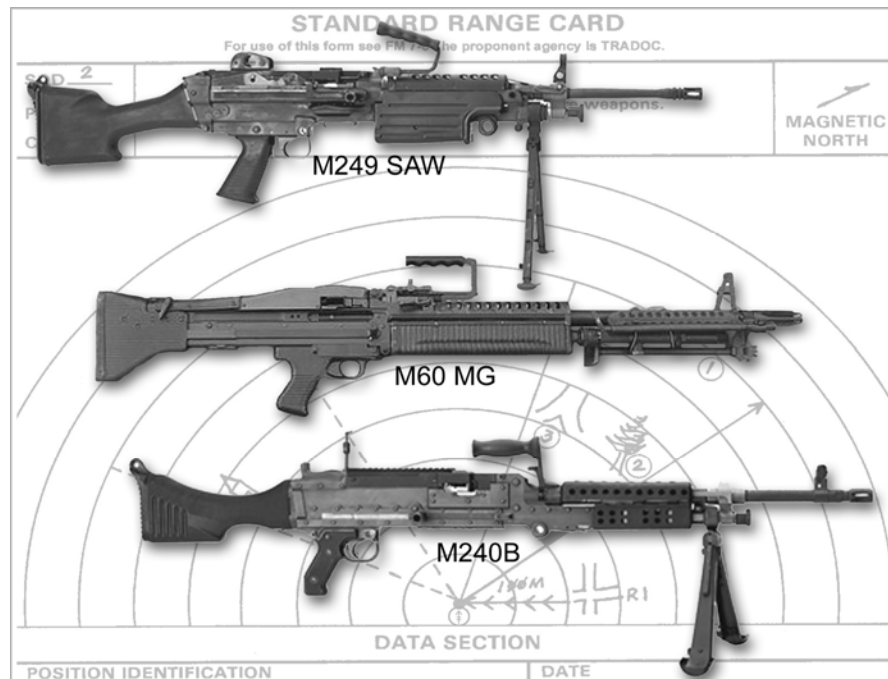


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## Crew-Served Machine Guns 5.56-mm and 7.62-mm

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# Crew-Served Machine Guns 5.56-mm and 7.62-mm

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# Preface

This manual provides a single source of technical information, training techniques, guidance for using, and integration into combat operations of three crew-served machine guns, the 5.56-mm and 7.62-mm M60, M240B, and M249. For quick reference, this publication includes an appendix with all of the firing tables collocated. Trainers must ensure that everyone observes safety procedures at all times. Leaders, trainers, and Soldiers must remember: safety is everyone's full-time responsibility. They must conduct all training as though each weapon is fully loaded. In training, safety is always more important than speed or accuracy.

This publication applies to the Active Army, the Army National Guard (ARNG)/Army National Guard of the United States (ARNGUS), and the U.S. Army Reserve (USAR) unless otherwise stated..

This publication prescribes--

- DA Form 85-R, *Scorecard for M249, M60, and M240B Machine Guns*, which supersedes DA Form 85-R, October 2002.
- DA Form 7304-R, which supersedes DA Form 7304-R, *Scorecard for M249 AR*, February 1994.
- DA Form 7476-R, *10-Meter Boresight Target*, which supersedes DA Form 7476-R, October 2002.

The proponent for this publication is the U.S. Army Training and Doctrine Command. The preparing agency is the US Army Infantry School. You may send comments and recommendations by any means, US mail, e-mail, fax, or telephone, as long as you use or follow the format of DA Form 2028, *Recommended Changes to Publications and Blank Forms*. You may also phone for more information.

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Some of the uniforms shown in this manual have been drawn without camouflage for clarity of the illustration.

Unless this publication states otherwise, masculine nouns and pronouns may refer to either men or women.



## Chapter 1

# M249 Machine Gun

The 5.56-mm M249 machine gun supports the Soldier in both the offense and defense. The M249 provides a medium volume of close and continuous fire. The Soldier needs this to accomplish the mission. The M249 lets units engage the enemy with controlled and accurate fire from individual weapons. The medium-range, close defensive, and final protective fires delivered by the M249 MG form an integral part of a unit's defensive fires. This chapter also describes the weapon and the types of ammunition in detail and provides a table of general data. Although this chapter discusses employment of the M249 in the machine gun role, Soldiers also use this weapon in the automatic rifle role (Chapter 4, Section V; see also Appendix A).

