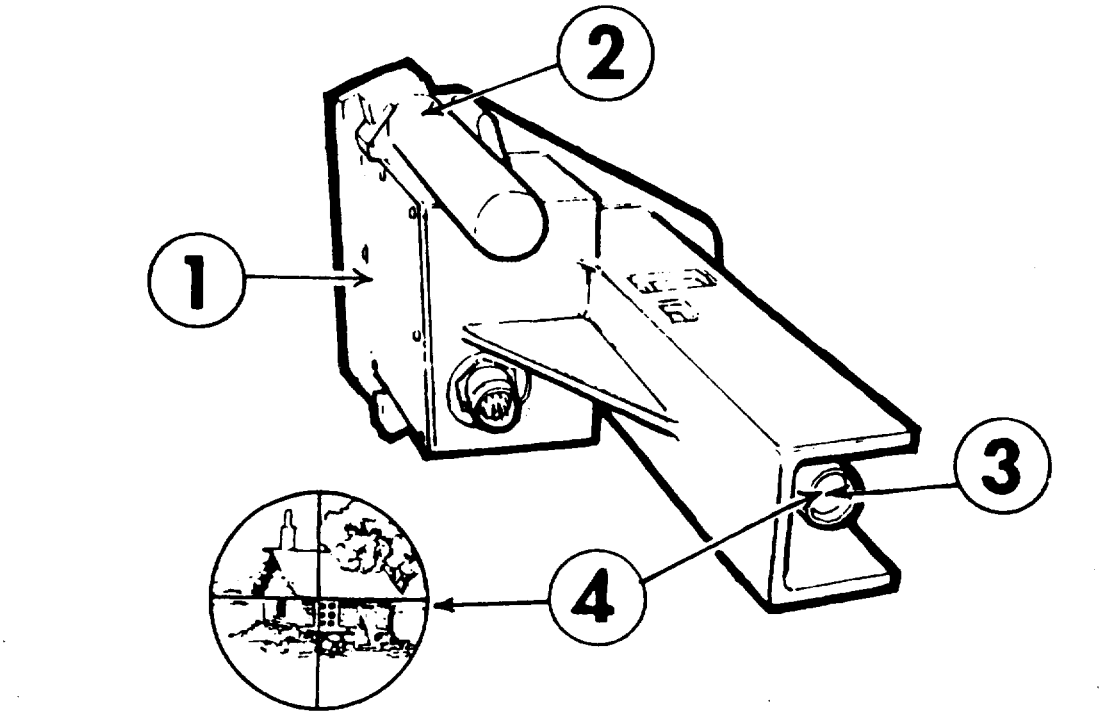
**The instructions and drawings are for the M240 MG. If your vehicle is equipped with another type of weapon, ask your NCOIC for installation instructions.**

- his task can be done with the coax machine gun already installed.

1. Place the microphone assembly on the barrel as shown above.

- Install the coax machine gun with:
  a. Blank fire adapter.
  b. Feed tray spacer in feed tray.

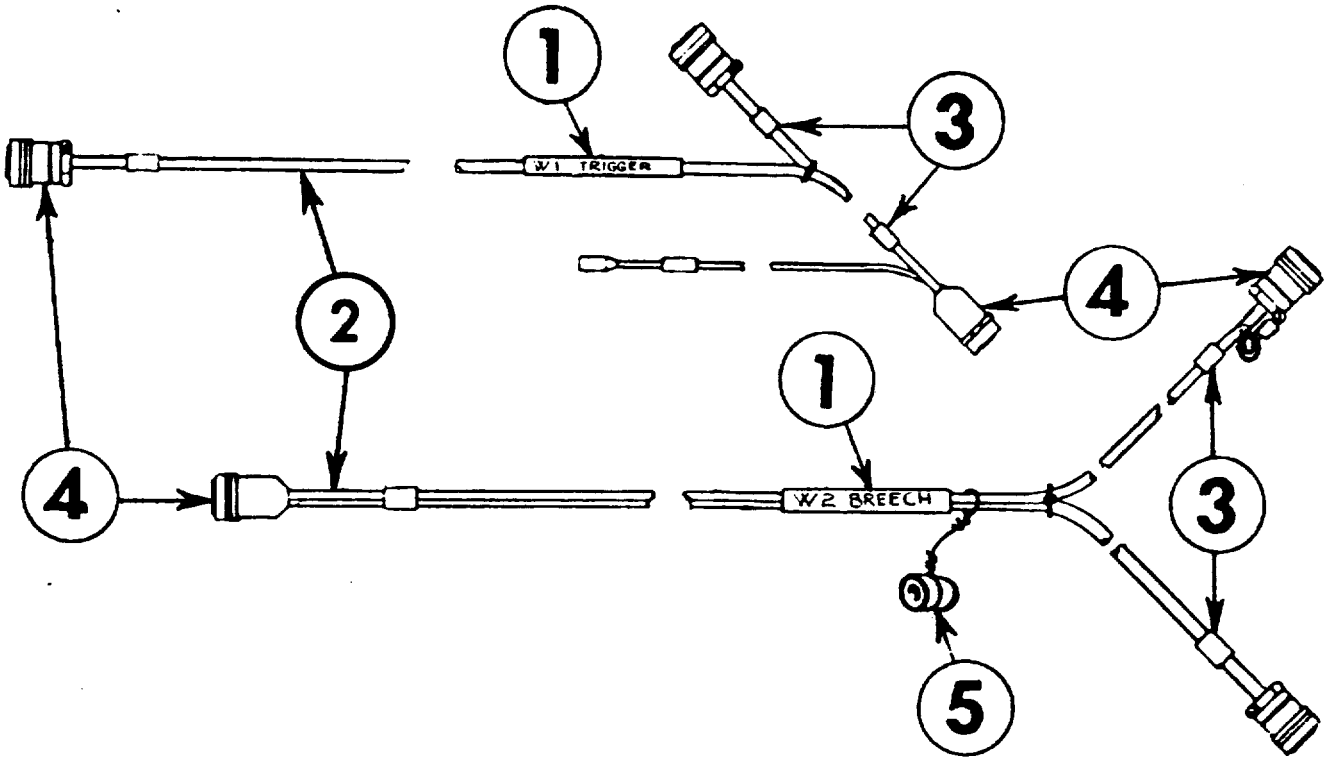
**TASK 6 INSIDE Inspect Main Gun/Shillelagh/Coax MS Transmitter**




1. Inspect transmitter for any damage that would prevent normal operation.
2. Make sure the handle turns.
3. Remove any dirt or oil from lens with a lens paper (see page 88) or soft dry cloth.
4. Look through the telescope. Be sure you can see distant objects.
5. Following inspection, temporarily set transmitter aside. Do not install at this time.

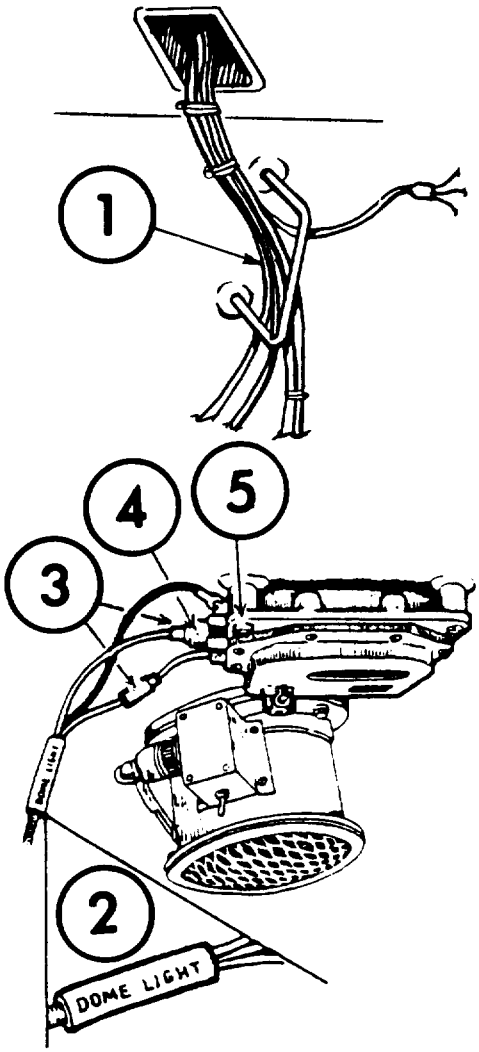
- Report any damage on DA Form 2402, and replace transmitter if inoperable.

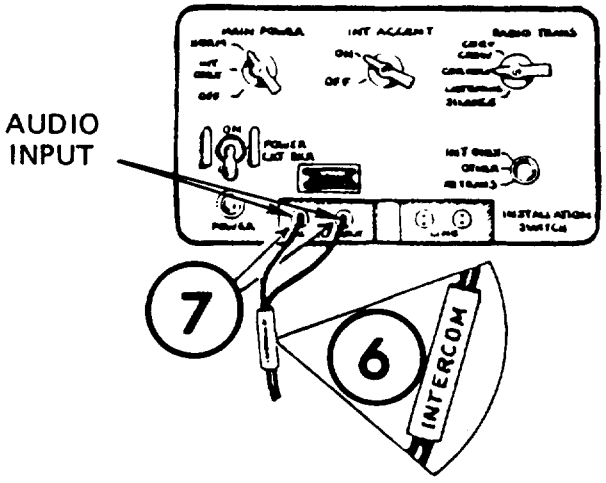
**TASK 7 INSIDE Inspect MILES Cables**




1. Find cable assemblies labeled W1-TRIGGER and W2-BREECH.
2. Check each cable assembly for worn insulation or bare wires.
3. Each connector should have a label showing where it goes.
4. Check all connectors for obvious damage.
5. Make sure the breech adapter plug is attached to the breech cable.
    - Report any damage on DA Form 2402, and replace cable assemblies if unusable.

**TASK 8 INSIDE Install MILES Cables**




SUBTASK 1: COMPLETE CVKI CABLE INSTALLATION

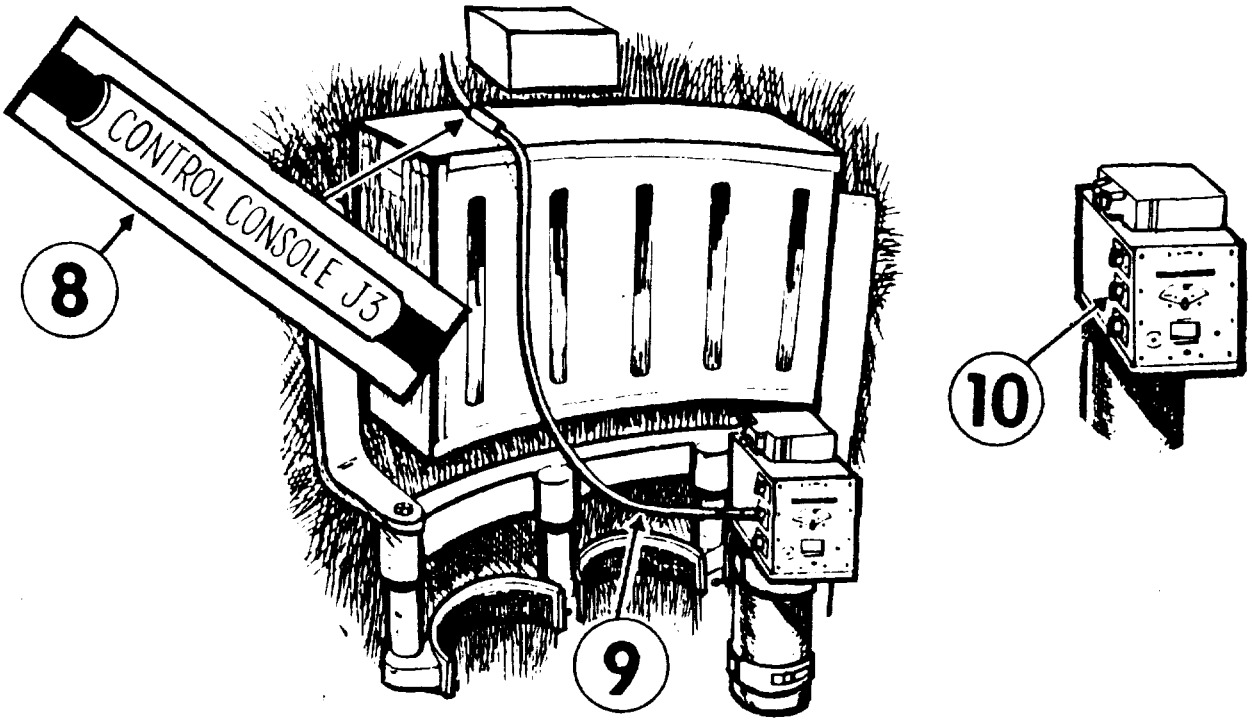
- Before doing this task, check with the TC to make sure that Outside Task 8 has already been done.
- CVKI cable should be inside the turret, hanging through loader's periscope hatch.

1. Route cable through handle in turret ceiling.
2. Locate cable end labeled DOME LIGHT.
3. Pull the plug from the dome light near the 7.62 ammunition rack. Plug the dome light cable into MILES cable end labeled P7.
4. Plug MILES connector labeled P8 into the dome light.
5. Loosen nearest dome light bolt. Slip connector labeled E1 under the bolt and tighten it. Insure clean metal-to-metal contact.

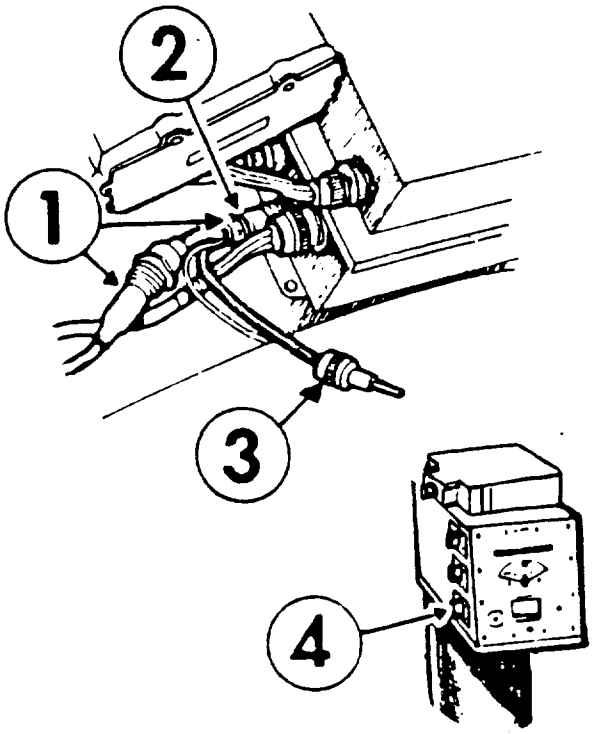
- If dome light has a dimmer control, turn it to the full bright position. Always keep the control in the full bright position while operating MILES equipment.