### SECTION I. DESCRIPTION AND COMPONENTS

This section describes the M249 machine gun, its components, and their purposes. It also discusses the types of ammunition used, installation of the blank firing adapter, and care of the gun while using the blank firing adapter.

### DESCRIPTION AND DATA

1-1. The M249 machine gun is a gas-operated, air-cooled, belt- or magazine-fed, automatic weapon that fires from the open-bolt position (Figure 1-1). Its maximum rate of fire is 850 rounds per minute. Ammunition feeds into the weapon from a 200-round ammunition box containing a disintegrating, metallic, split-link belt. Only in emergencies do M249 gunners use a 20- or 30-round M16 rifle magazine, in part because this increases the chance of stoppages. The gunner can fire the versatile M249 machine gun from the shoulder, hip, or underarm; with a bipod; or with a tripod. Table 1-1 provides general data.

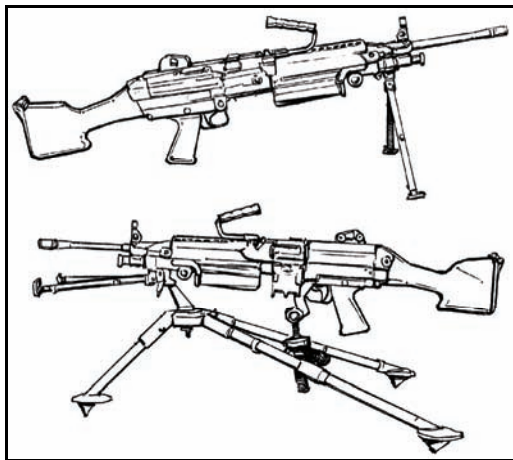


Figure 1-1. M249 machine gun, bipod and tripod mounted.

Length of Weapon.....	40.87 inches
Height of Weapon (on Tripod).....	16.00 inches
Weight:	
M249.....	16.41 pounds
M122 Tripod Mount with T&E, pintle.....	16.00 pounds
Ammunition.....	5.56-mm ball and tracer (4:1 mix) ammunition-delivered in 200-round drums, each of which weighs 6.92 pounds. Separate ball, tracer, blank, and dummy ammunition also available
Rates of Fire:	
Sustained.....	50 rounds a minute in 3- to 5-round bursts, with 4 to 5 seconds between bursts (barrel change every 10 minutes).
Rapid.....	100 rounds per minute, fired in 8- to 10-round bursts, 2 to 3 seconds between bursts (barrel change every 2 minutes).
Cyclic.....	650 to 850 rounds per minute, continuous burst, barrel changed every minute.
Basic load.....	1,000 rounds in five 200-round drums
Tracer burnout.....	900 meters (+)
Ranges:	
Maximum.....	3,600 meters
Maximum effective.....	1,000 meters with the tripod and T&E
Maximum for grazing fire over..... uniformly sloping terrain	600 meters
Area Target:	
On tripod.....	1,000 meters
On bipod.....	800 meters
Point Target:	
On tripod.....	800 meters
On bipod.....	600 meters
Suppressive Fire.....	1,000 meters
Depression:	
On tripod.....	-200 mils
On bipod.....	-445 mils
Elevation:	
On tripod.....	+200 mils
On bipod.....	+445 mils
Traverse, with T&E mechanism.....	100 mils
Normal sector of fire, with tripod.....	875 mils

Table 1-1. General data for gun with M122 tripod.

## COMPONENTS

1-2. Table 1-2 lists M249 components and their purposes, and Figure 1-2 shows them. The item numbers in the table correspond to the callout numbers in the figure.