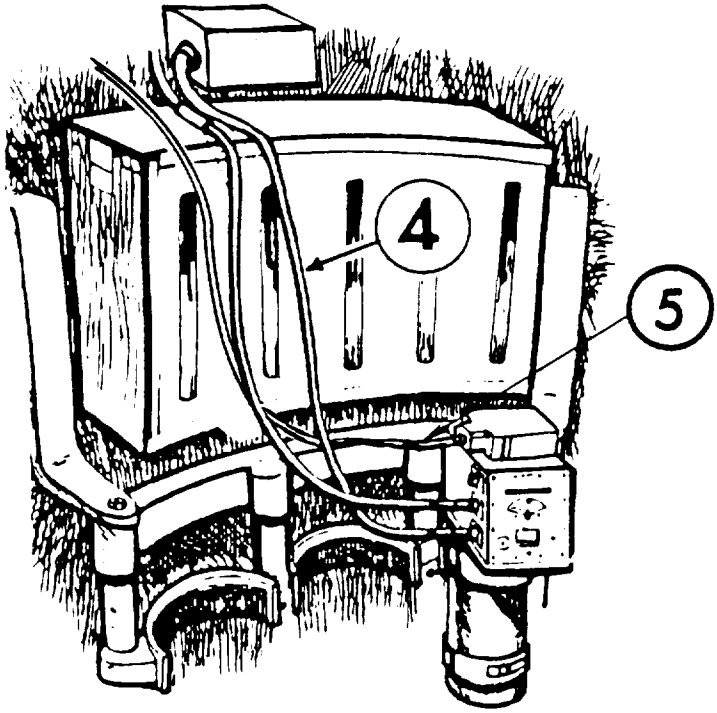
6. Find cable end labeled INTERCOM. Route the intercom cable around the rear of the turret to the AM1780 intercom unit, at the track commander's station.
7. Plug MILES connectors labeled P5 and P6 into the intercom unit as shown. Either plug fits either jack.

**TASK 8 INSIDE**



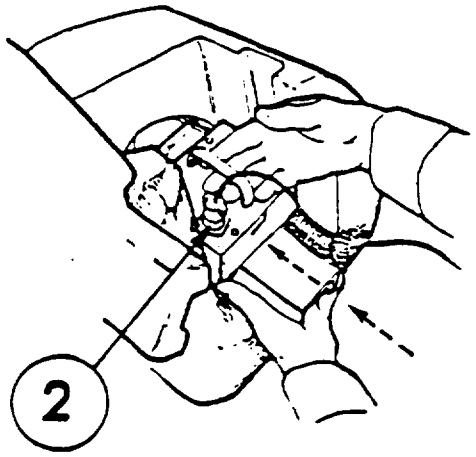

8. Find the end of the cable labeled CONTROL CONSOLE J3.
9. ROUTE cable in front of 7.62 ammunition rack, as shown.
10. Plug the cable connector into J3 on the control console.




SUBTASK 2: INSTALL M551 TRIGGER CABLE ASSEMBLY

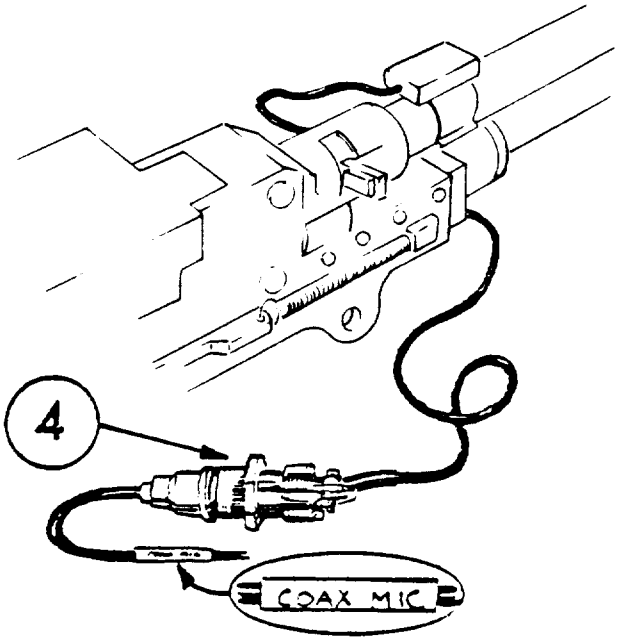
1. Pull cable from J3 of the relay box. Connect it to MILES connector labeled RELAY CONTROL CABLE P4.
2. Plug MILES connector labeled RELAY CONTROL BOX P2 into the relay box.
3. Connect MILES connector P3 to the Hoffman trigger cable.
4. Route cable in front of 7.62 ammunition rack and plug the cable connector into J2 on the control console.
5. Connect cable labeled BATTERY into the connector on the battery box.

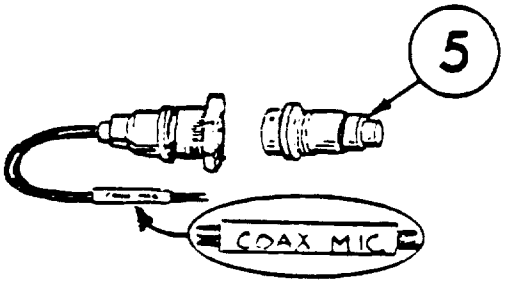



SUBTASK 3: INSTALL BREECH CABLE ASSEMBLY

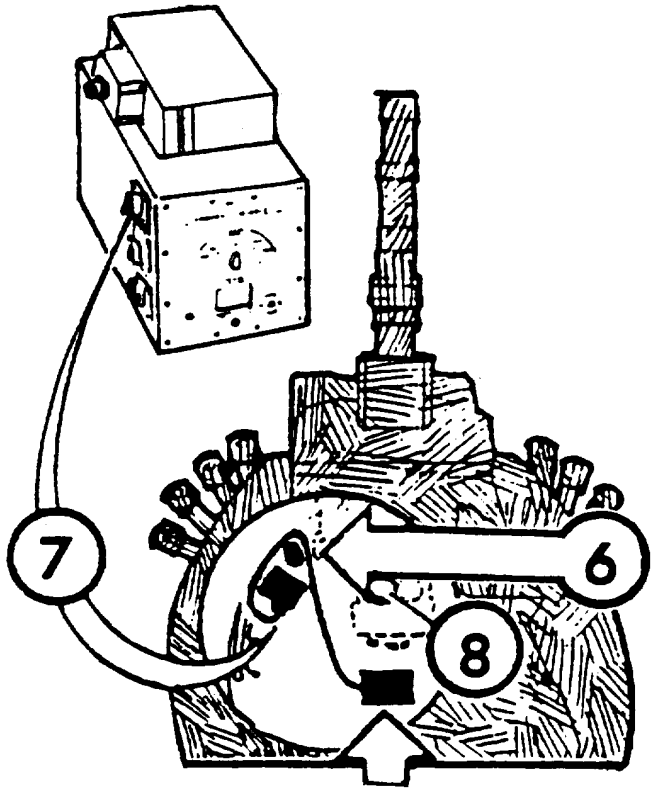
1. Find cable connector labeled BREECH XMTR.
2. Plug connector into transmitter.

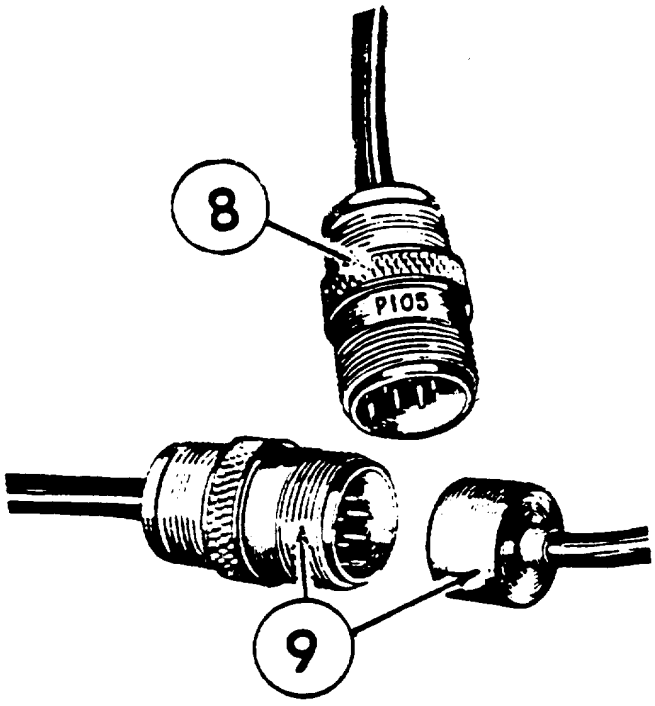
3. Find connector labeled COAX MIC.
4. Connect COAX MIC to cable from coax machine gun microphone.
   - M240 MG is shown. Your weapon may differ.
5. For dry-fire operation, disconnect the microphone, obtain dry-fire plug from controller, and plug it into the COAX MIC connector.



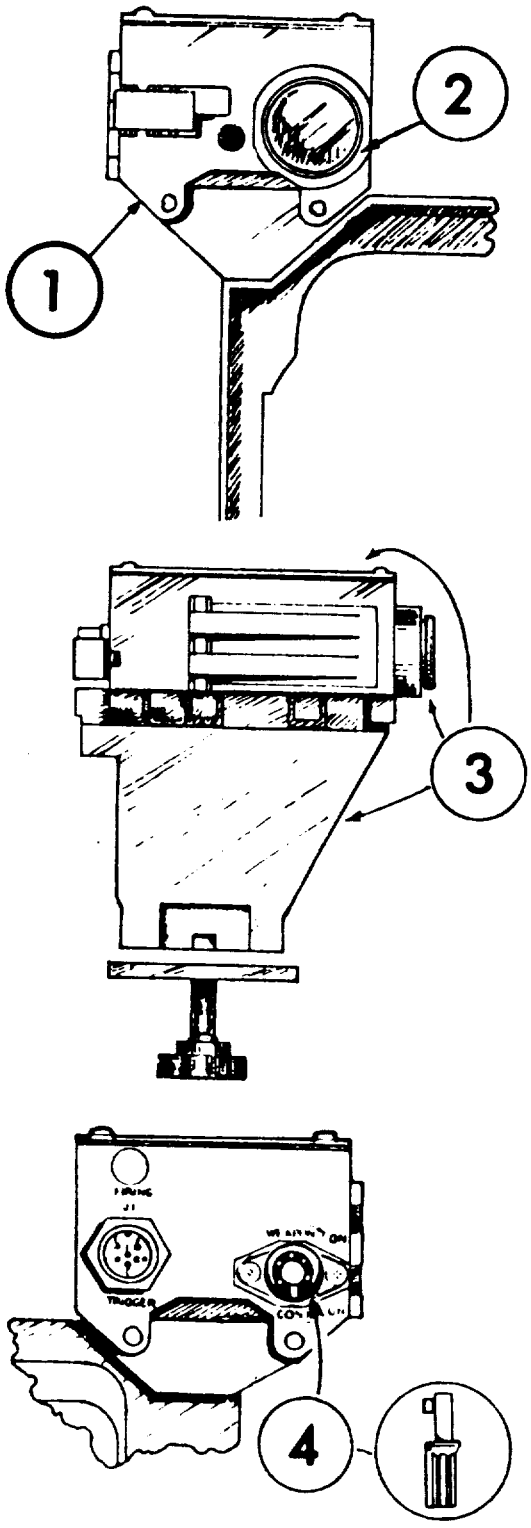
**TASK 8 INSIDE**




6. Route cable from transmitter behind gauge on the $C0_2$ bottle.
7. Connect cable to J1 on the control console.
8. Locate the two vehicle cables underneath the breech of the main gun. Remove the one that is to the left and closest to you. If you look at the cable it is labeled P105.
9. Unplug the cable. Insert the breech interlock plug into the plug on the cable. Leave the cable hanging loose.

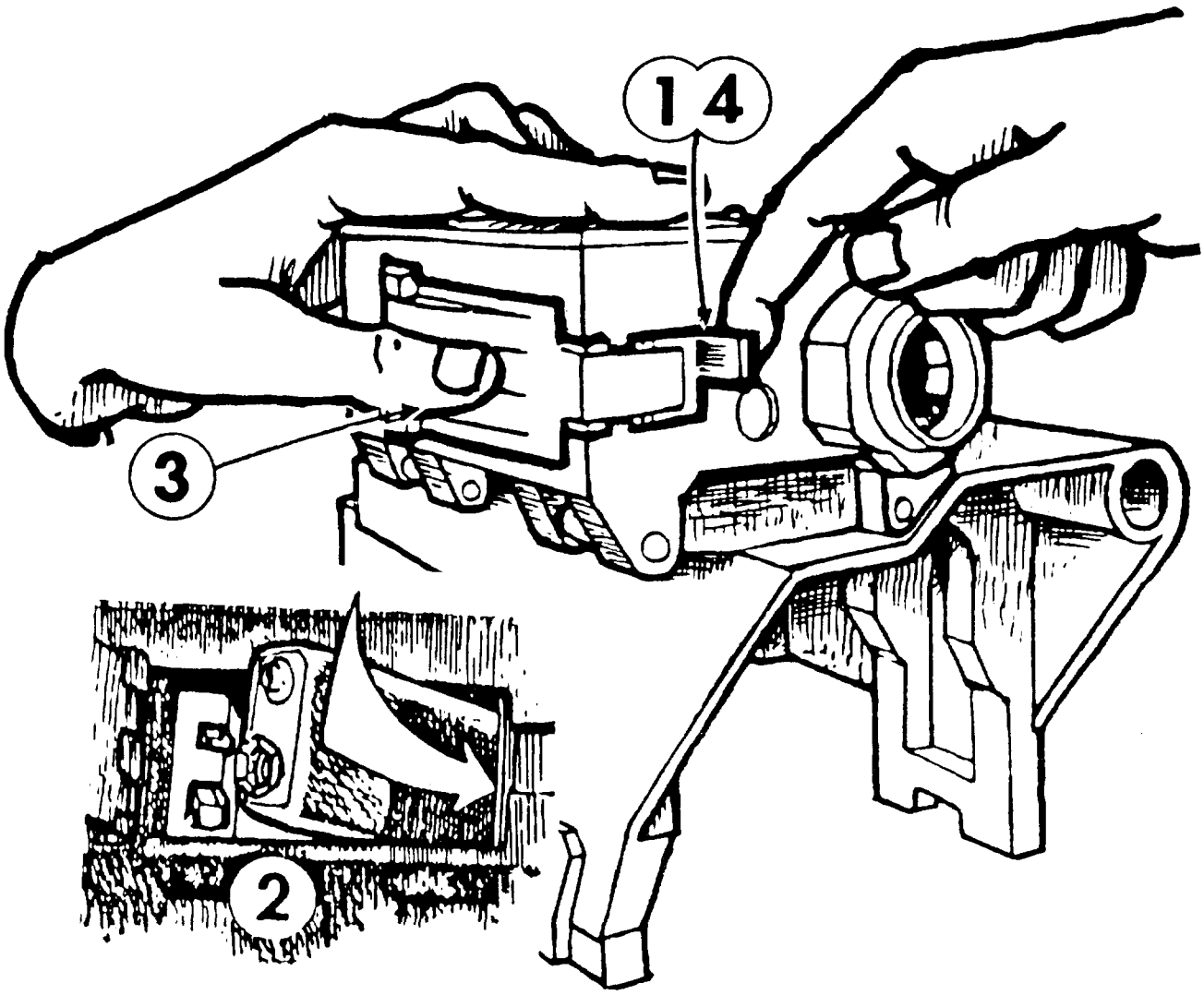
**TASK 1 MG Inspect and Service M2 Machine Gun Transmitter**




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 88) or a soft, dry cloth.
3. Wipe all surfaces clean.
4. Make sure you can turn orange key. It should turn to the ON position and back again.

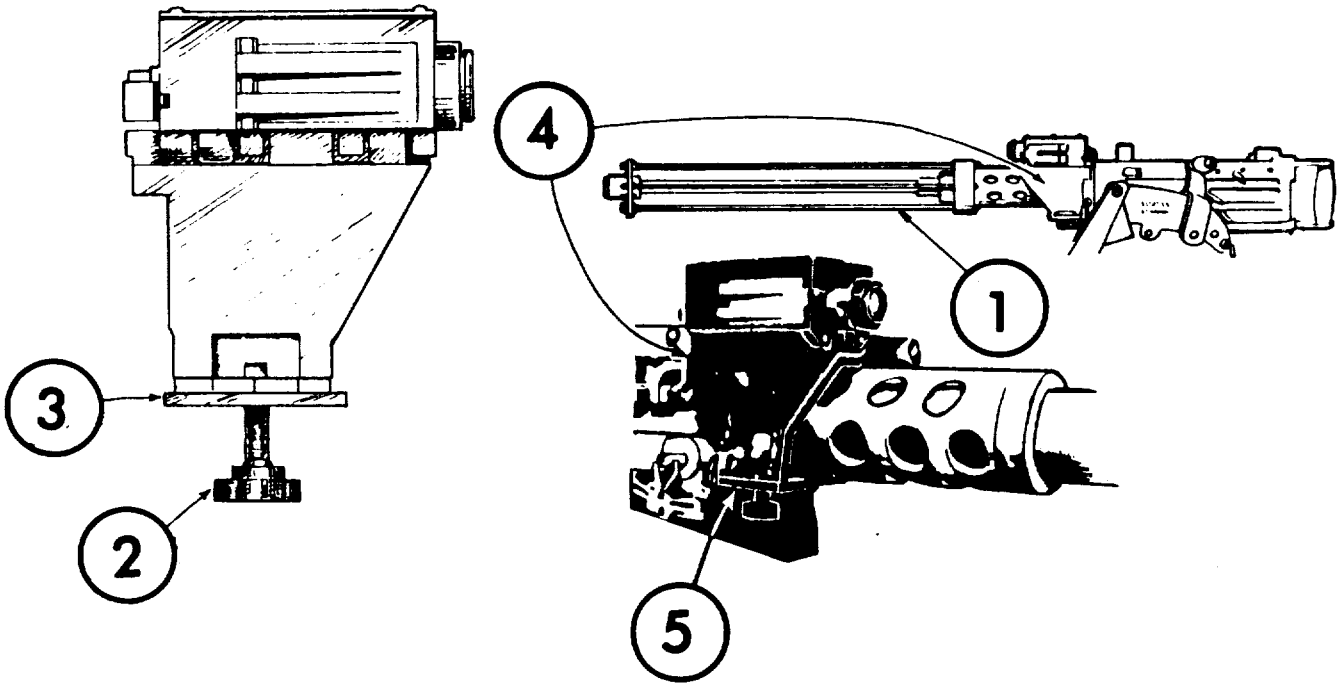
- Report any damage on DA Form 2402, and replace damaged transmitter if inoperable.

**TASK 2 MG 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.
4. Press the latch closed.

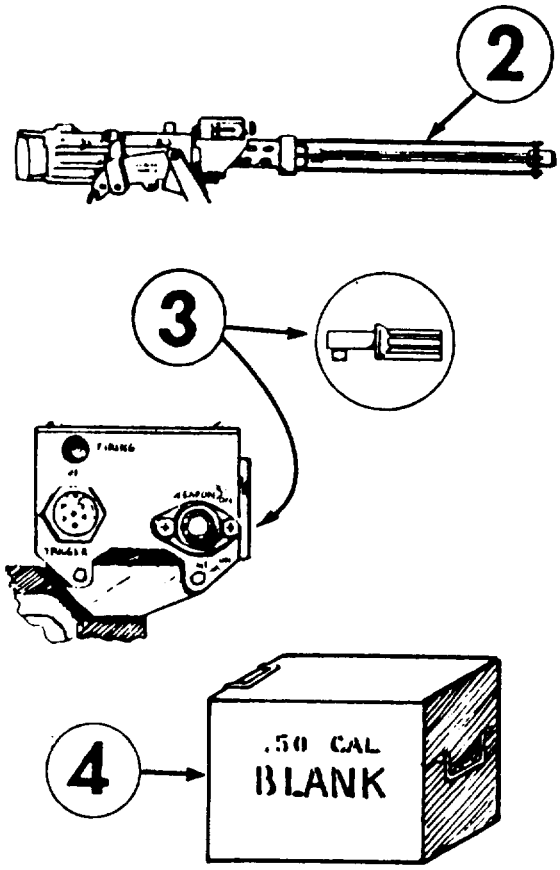
**TASK 3 MG Attach Transmitter**




- Before installing transmitter, mount M2 machine gun on vehicle.
- Remove pintle protective armor assembly if there is one installed.

1. Attach blank fire adapter M19.
2. Unscrew knob on bottom of transmitter bracket.
3. Swing plate down.
4. Put transmitter on heat shield right up against receiver. Be sure the lip of the back of mounting bracket sits behind the barrel cooling jacket so that the transmitter is held securely in place.
5. Swing plate up under the cooling jacket and securely tighten the knob with your hand.

**TASK 4 MG Blank-Fire Operation**

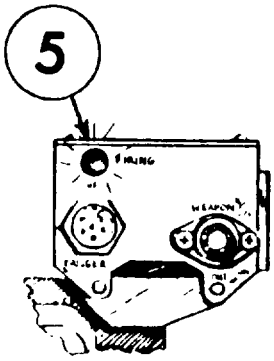



1. Make sure Task 3 has been completed.
2. Make sure blank fire adapter is attached.
3. Turn orange weapon key to WEAPON ON.
4. Load the M2 with blank ammunition.
5. Ask another crewman to watch the firing light on the transmitter as you fire a short burst. The lamp should light.

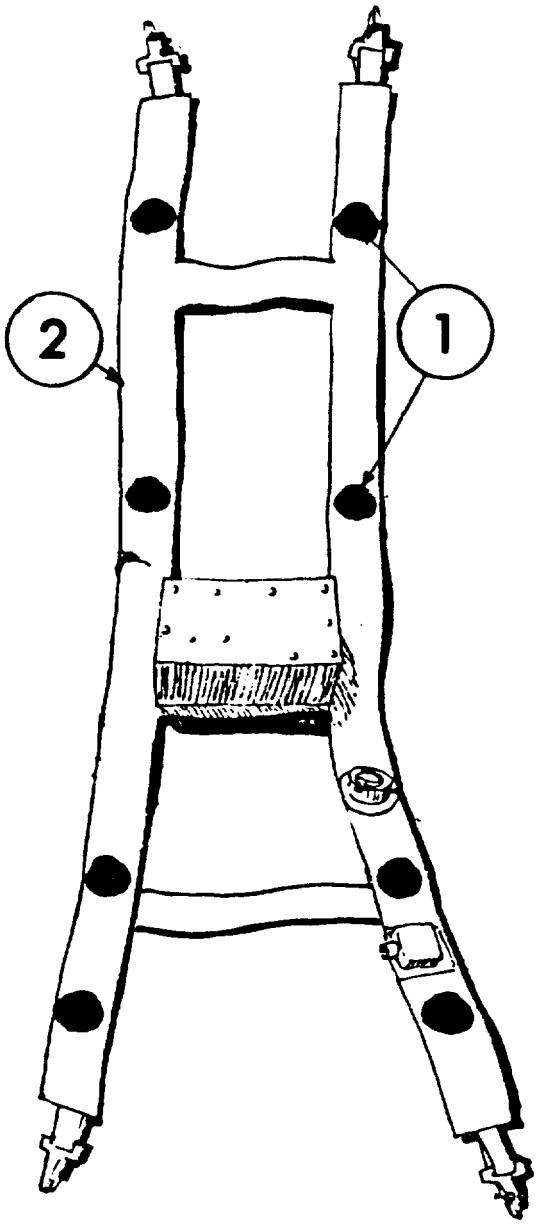
**NOTE**

**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 lighting during the exercise, replace the transmitter battery and ask the controller to reset the transmitter.**

- The M2 is ready to fire. The sound of blanks firing will trigger the transmitter. The transmitter will operate only when blank ammunition is fired.



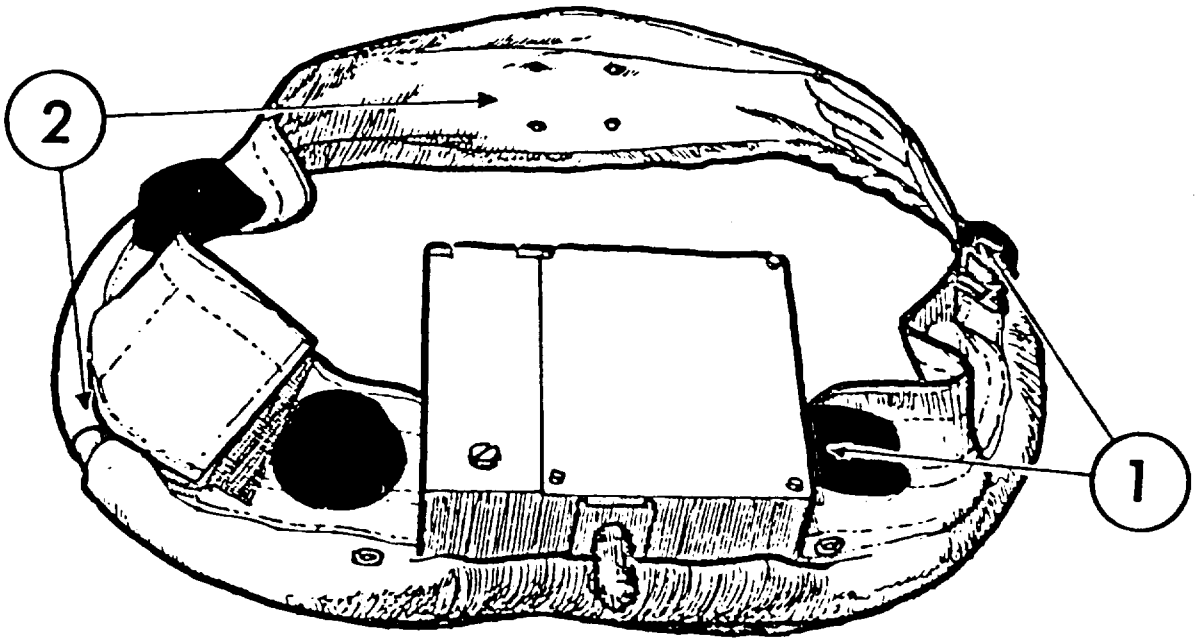
**TASK 1 MWLD Inspect and Clean Torso Harness**




1. Wipe all detectors clean.
2. Inspect torso harness for any damage that would prevent normal operation.

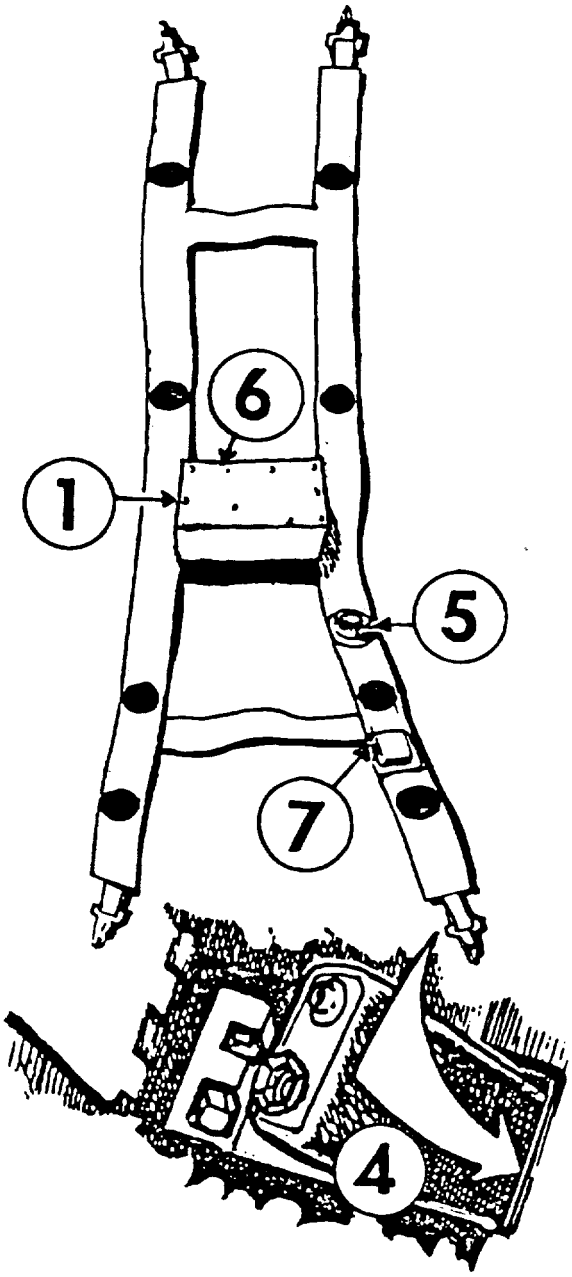
•. Report any damage on DA Form 2402, and replace torso harness if unusable.

**TASK 2 MWLD Inspect and Clean Helmet Harness**




1. Wipe detectors clean.
2. Inspect helmet harness for any damage that would prevent normal operation.
   - Report any damage on DA Form 2402, and replace helmet harness if unusable.

**TASK 3 MWLD Install Batteries in MWLD Harnesses**



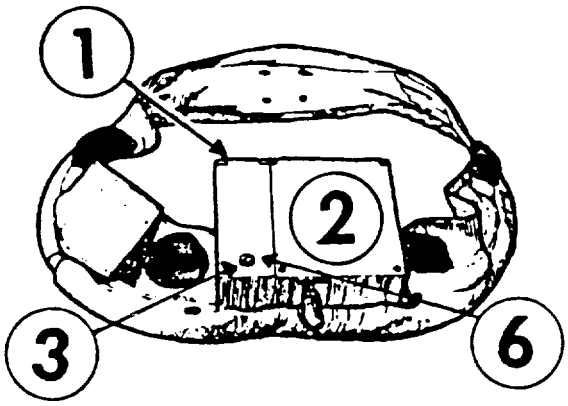

1. Locate battery boxes on both helmet and torso harnesses.
2. Put a battery in the helmet harness first.
3. Loosen thumbscrew and open door.
4. Put in battery as shown.
5. When you put a battery in the torso harness, an alarm should sound.