<i>Components</i>		<i>Purposes</i>
1.	Barrel assembly	Houses cartridges for fire; directs the projectile; supports gas regulator.
2.	Heat shield assembly .....	Protects the hand from the hot barrel.
3.	Rear sight assembly .....	Adjusts for windage and elevation.
4.	Cover and feed mechanism assembly	Feeds linked, belted ammunition. Positions and holds cartridges in position for stripping, feeding, and chambering.
5.	Feed tray assembly .....	Positions belted ammunition for fire.
6.	Cocking handle assembly	Moves on a guide rail fixed to the right side of the receiver. Pulls moving parts rearward.
7.	Buttstock and buffer .....	Folding buttplate and shoulder rest enhance aiming and firing. Hydraulic buffer absorbs recoil.
8.	Bolt assembly	Feeds, strips, chambers, fires, and extracts round. Powered by projectile gasses.
9.	Slide assembly	Houses firing pin and roller assembly.
10.	Return rod and transfer .....	Absorbs recoil for bolt and operating rod assembly at the end of recoil movement.
11.	Receiver assembly .....	Supports all major components, houses the action, and, by use of cams, controls weapon function.
12.	Trigger mechanism .....	Controls fire. Grip has storage for lubricant.
13.	Handguard assembly .....	Thermal insulation protects against temperature extremes; assembly houses cleaning equipment.
14.	Sling and snap hook .....	Simplifies carriage of weapon.
15.	Bipod	Supports gun in prone position. Legs telescope to three lengths.
16.	Gas cylinder assembly .....	Locks bipod and allows gasses to escape.
17.	Piston assembly .....	Holds bolt and slide assemblies and houses return spring.
18.	Return spring	Locks bolt, slide, and piston during counterrecoil.
19.	Tripod (M122) (not shown)	Tripod, T&E mechanism, and pintle stabilize weapon for accuracy and control.
20.	M145 straight telescope (not shown)	Allows target acquisition and identification at increased ranges.

Table 1-2. Components and purposes.

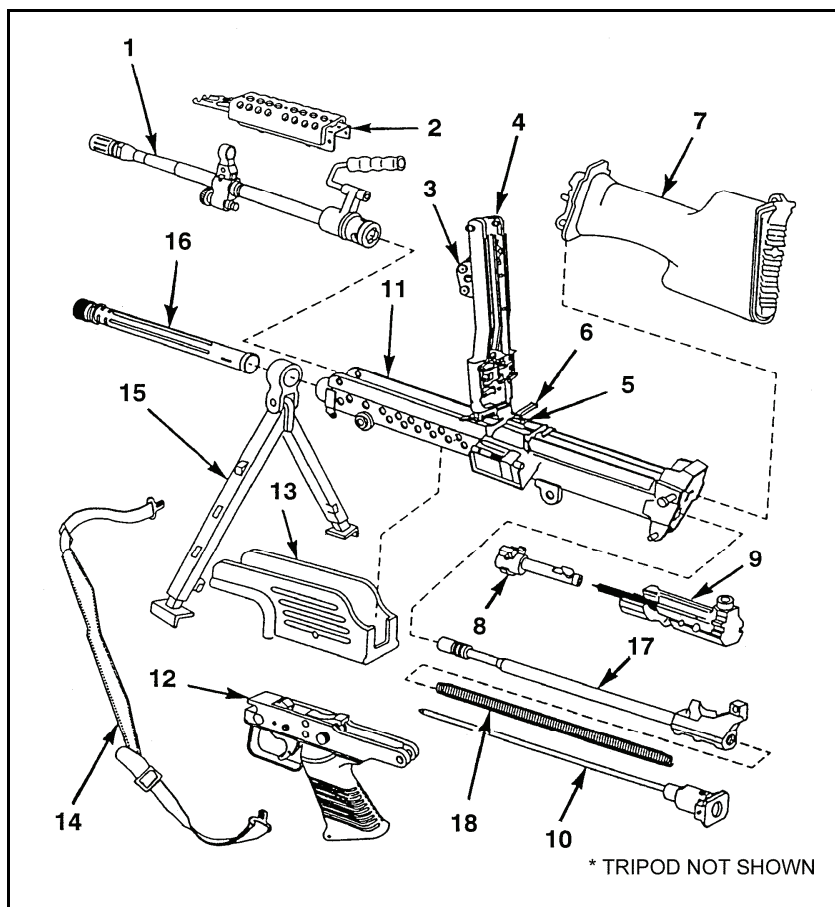


Figure 1-2. Components of the M249 machine gun.