**NOTE**

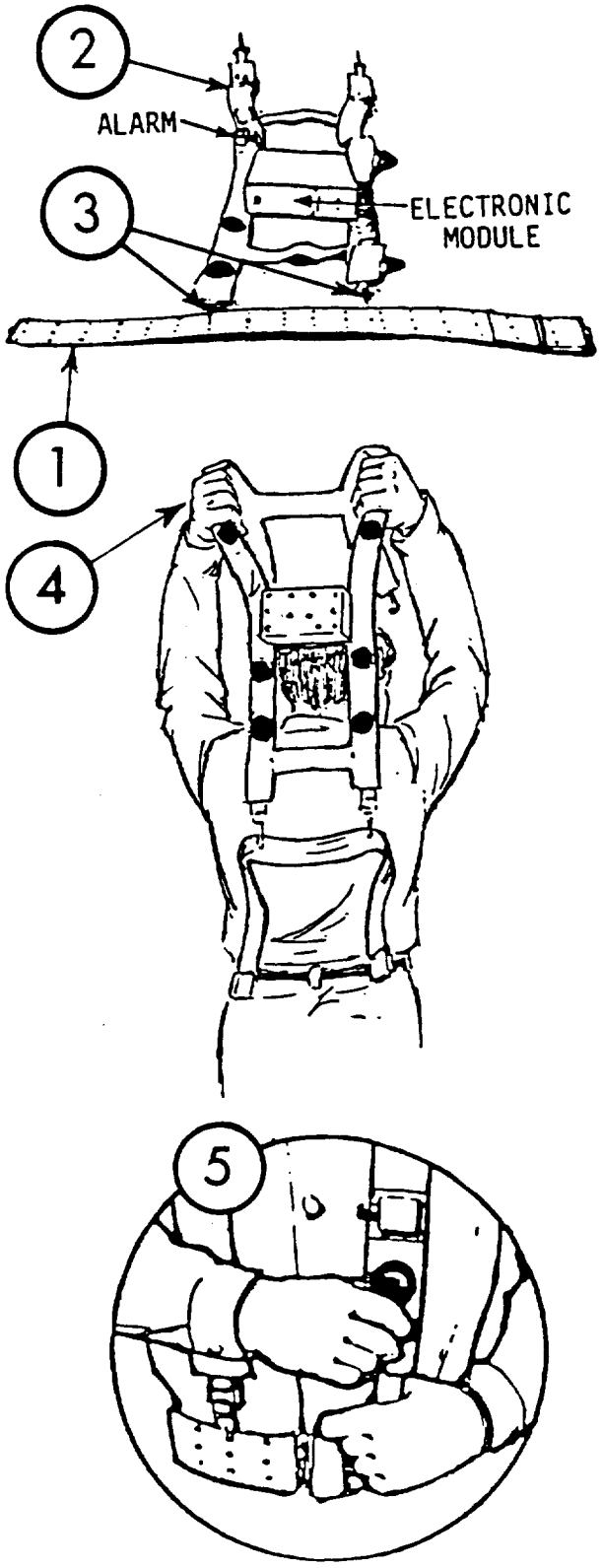
**If no alarm, remove and reinsert the same battery. If still no alarm, get a new battery from your NCOIC and try again. If still no alarm, report on DA Form 2402, and replace the torso harness.**

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.



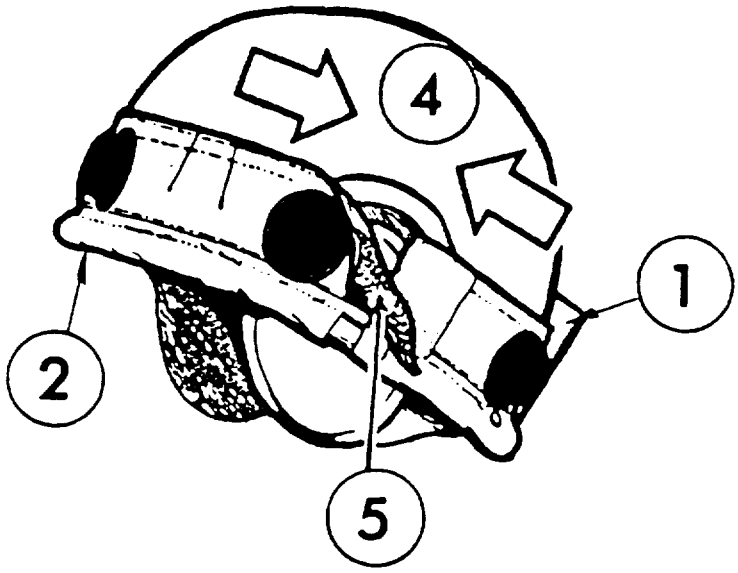
**TASK 4 MWLD Put on Torso Harness**




- 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**

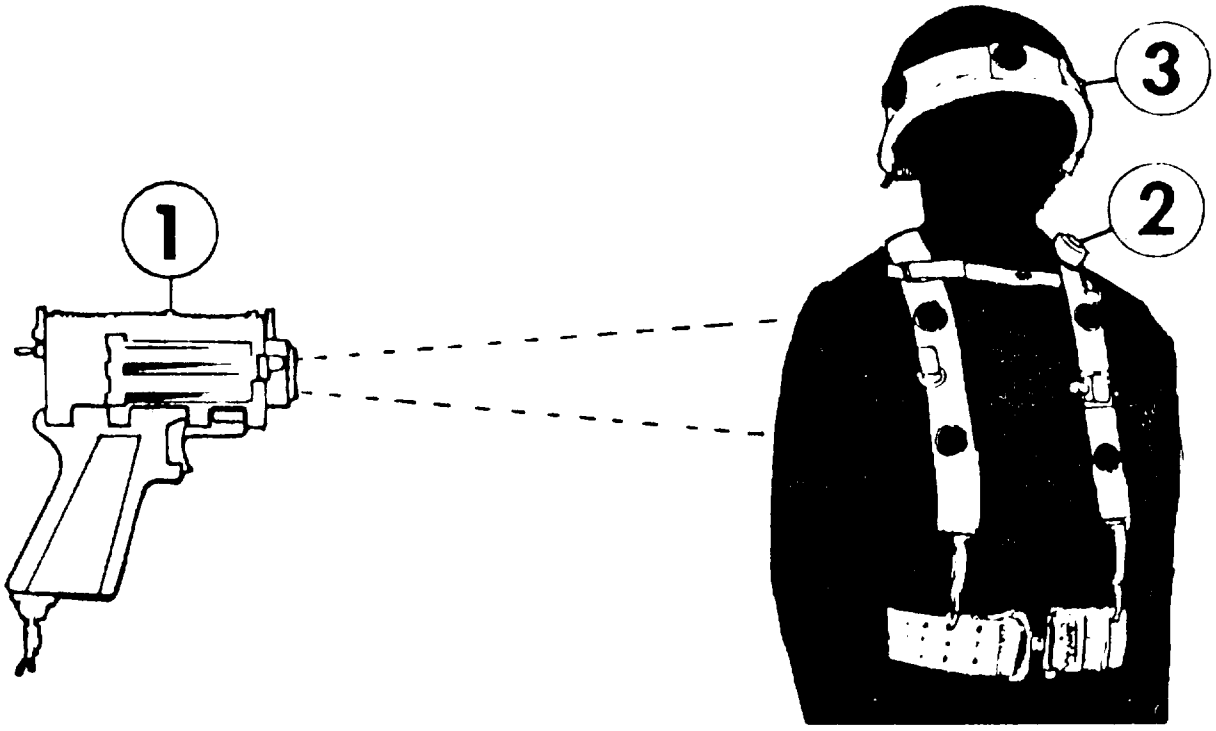



- Your helmet must have three to five patches of Velcro installed on the outside. If you do not have any Velcro on your helmet, turn to page 18 for instructions on installing the Velcro.

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 to five 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 by firing a "Near-Miss."
2. When he fires, your alarm should sound briefly.

**NOTE**

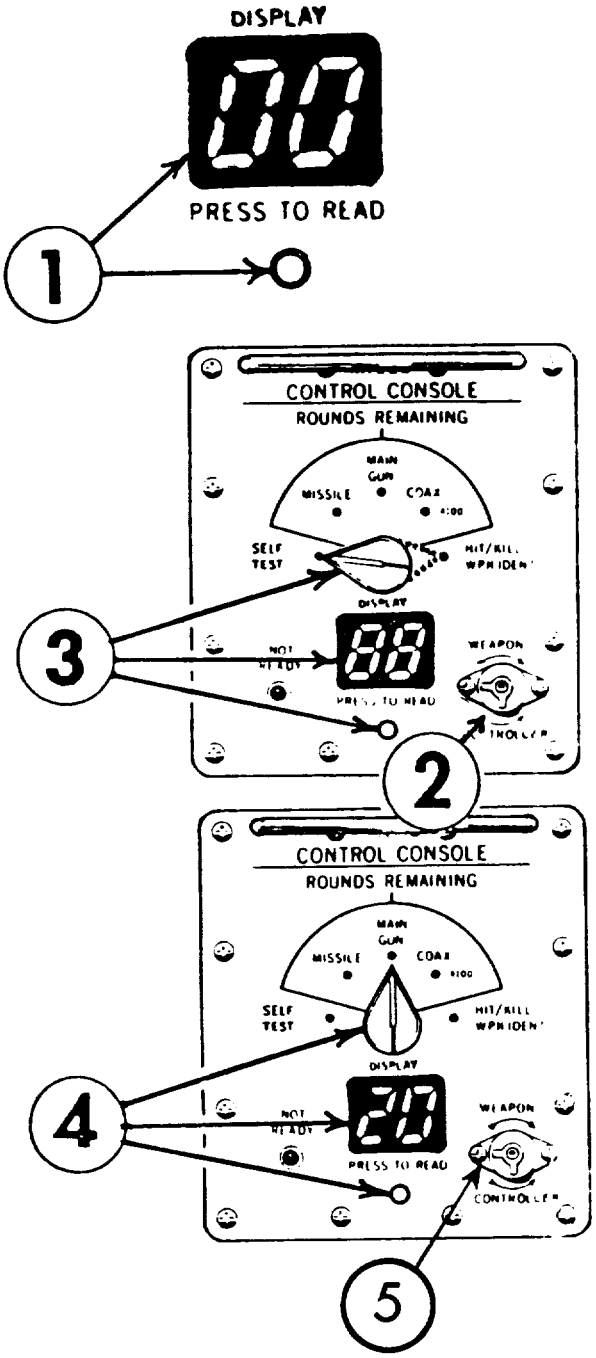
**If no alarm, remove and reinsert the same battery in the torso harness and test again. If still no alarm, replace the battery in the torso harness (see MWLD Task 3 and test again. If still no alarm, report on DA Form 2402, and replace the MWLD.**

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 Form2402, and replace the MWLD.**

**TASK 2 TEST Test MILES System**




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

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 65.**

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. Push PRESS TO READ button. Display should show 88.

**NOTE**

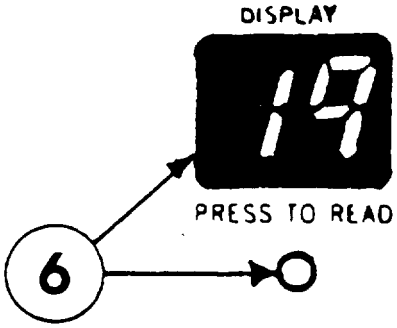
**If display does NOT show 88, go to page 65.**

4. Turn console switch to MAIN GUN. Press PUSH TO READ button. Push PRESS TO READ button on control console. Display should show 20.

**NOTE**

**If display does NOT show 20, go to page 65.**

5. Turn console switch to SELF-TEST. Insert orange weapon key into control console receptacle and turn. Then turn key back and remove. Verify that a tone sounds in the vehicle's intercom, that the CVKI light flashes continuously, and that the display shows a 99.




**NOTE**

**If no intercom tone, go to page 69. If CVKI does not flash, go to page 68.**

- Ask controller to reset the control console.

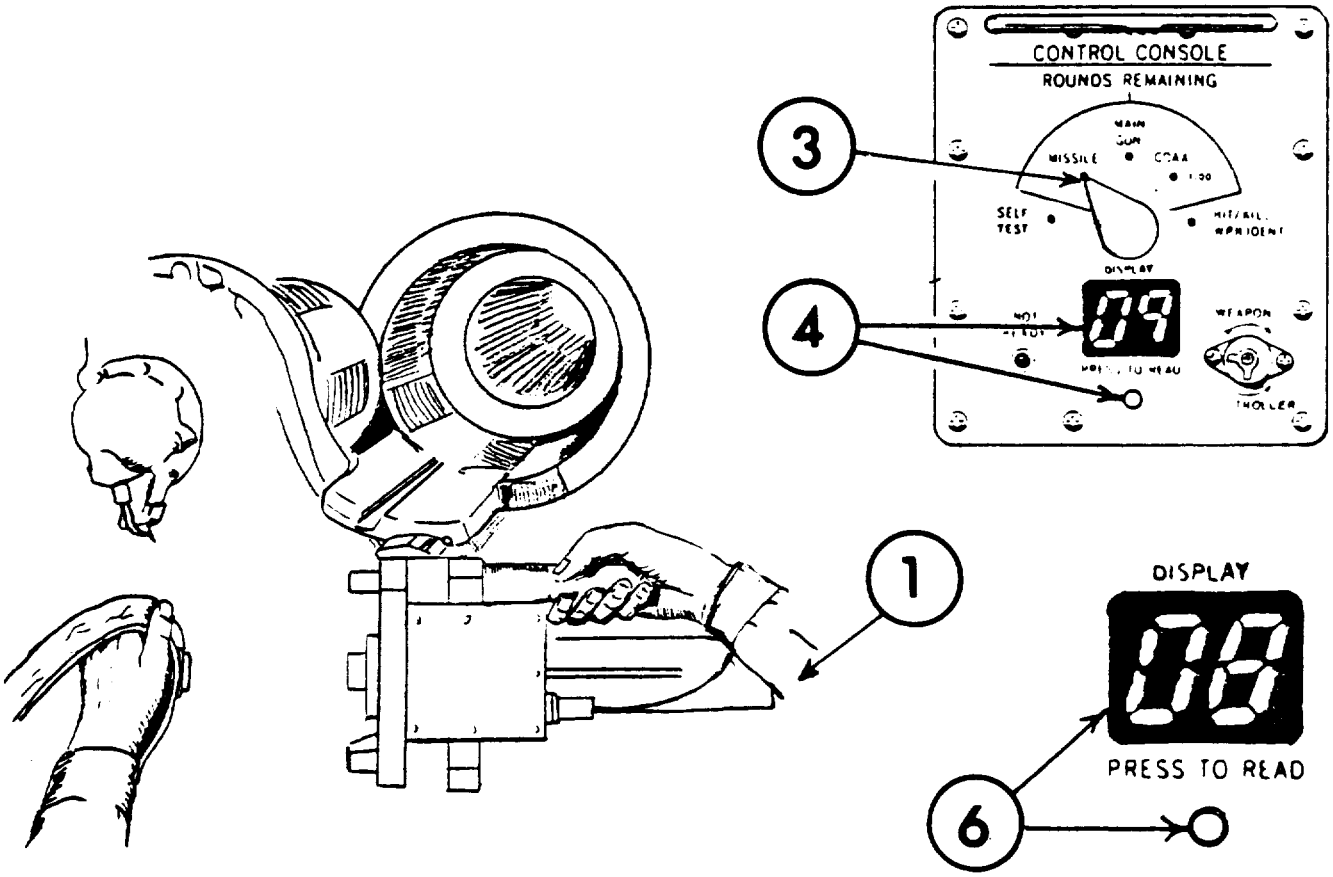
Trigger Interface Test

1. Turn MASTER VEHICLE POWER to ON.
2. Set M551 READY/SAFE switch to READY.
3. Open TRACKER DOOR.
4. Set FIRE CONTROL SELECTOR to CONV.
5. Turn TURRET CONTROL switch ON and fire main gun.
6. Push PRESS TO READ Button. Display should show 19.

**NOTE**

**If display does NOT show 19, go to page 65.**

**TASK 2 TEST**




MAIN GUN TRANSMITTER TEST

1. Pick up main gun transmitter and hold it so that the lens marked 152 is in front of a detector on a MWLD torso harness. 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. Ask controller to reset harness using his green controller key.

**NOTE**

**If no indication of main gun hit, go to page 66.**

2. Set FIRE CONTROL SELECTOR to MISSILE.
3. Set MILES control console switch to MISSILE.
4. Press PUSH TO READ button. Display should show 9.

**NOTE**

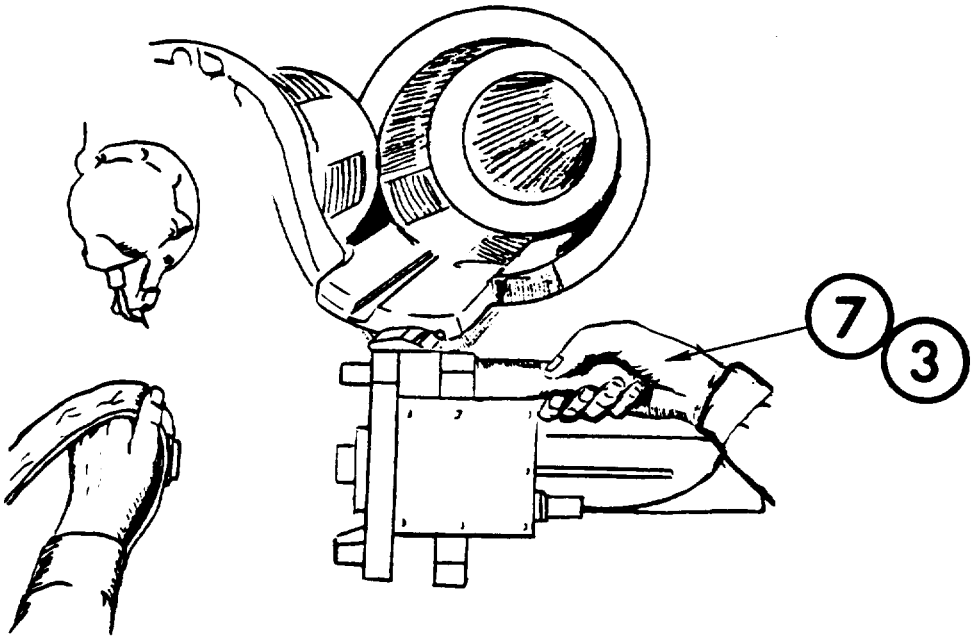
**If display does NOT show 9, go to page 66.**

5. Fire the Shillelagh.
6. Press PUSH TO READ button. Display should show 3.

**NOTE**

**If display does NOT show 8, go to page 66.**

**TASK 2 TEST**




7. Hold main gun transmitter so that the lens marked MISSILE is in front of a detector on the MWLD torso harness. Fire the Shillelagh and listen for a kill indication. Ask controller to reset harness using his green controller key.

**NOTE**

**If no indication of Shillelagh hit, go to page 67.**

COAX MACHINE GUN TRANSMITTER TEST

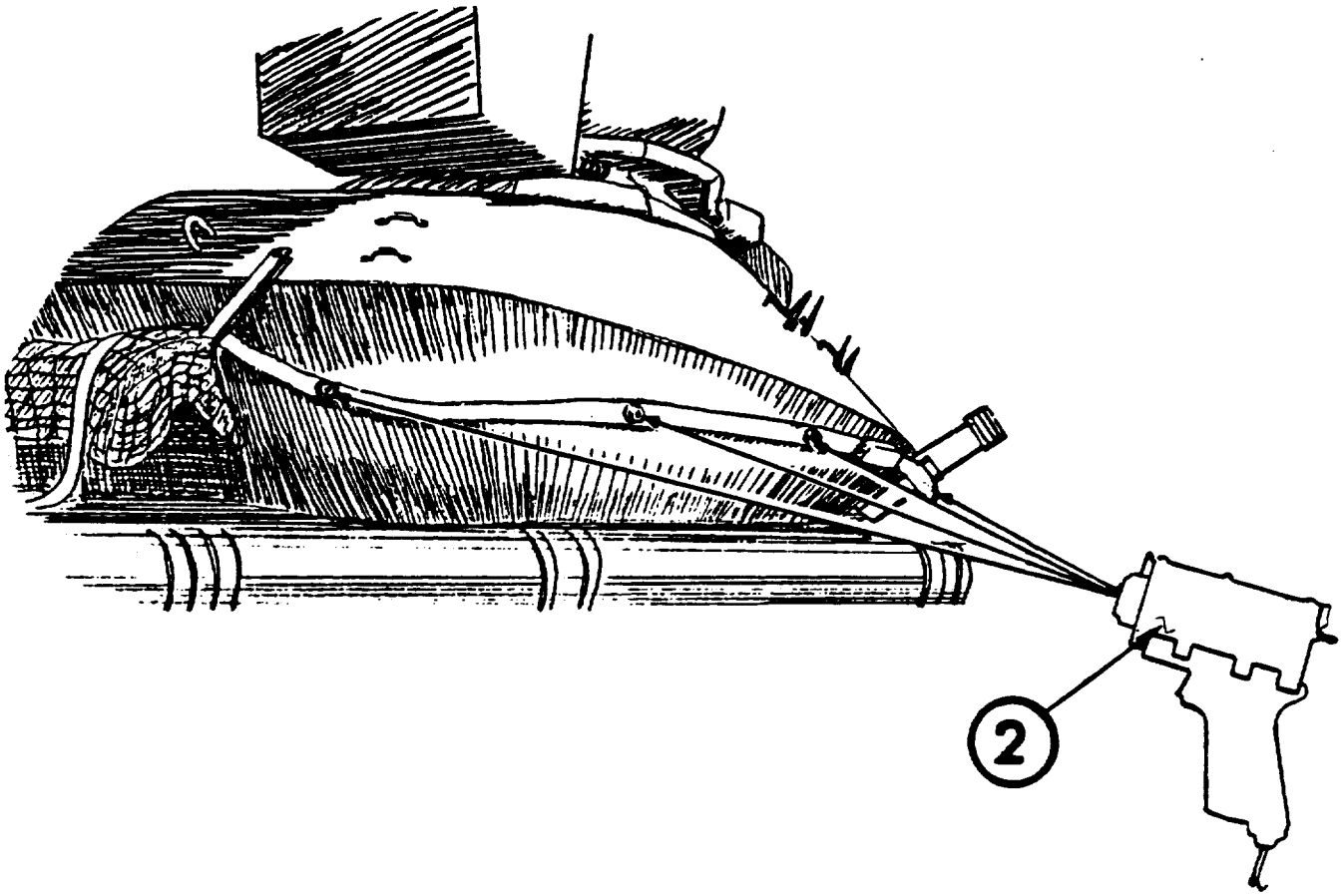
1. Make sure coax machine gun is loaded with blank ammunition.
2. Take the coax machine gun off SAFE.
3. Hold main gun transmitter so that the lens marked COAX is in front of a detector on the MWLD torso harness. Fire the coax machine gun and listen for a kill indication. Ask controller to reset harness using his green controller key.

**NOTE**

**If no indication of coax machine gun hit, go to page 67.**

4. Place coax machine gun on SAFE.

**TASK 2 TEST**




BELT TEST

- Make sure MASTER VEHICLE POWER is ON.

1. Check that all cable and Detector Belt Segment connections are tight. Ask a crewmate to check that CVKI cable connections to the control console and the dome light 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.
3. If the CVKI fails to flash for some or all of the detectors or if no tone in intercom, go to page 68.

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

4. If no intercom tone, go to page 67.

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 pressing display 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 Electronic Systems Test Set.

NO 88

If the display does not show the number 88:

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

- If display shows 88, go to step 4 on page 60.

B. If display still does not show 88, ask controller to check out the equipment using the Electronic Systems Test Set.

NO 20

If the display does not show the number 20.

A. Ask controller to check out the system using the Electronic Systems Test Set.

NO 19

If the display does not show the number 19.

A. Make sure all MILES trigger cable connections are tight (see Inside Task 8).

- Fire the main gun.
- Check for 19.
- If display shows 19, go to Main Gun Transmitter Test on page 62.

B. If still no 19, ask controller to check out the system using the Electronic Systems Test Set.

TROUBLESHOOTING PROCEDURES (Continued):

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 8).
   - 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 Step 2 on page 62.

B. If still no kill indication, ask the controller to check out the system using the Electronic Systems Test Set.

NO 9

If display does not show the number 9.

A. Ask controller to check out the system using the Electronic Systems Test Set.

NO 8

If the display does not show the number 8.

A. Make sure all MILES trigger cable connections are tight (see Inside Task 8.)
   - Fire the Shillelagh missile.
   - Check for 8.
   - If display shows 8, go to step 7 on page 63.

B. If still no 8, ask controller to check out the system using the Electronic Systems Test Set.

TROUBLESHOOTING PROCEDURES: (Continued)

NO INDICATION, SHILLELAGH HIT

If no kill indication when fired at MWLD torso harness:

A. Make sure all MILES breech cable connections are tight (see Inside Task 8).

- Fire the Shillelagh at the MWLD torso harness held in front of the transmitter inside the turret.
- If a kill indication occurs, go to Coax MG transmitter test on page 63.

B. If still no kill indication, ask the controller to check out the system using the Electronic Systems Test Set.

NO INDICATION, COAX MACHINE GUN

If no hit indication when fired at a target:

A. Make sure the coax microphone cable connections are tight (see Inside Task 8).

- Fire coax machine gun at a target.
- If hit indication occurs, go on to Step 4 on page 63.

B. If still no hit indication, ask the controller to check out the system using the Electronic Systems 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 (see Inside Task 8).

- If tone sounds, go to Trigger Interface Test on page 61.

3. If still no tone, ask controller to check out the equipment using the Electronic Systems Test Set.

NO CVKI FLASH

1. Make sure CVKI cable connection is tight (see Outside Task 8).

2. Make sure dome light connections are tight (see Inside Task 8).

    - If CVKI flashes, go to Trigger Interface Test on page 61.

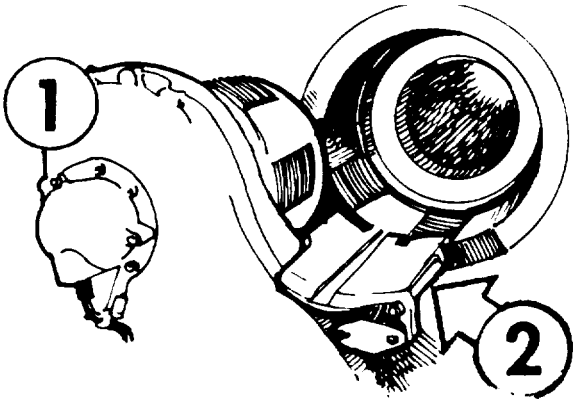
3. If still no flashing, ask controller to check out the equipment using the Electronic Systems Test Set.

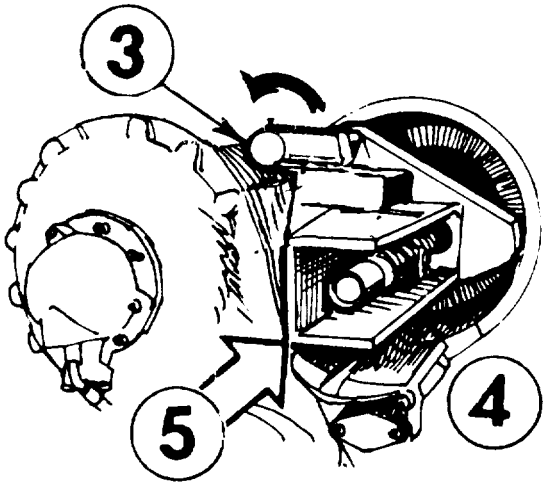
FAULTY DETECTOR BELT SEGMENTS

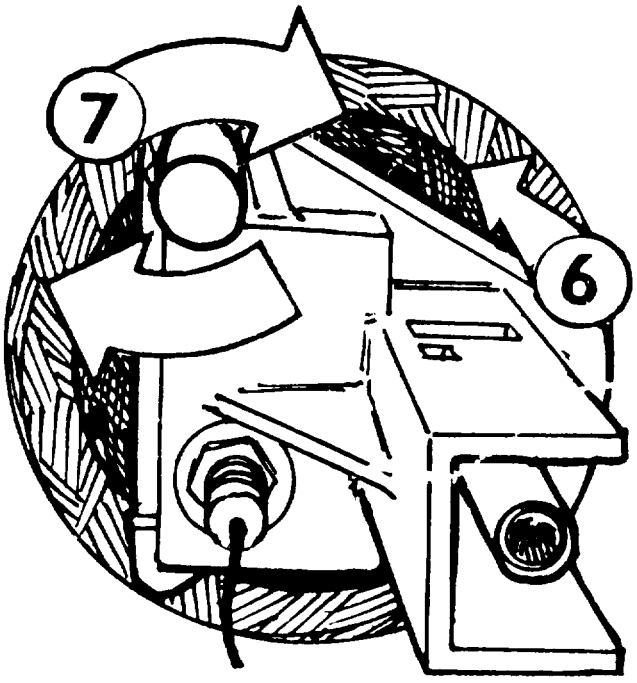
1. Check cable connections at the detector belt segments.

2. If detector belt segments are still faulty, ask controller to check out the equipment using the Electronic Systems Test Set.