### Sights

1-3. The M249's front sight is hooded and semifixed front sight. Its rear sight assembly mounts on the top of the cover and feed mechanism assembly (Figure 1-3). The elevation knob drum has range settings from 300 meters to 1,000 meters. For large range changes, the gunner rotates the elevation knob to the desired range setting. For finer changes in elevation or range, such as during zeroing, he rotates the rear sight aperture (peep sight). Each click of the elevation knob moves it 180 degrees, or one-half turn. This equals a one-half-mil change in elevation, which is 0.5 cm at 10 meters. Obviously, the gunner uses the windage knob to adjust windage. Each click of the knob also equals a one-half-mil change, which again is 0.5 cm at 10 meters. An indexed, sliding scale allows the gunner to center the rear sight aperture. (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

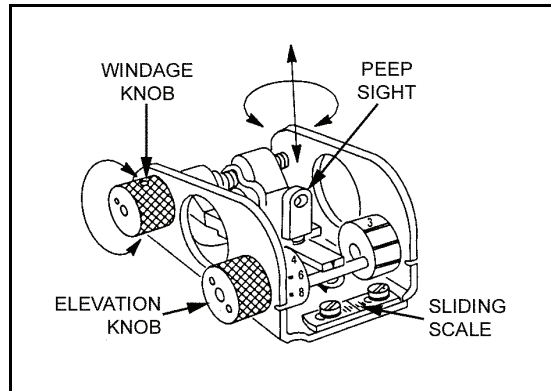


Figure 1-3. Sights.

## SAFETY

1-4. The M249's safety control (Figure 1-4) is in the trigger housing. The gunner pushes it left or right to hide or reveal the red ring. Pushing it from the left to the right hides the red ring and places the weapon on safe. This prevents the bolt from going forward. Pushing the safety from right to left reveals the red ring, indicating that the weapon is ready to fire. The gunner uses the cocking handle on the right side of the weapon to pull the bolt to the rear.

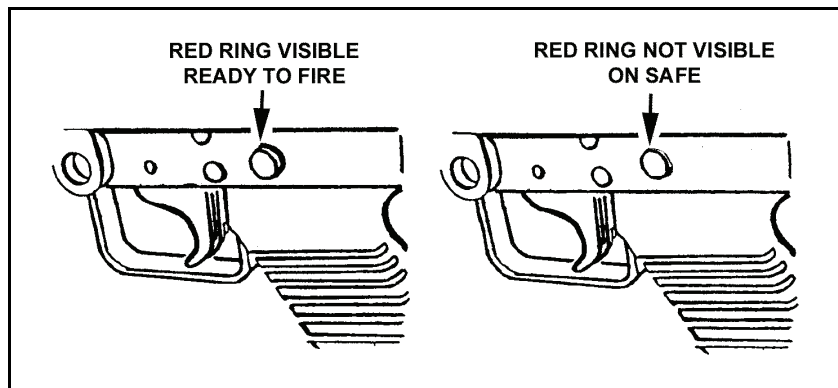


Figure 1-4. Safety.

## AMMUNITION

1-5. The M249 machine gun uses several different types of standard 5.56-mm military ammunition. Soldiers should only use authorized ammunition manufactured to US and NATO specifications. The 5.56-mm NATO cartridge is recognizable by its painted projectile tips, stamped manufacturer's initials, and year of manufacture (base of cartridge case) as well as by the markings on the packing containers. Two M16 rounds, the M193 and the M196 cartridges, will fire through the M249, but with reduced accuracy. The gunner should only resort to this when he is out of M855 and M856 rounds.

## TYPE AND CHARACTERISTICS

1-6. Figure 1-5 shows M249 ammunition and its characteristics. The color of the projectile's tip, the manufacturer's initials and year of manufacture stamped on the base of the cartridge case, and the markings on the packing containers distinguish these rounds. The M193 and M196 cartridges for the M16 can be

fired with the M249, but accuracy is degraded; therefore, they should only be used in emergency situations when M855 or M856 ammunition is not available:

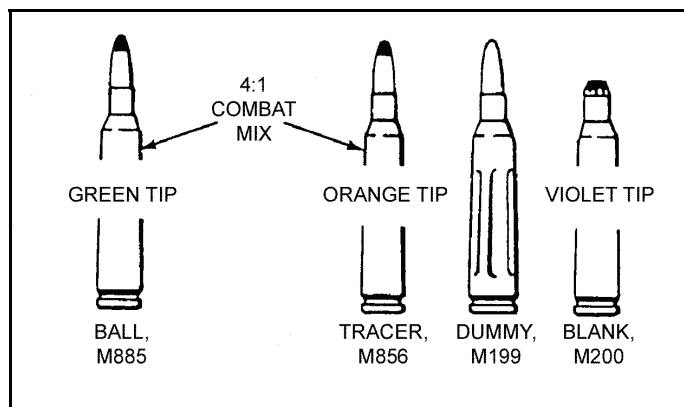


Figure 1-5. Cartridges for the M249.

### Cartridge, 5.56-mm Ball M855 (A059)

1-7. The NATO standard round for the M249 machine gun is the M855 cartridge, which has a metal-jacketed, lead-alloy-core bullet with a steel penetrator (point). The primer and case are waterproof. A disintegrating metallic split-link belt links this ammunition so that the ammunition can feed from the ammunition box (Figure 1-6). In an emergency, the M855 round can also be fired from the M16A2, A3, or A4 when loaded in a 20- or 30-round magazine. A green tip identifies this round, whose projectile weighs 62 grains, and whose length is 2.3 cm. It is effective only against personnel and light materials.

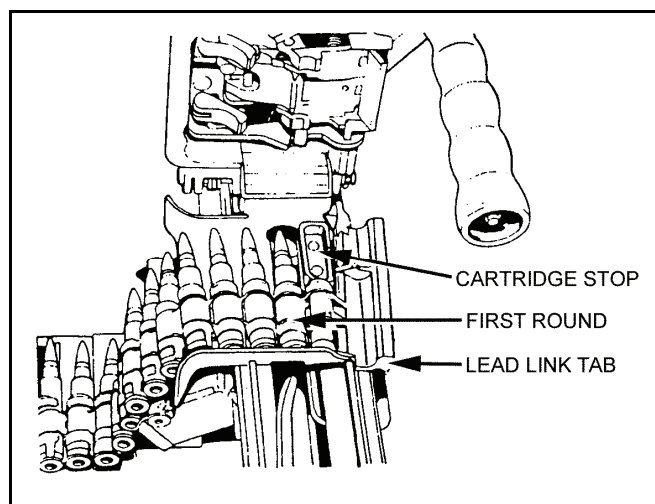


Figure 1-6. M855 cartridges in metallic belt.

### Cartridge, 5.56-mm Tracer, M856 (A064)

1-8. The projectile on the M856 cartridge weighs 63.7 grains. An orange tip identifies this round, which lacks a steel penetrator. The gunner fires this tracer for adjustments after observation, incendiary effects, and signaling. When the gunner fires tracer rounds, they mix with ball ammunition in a ratio of four ball rounds to one tracer round. The DODAC for ball and tracer mix is A064.

**Cartridge, 5.56-mm Dummy M199 (A060)**

1-9. Six grooves along the side of the case, beginning about one-half inch from its head, identify this cartridge. It contains no propellant or primer. The primer well is open to prevent damage to the firing pin. The gunner uses the dummy round during mechanical training, dry-fire exercises, and function checks.

**Cartridge, 5.56-mm Blank M200 (M2 link, A075)**

1-10. The blank cartridge has no projectile. A seven-petal rosette crimp closes the mouth of the case, which has a violet tip. The original M200 blank cartridge had a white tip. Field use of this cartridge resulted in residue buildup, which caused malfunctions. The gunner should only use the violet-tipped M200 cartridge. The gunner uses the blank round to simulate live fire during training. The gunner must use the M249 blank-firing adapter (NSN 1005-21-912-8997) to fire this ammunition.

**Storage**

1-11. The gunner stores ammunition under cover. If he keeps it in the open, he must store it at least 6 inches aboveground, covered with two thicknesses of tarpaulin. He places the cover so that it protects the ammunition, but allows ventilation. Then, he digs trenches to divert water from flowing under the ammunition.

**Care, Handling, and Preservation**

1-12. Leave ammunition in the airtight containers until ready for use. Early removal, especially in damp climates, can corrode the ammunition.

1-13. Protect ammunition from mud, dirt, and moisture. If the ammunition gets wet or dirty, wipe it off before use. Wipe down lightly corroded cartridges as soon as you discover the corrosion. Avoid firing heavily corroded, dented, or loose projectiles.

- Protect ammunition from the direct rays of the sun. Excessive pressure from the heat can cause premature detonation.
- Never use oil on ammunition. Oil collects dust and other abrasives that may possibly damage the operating parts of the weapon.

**PACKAGING**

1-14. The ammunition can holds two plastic ammunition drums. Each drum contains 200 rounds and weighs 6.92 pounds. Dummy ammunition (M199) comes in boxes of 20 rounds each.

**DANGER**

**BLANK AMMUNITION**

**Avoid firing blank ammunition at anyone within 20 feet of you. Fragments of a closure wad or particles of unburned propellant could cause injury or death.**

**BLANK FIRING ATTACHMENT**

**Use only the BFA NSN 1005-21-912-8997 with the M249 short-barrel machine gun. Use of any other blank firing attachment could cause the weapon to explode and cause the gunner injury or death.**

## **BLANK FIRING ATTACHMENT**

1-15. The only blank firing attachment authorized for use with the M249 machine gun is NSN 1005-21-912-8997.

### **INSTALLATION**

1-16. Attach the BFA to the M249 machine gun as shown in Figure 1-7.

### **CARE OF THE M249 WHILE USING THE BFA**

1-17. A buildup of carbon inside the weapon causes friction between the moving parts. Carbon deposits build rapidly when the gunner fires blanks. When these deposits become excessive, stoppages occur. Therefore, you must keep the weapon—especially the gas system and chamber—clean during blank firing. To get the best performance with the BFA--

- Inspect the weapon for damaged parts, excessive wear, cleanliness, and proper lubrication before firing.
- When feasible, test fire the weapon with ball ammunition before attaching the BFA.
- Adjust the BFA to fit the weapon.
- Apply immediate action when stoppages occur.
- Clean the gas system after firing 500 rounds.
- Clean and lubricate the entire weapon after firing 1,000 rounds.