**TASK 1 ALIGN Install Main Gun/Shillelagh/Coax Transmitter**



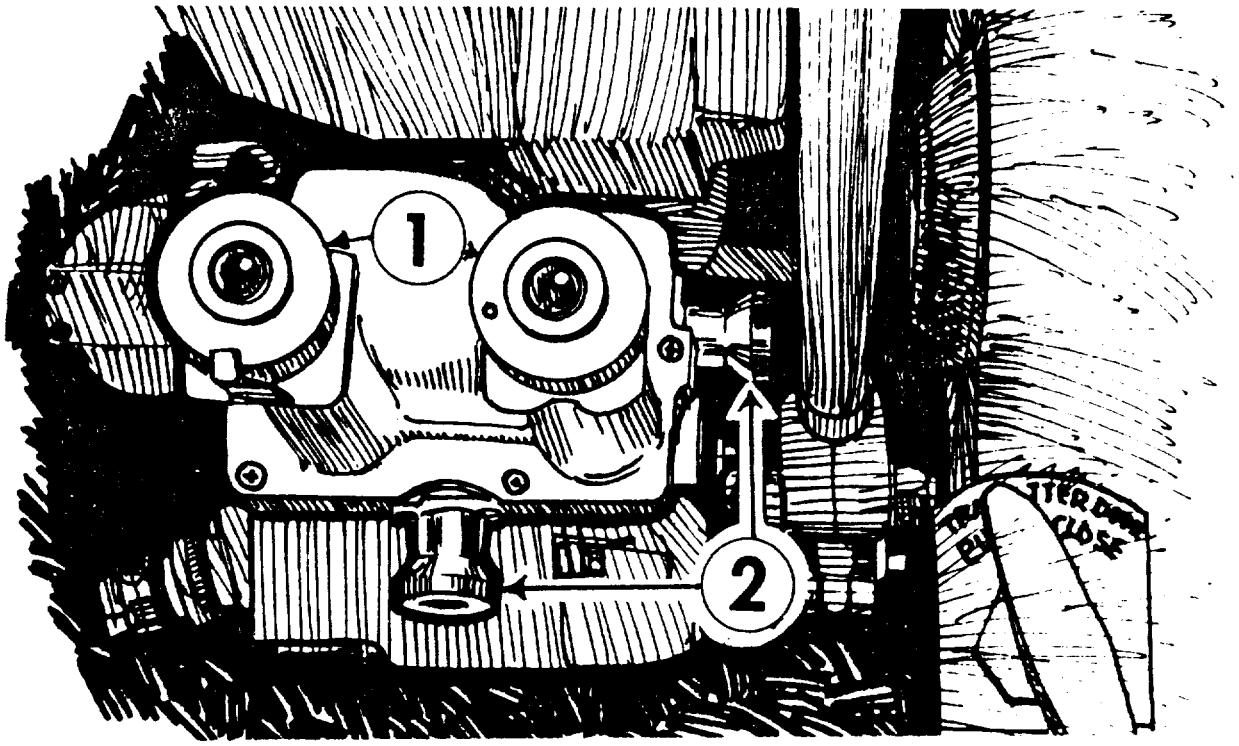




- Remove gun/launcher seal before installing main gun MILES transmitter.

1. Open the main gun breech ALL THE WAY.
2. Slide the loading tray all the way back.
3. Before inserting the transmitter in the breech, loosen the handle by turning it left AS FAR AS IT GOES.
4. Set the transmitter on the loading tray.
5. Slide the transmitter forward. As you do, rock the transmitter slightly. Do this until the transmitter drops off the loading tray into the breech.
6. Slide the transmitter all the way into the breech.
7. Hold transmitter in place. Turn the handle all the way right to lock transmitter in place. Make sure that transmitter is locked tightly in the breech.

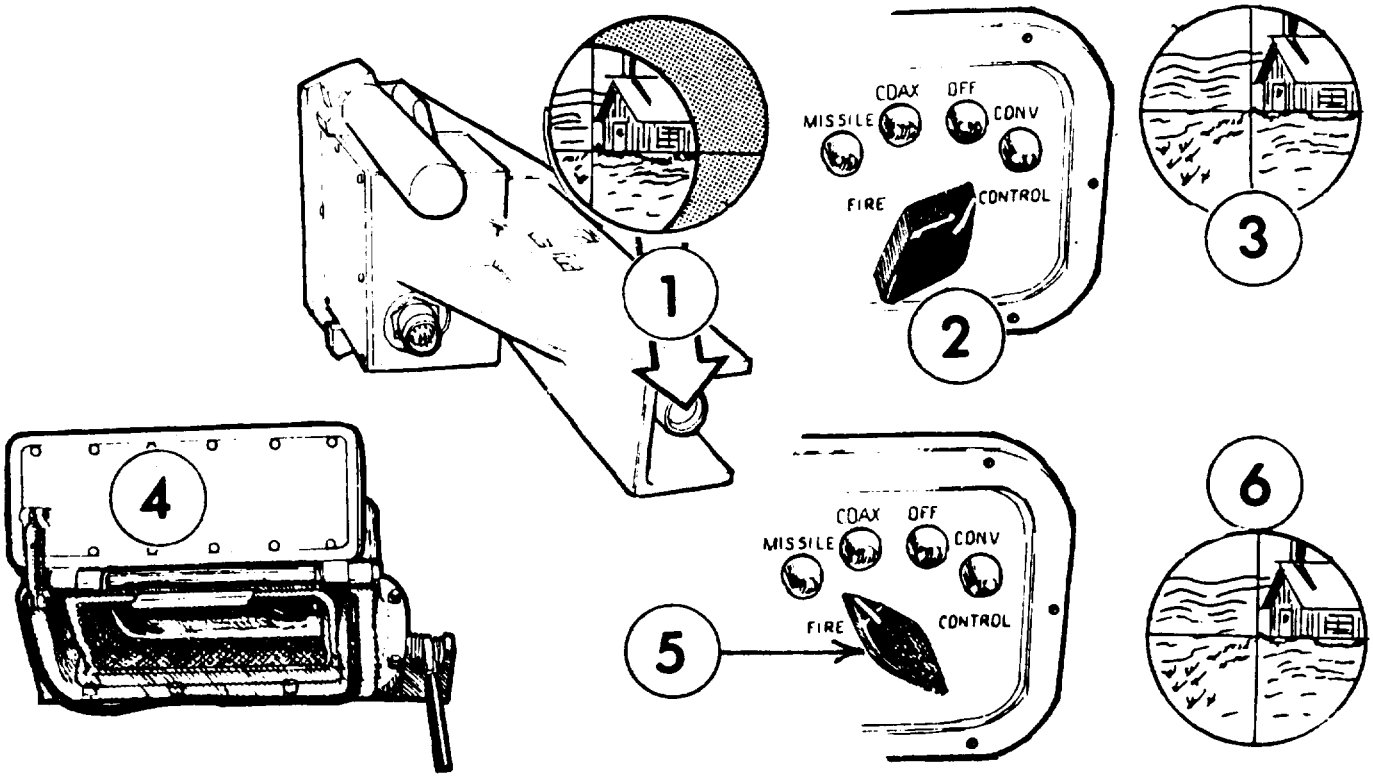
**TASK 2 ALIGN Align Main Gun/Shillelagh/Coax Transmitter**

RETICLE CONTROL KNOB LOCATION




1. These knobs align the main gun sighting reticle on your boresight target.

2. These knobs align the Shillelagh sighting reticle on your boresighting target.




1. 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.

2. Turn fire control selector to CONV.

3. Align the track's main gun sighting telescope so boresight crosshairs are on the same spot as the transmitter telescope crosshairs.

    - This procedure also boresights the coax gun.

4. Be sure Shillelagh tracker door is open.

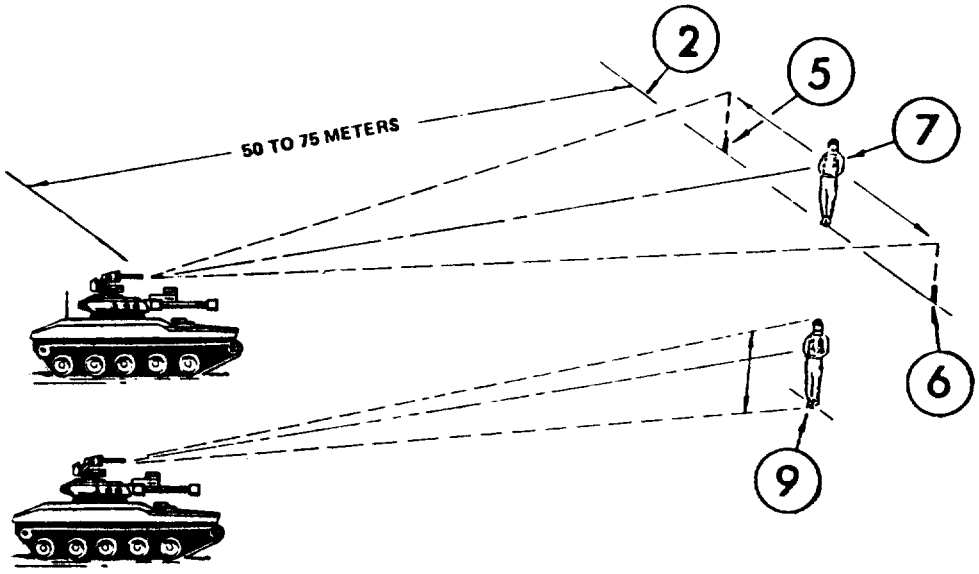
5. Set fire control switch to MISSILE.

6. Align Shillelagh sight so its boresight crosshairs are on the same spot as the transmitter telescope crosshairs.

7. Set up standard boresight target, or select a MILES-equipped vehicle target at least 1200 meters distant.

8. Fire at target with the main gun. Verify that target was hit. If not, check alignment.

**TASK 3 ALIGN Align M2 Machine Gun**




The M2 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 M2 machine gun you will need a soldier with a helmet and torso harness on.

1. Connect trigger cable assembly. Ask controller to initialize the system.

2. Send the soldier out about 50 to 75 meters away from the vehicle. 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.

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 M2 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 track commander now adjusts the windage and 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 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**

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 METERS ON EACH SIDE.
   - Firing within a RADIUS OF 150 METERS FROM BUILDINGS IS FORBIDDEN.

**TASK 1 OPER Place Hoffman Device into Ready/Fire Operation**

PREPARATION FOR FIRING

1. Make sure the lockout switch is off and the key is removed. Press the yellow contact button and adjust the automatic firing-device to the "LOADING POSITION." The green signal light must shine.

2. When loading, do NOT stand in front of the firing-device. Load either from the side or from behind.

3. Preparing the pyro charges for loading:

    - Remove the adhesive tape.

    - Remove the cover.

    - Pull the ignition lead 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.

**TASK 1 OPER**

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 track commander, the pyro charges are individually fired off by the track main gun 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.
- ing 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.

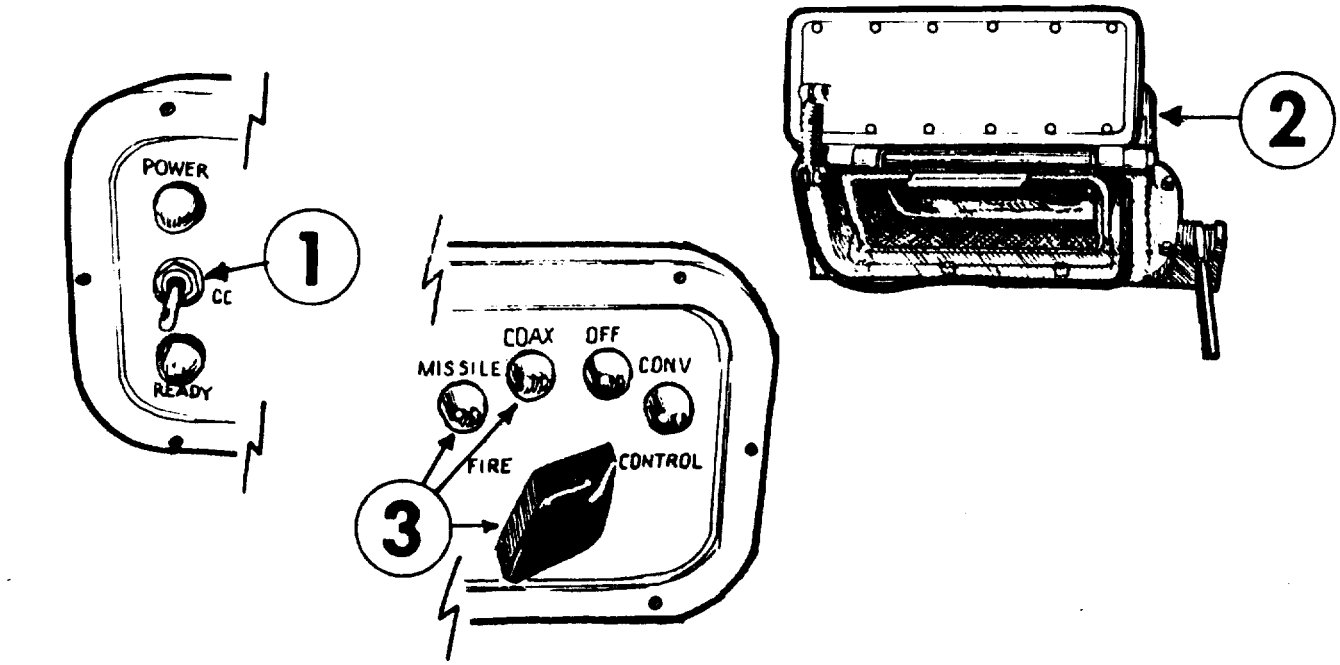
11. Reloading is to be carried out in the same way regardless of whether the Hoffman device is partially reloaded or fully reloaded.

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 device drums the pyro charges attached to the ignition leads.
- Place the protective caps on the pyro charges and pack the charges away.

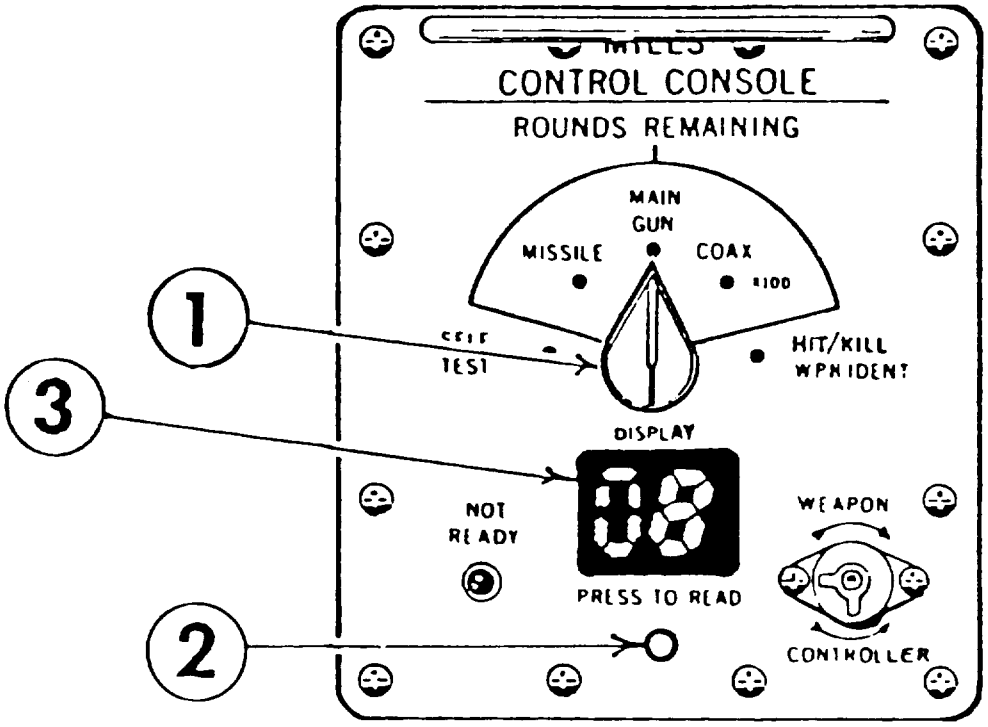
**TASK 2 OPER**
**FIRE MAIN GUN/SHILLELAGH OR COAX MG**




1. Set Ready/Safe switch to Ready.
2. Open the tracker door.
3. Set Fire Control selector to CONV, MISSILE or COAX.
4. Fire weapon selected.