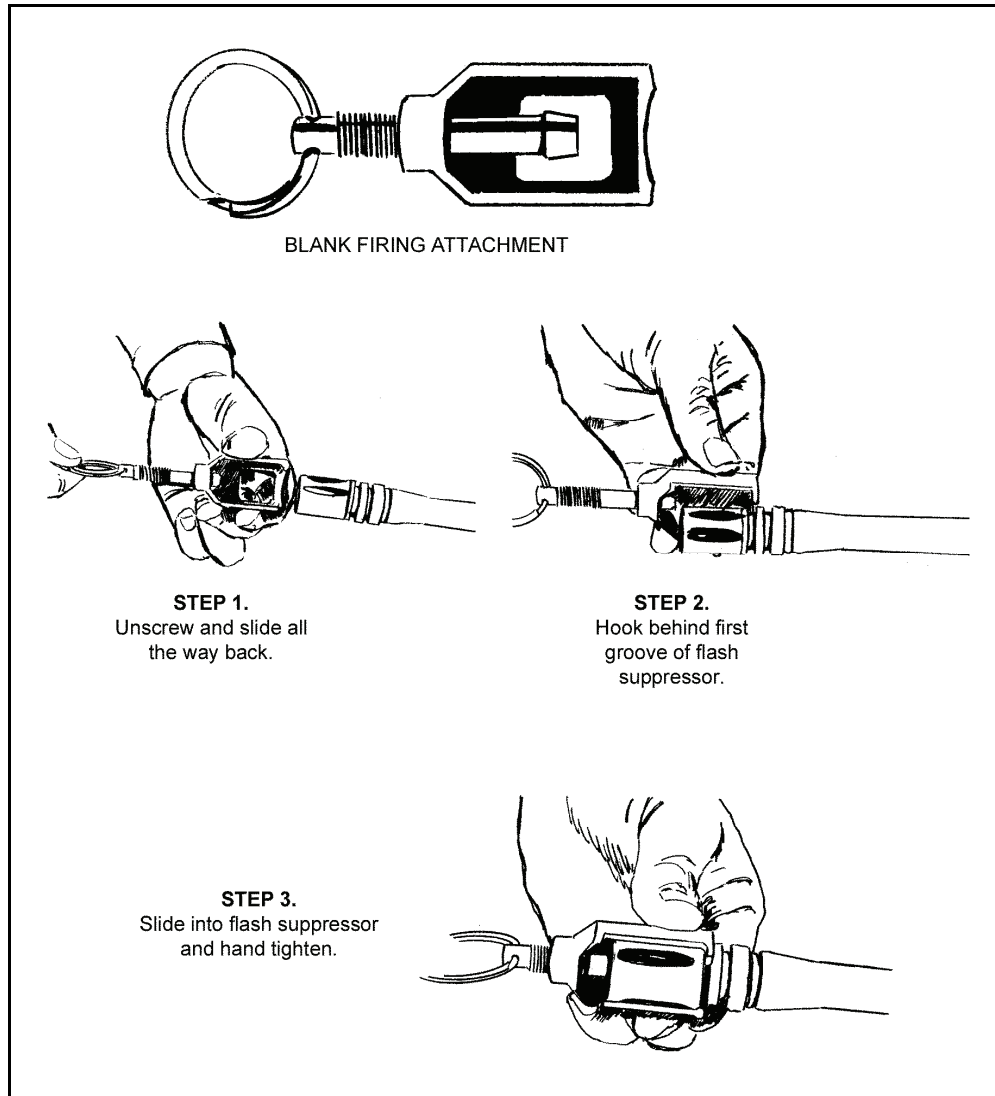


Figure 1-7. M249 blank firing attachment.

## SECTION II. MAINTENANCE

Proper maintenance contributes to weapon effectiveness as well as unit readiness. Maintenance of the M249 includes inspection; cleaning and lubrication; as well as maintenance before, during, and after firing, and in CBRN (chemical, biological, radiological, or nuclear) conditions. This section discusses maintenance tasks, including clearing, general assembly and disassembly, and function checks, in detail.

### CLEARING PROCEDURES

1-18. The first step in maintenance is to clear the weapon (Figure 1-8). This applies in all situations, not just after firing. The gunner must always assume the M249 machine gun is loaded. To clear the M249, the gunner performs the following procedures:

- Moves the safety to the fire “F” position (A, Figure 1-8) by pushing it to the left until the red ring is visible.

- With his right hand, palm up, pulls the cocking handle to the rear, locking the bolt in place (B, Figure 1-8).
- While holding the resistance on the cocking handle, moves the safety to the safe position (C, Figure 1-8) by pushing it to the right until the red ring is not visible. (The gunner can only place the weapon on safe with the bolt locked to the rear.)
- Returns and locks the cocking handle to the forward position (D, Figure 1-8).

## **DANGER**

### **HOT WEAPON**

**A "hot" weapon, that is, one through which 200 or more successive rounds have just been fired, can "cook off" a round without any action by the firer.**

**If a "hot" weapon fails to fire, and you must clear it while the barrel is still hot--**

- 1. Keep the feed tray cover closed, get the weapon off your shoulder, and point it downrange.**
- 2. Place the weapon on safe (no red showing).**
- 3. Place the weapon on the ground, still pointed downrange.**
- 4. Before clearing and applying immediate or remedial action, you must first wait--**
  - **Training situations: 15 minutes.**
  - **Tactical situations: 5 seconds.**

### **HOT WEAPON--FEED COVER**

**Before opening the feed tray cover on a hot gun, place the weapon on the ground away from your face.**

**If a round cooks off while your weapon is on your shoulder, and the feed tray cover is open, you could suffer injury or death.**

- Raises the cover and feed mechanism assembly, and conducts the *five-point safety check* for brass, links, or ammunition (E, Figure 1-8):
  - 1) Checks the feed pawl assembly under the feed cover.
  - 2) Checks the feed tray assembly.
  - 3) Lifts the feed tray assembly and inspects the chamber.
  - 4) Checks the space between the bolt assembly and the chamber.
  - 5) Inserts two fingers of left hand into magazine well to extract ammunition or brass.
- Closes the cover and feed mechanism assembly, and moves the safety to the "F" position (F, Figure 1-8). With his right hand, palm up, returns the cocking handle to the rear position. Presses the trigger and at the same time eases the bolt forward by manually riding the cocking handle forward.