- When firing the main gun, you must wait 10 seconds between rounds (15 seconds for the Shillelagh). This delay simulates loading time. You may fire again when the NOT READY light on the MILES control console goes out.

- Coax machine gun transmitter operates when blanks are fired. The transmitter will stop firing when blanks are gone.

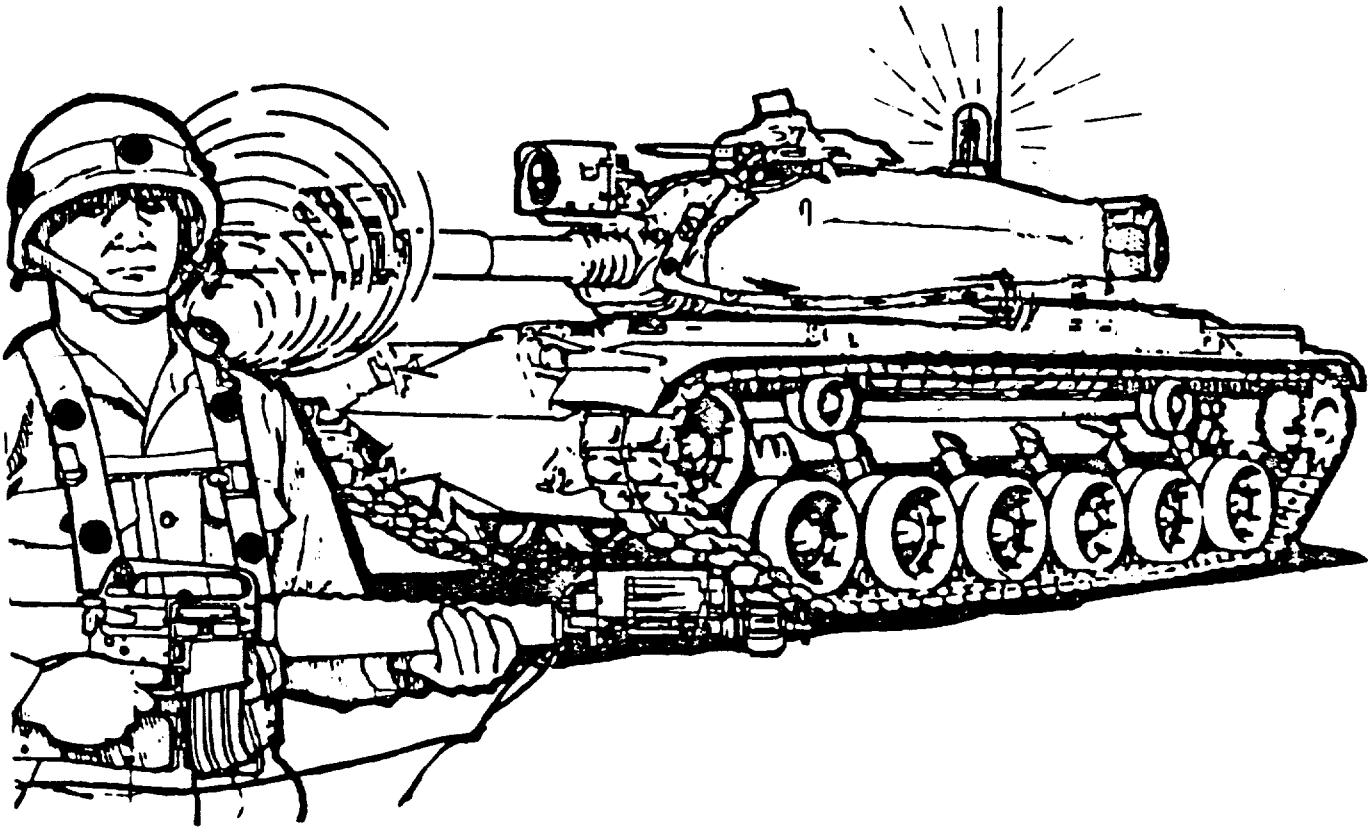



- If you wish to see how many rounds are left in your weapons:

1. Set the ROUNDS REMAINING switch to the weapon of interest.
2. PUSH the PRESS TO READ button.
3. With the button held down, read the display for rounds remaining.

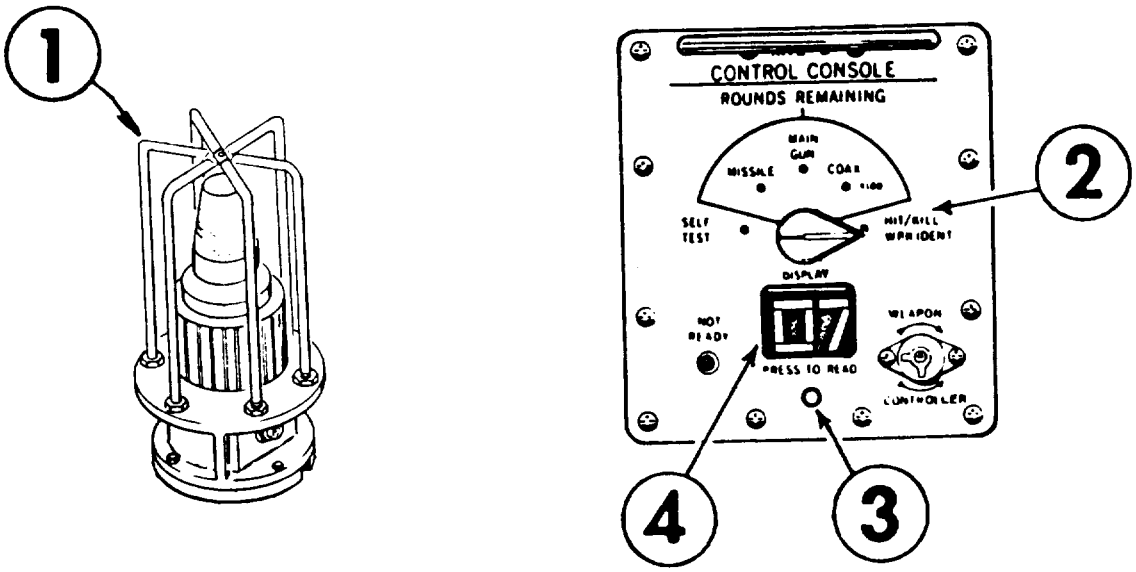
- The display shows the rounds remaining. If the display shows 00, you have no rounds left.
- The number of coax rounds remaining is 100 times the number displayed.

**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 alarms.
- 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 OPER**
**RECOGNIZING ENEMY FIRE**




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.

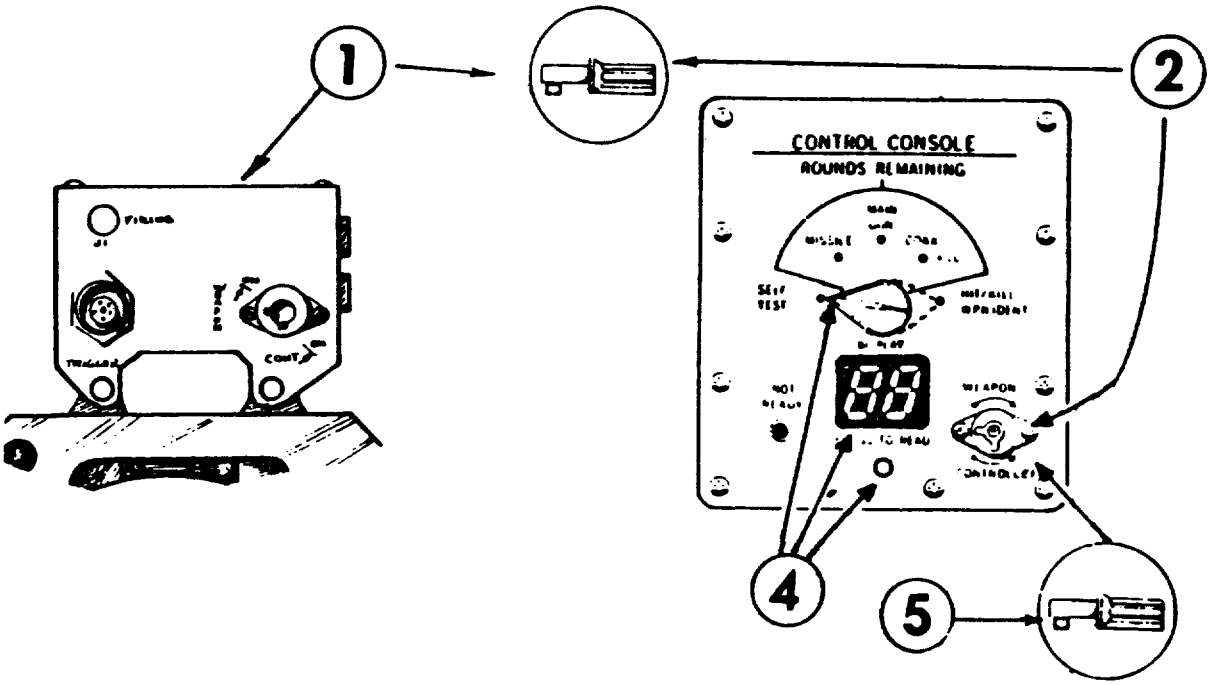
4. The display will show a number. Use the chart below to match the number on the display with the type of weapon firing on you.

| Display Number | Weapon |
|---|---|
| 00 | Controller Gun |
| 07 | TOW or Shillelagh |
| 08 | DRAGON |
| 12 | 105 mm |
| 13 | 152 mm |
| 15 | VIPER |
| 99 | Self-Kill |

**NOTE**
**If your console displays codes other than those shown above, 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 OPER**
**RESET AFTER A "KILL"**

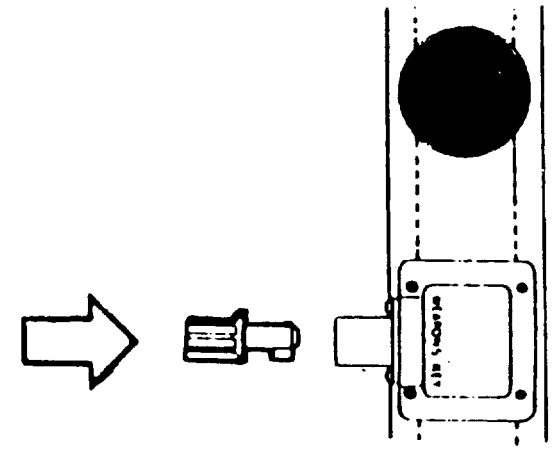



- If your track is "killed," the main gun and coax machine gun transmitters are automatically turned off.

1. To silence your intercom alarm after a "KILL," remove the orange weapon key from the M2 machine gun transmitter. THE M2 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 system.
4. Turn control console switch to HIT/KILL WPN IDENT. Then turn to SELF TEST. Push PRESS TO READ button. Display should show 88. If no 88, turn to page 65 and do the troubleshooting procedure.
5. Put your orange weapon key back in the M2 transmitter and turn it to WEAPON ON.

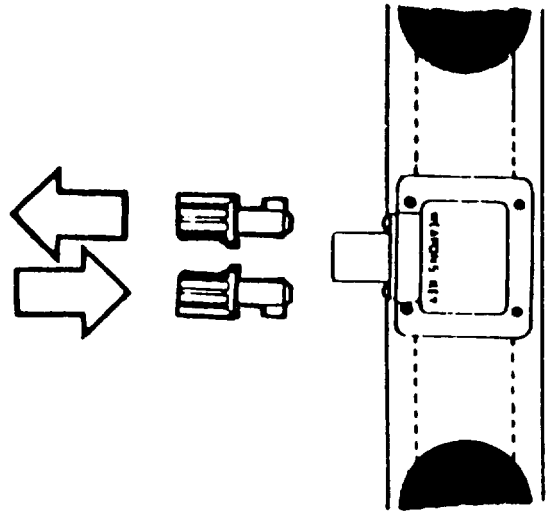
- The controller will determine when to reset your system.

**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.

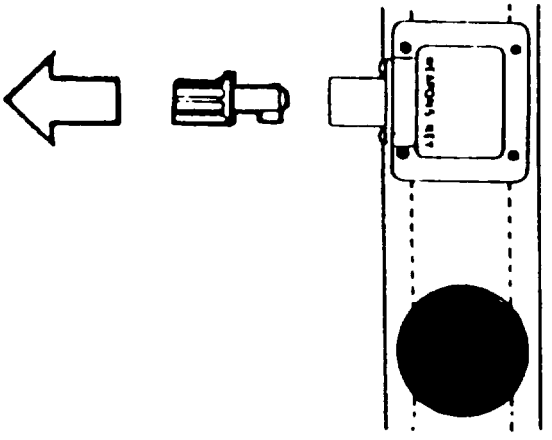


To reset alarm, you must call the controller.

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 OPER**
**REMOVE, INSPECT, SERVICE AND RETURN ALL MILES EQUIPMENT**

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

Outside Tasks:

1. Remove and inspect CVKI cable assembly. See Outside Tasks 7 and 8.
2. Remove and inspect the CVKI. See Outside Tasks 5 and 6.
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.

M2 MG Tasks:

1. Remove the M2 transmitter. See MG Task 3.
2. Remove the battery from the M2 transmitter and close battery compartment door. See MG Task 2.
3. Inspect and service M2 MG transmitter. See MG Task 1.
4. Remove, inspect, and service M2 MG blank firing attachment.

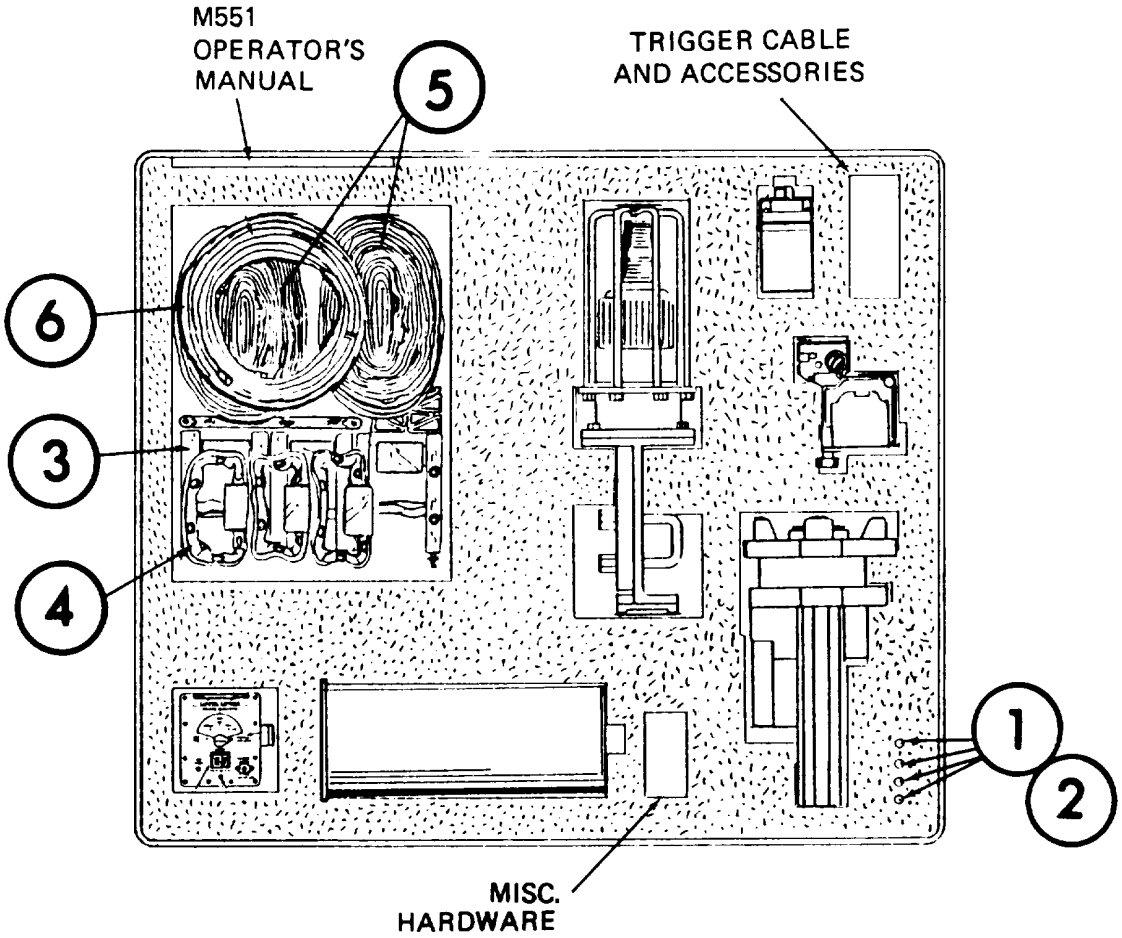
Inside Tasks:

1. Remove and inspect MILES inside cables. See Inside Tasks 7 and 8.
2. Remove and inspect the main gun/Shillelagh/coax MG transmitter. See Inside Task 6 and Align Task 1.
3. Remove and inspect coax microphone assembly. See Inside Tasks 4 and 5.
4. Remove battery box. Remove batteries from battery box and inspect battery box. See Inside Task 3.
5. Remove and inspect control console. See Inside Tasks 1 and 2.

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 transit case. If so, follow the instructions on the next page.




Transit Case Loading Instructions

1. Remove orange weapon key from M2 transmitter and place key in the space provided.
2. Track commander, gunner, and loader place their yellow MWLD keys in the space provided.
3. Fold up the three MWLD torso harnesses and place them in the large space, as shown.
4. Fold up the MWLD helmet harnesses and place them on top of the torso harnesses.
5. Roll up the detector belts and place them next to the MWLD harnesses as shown.
6. Roll up the vehicle cables and place them on top of the belts.
7. Return the remaining MILES equipment to their proper places as shown on drawing above.

## APPENDIX A
## REFERENCES

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

Forms:

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

Field Manuals:

| | |
|---|---|
| Field Manual: First Aid for Soldiers | FM 21-11 |

Technical Manuals:

| | |
|---|---|
| Operator's Manual: M2 Machine Gun | TM 9-1005-213-10 |
| Operator's Manual: M73, M73A1 and M219 | TM 9-1005-233-10 |
| Operator's Manual: AR/AAV M551A1 (Sheridan) | TM 9-2350-230-10 |
| Operator's and Maintenance Manual: Cannon, Fire Simulator | Hoffman-Werke, 1 Apr. 79 |
| Hand Receipt for Simulator System, Firing Laser: M67 for M551 Vehicle | TM 9-1265-369-10-3-HR |

Miscellaneous Publications:

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

**APPENDIX B**
**COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS**
**SECTION I. INTRODUCTION**

This appendix lists integral components of the M551/MILES system. All these items must be returned to the NCOIC, following a training exercise.

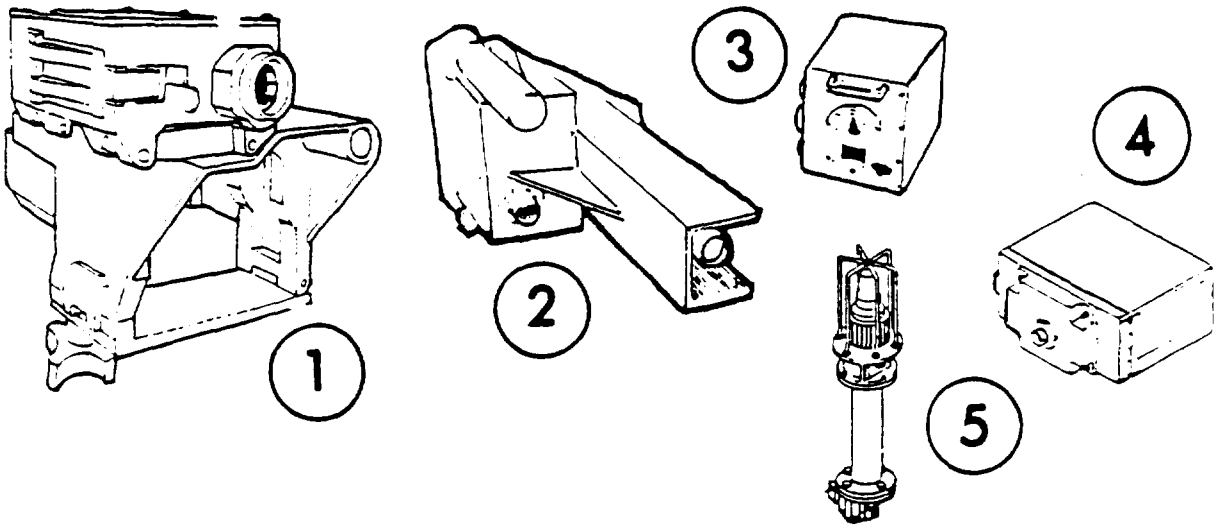
Explanation of Columns:

| | |
|---|---|
| NATO Stock Number: | Stock requisition number. |
| Description: | Line 1 gives a brief item description.<br>Line 2 lists the Federal Supply Code for Manufacturer (FSCM) and the reference number. |
| U/M: | Unit of Measure |
| Qty: | Quantity of item furnished for each piece of equipment. |
| Illustration: | Shows where to find an illustration of the item. |

**SECTION II. COMPONENTS OF END ITEM**

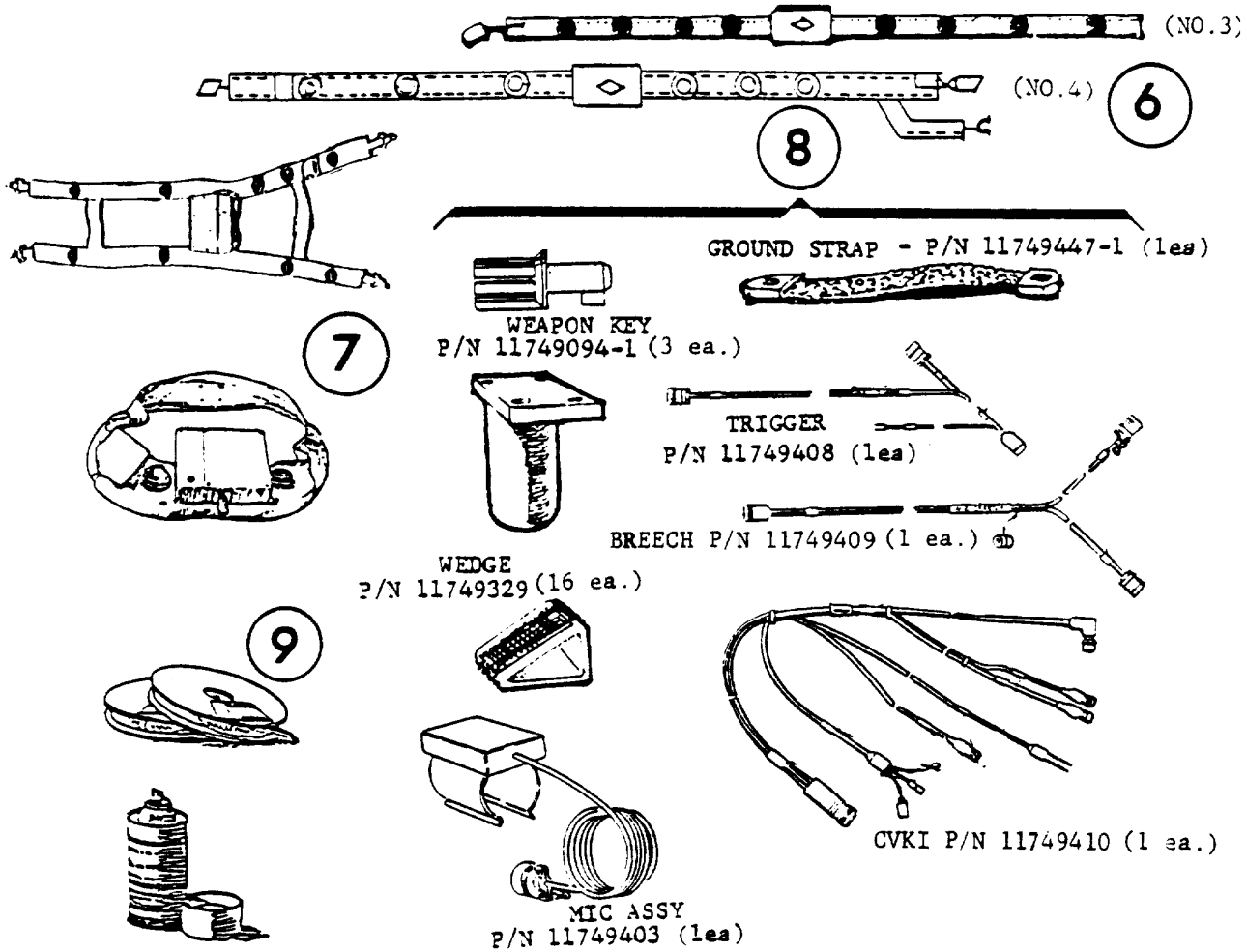
| NATO Stock Number | Description FSCM & Reference Number | U/M | Qty | Illustration |
|---|---|---|---|---|
| 1265-01-076-2039 | M2 Machine Gun Transmitter Assembly 19200-11748803 | ea. | 1 | Outside Task 2 and (1) |
| 1265-01-075-4900 | 152 mm Shillelagh/Coax MG Transmitter Assembly 19200-11748806 | ea. | 1 | Outside Task 2 and (2) |
| 1265-01-076-2028 | Control Console 19200-1749396 | ea. | 1 | Outside Task 2 and (3) |
| * | Battery Box 19200-11749790 | ea. | 1 | Outside Task 2 and (4) |
| * | CVKI Adapter Assembly 19200-11749728-2 | ea. | 1 | Outside Task 2 and (5) |

*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 |
|---|---|---|---|---|
| 1265-01-076-6522 | Detector Belt Assembly Segment Number 3 19200-11749300 | ea. | 2 | Outside Task 2 and (6) |
| 1265-01-076-2035 | Detector Belt Assembly Segment Number 4 19200-11749296 | ea. | 1 | Outside Task 2 and (6) |
| 1265-01-075-4892 | MWLD - Torso 19200-11748856 | ea. | 3 | Outside Task 2 and (7) |
| 1265-01-075-4893 | MWLD - Helmet 19200-11748893 | ea. | 3 | Outsize Task 2 and (7) |
| 1265-01-077-6392 | Adapter Set 19200-11748814 | ea. | 1 | Outside Task 2 and (8) |
| 1265-01-079-4262 | Installation Kit 19200-11749420 | ea. | 1 | Outside Task 2 and (9) |




**1 ea. TM 9-1265-369-10-3** **Operator's Manual f/ Simulator System, Firing Laser: M67 f/M551 Vehicle**

## APPENDIX C

## ADDITIONAL AUTHORIZATION LIST

This appendix lists additional items you will need to operate the M551/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 M551/MILES.

| National Stock Number | Description FSCM & Part Number | U/M | Qty. | Illustration |
|---|---|---|---|---|
| 6135-01-063-1978 | *Battery, 9 volt 80058-BA3090/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 the M551/MILES system.

Explanation of Columns:

National stock numbers and descriptions are provided to help you identify and request special tools and test equipment used with the M551/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 M551/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 M551/MILES system.

| National Stock Number | Description FSCM & Part Number | U/M | Qty. |
|---|---|---|---|
| 8315-01-111-7170 | Velcro Tape<br>119200-11749428 | roll | 1 |
| 8010-01-040-0947 | Tape Primer<br>119200-11749034 | 16 oz. | 1 |
| 6640-00-240-5851 | Paper, Lens<br>8139-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 M551 vehicle. |
| 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 No. 4. |
| Dry-Fire Plug | Plug Assembly, Dry-Fire. |
| Helmet Harness Laser: Man Worn. | Detector Assembly, Simulator System |
| M2 Machine Gun Transmitter | Transmitter Assembly, Simulator System, Laser: For M2 Machine Gun. |
| Torso Harness | Detector Assembly, Simulator System Laser: Man Worn. |
| 152 mm/Shillelagh/Coax MG Transmitter (Main Gun Transmitter | Transmitter Assembly, Simulator System, Laser: For 152 mm/Shillelagh/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 armored vehicles 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 weapon key has two uses:<br>1. Turns on the M2 machine gun transmitter.<br>2. When continuous intercom alarm sounds and external light flashes, 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, M67 (for M551A).

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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 = 1,000 Millimeters = 39.37 Inches

1 Kilometer = 1,000 Meters = 0.621 Miles

## 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 = 1,000 Cu Millimeters = 0.06 Cu Inches

1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

## LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces

1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

## 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°

## WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces

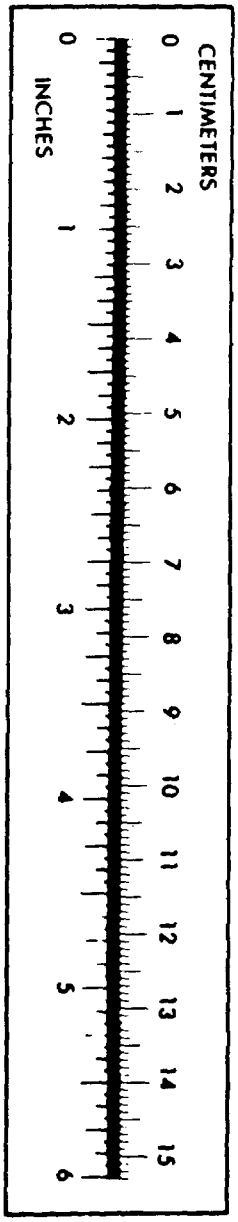
1 Kilogram = 1,000 Grams = 2.2 Lb.

1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

# 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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