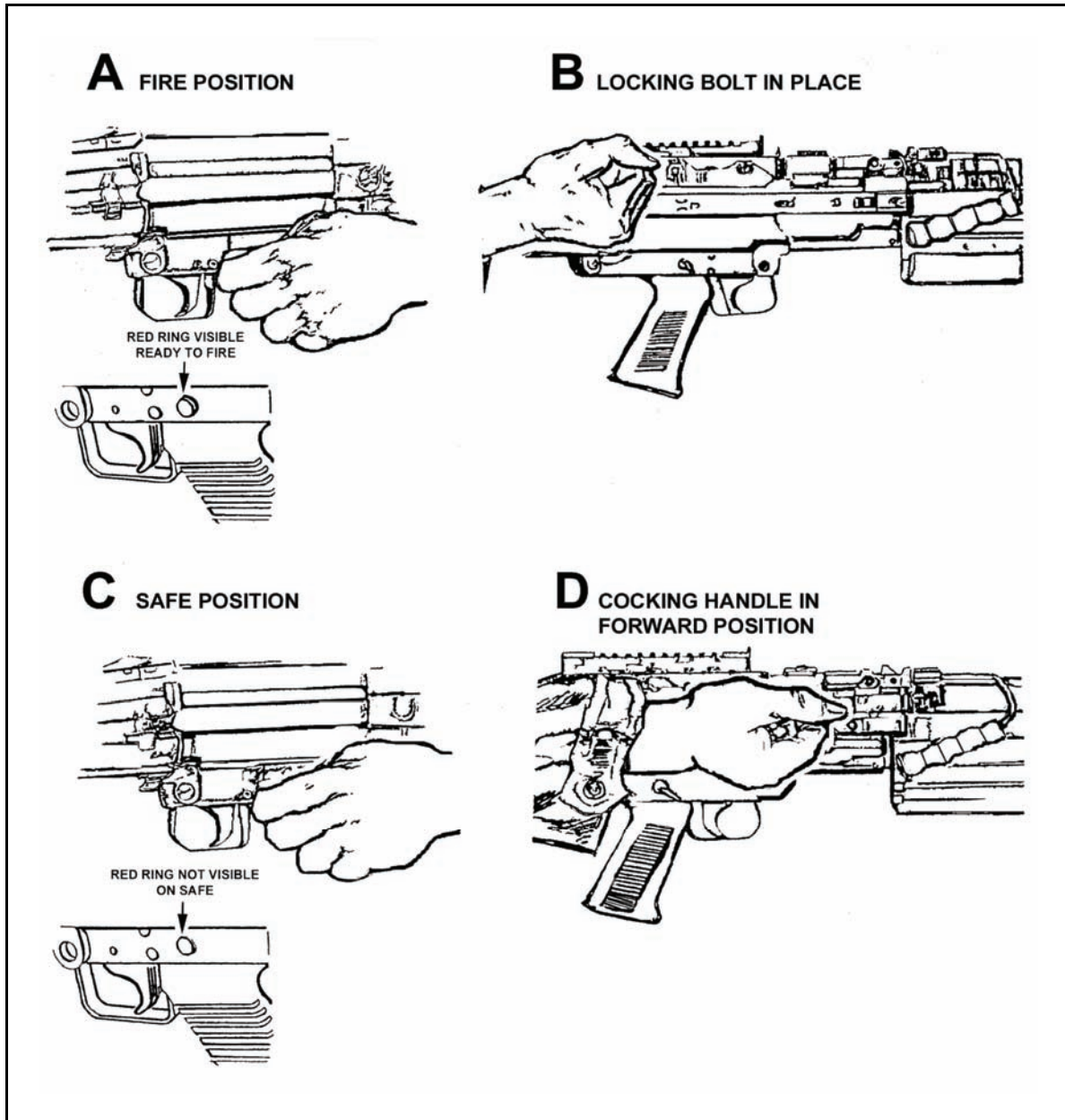


Figure 1-8. Clearing procedures.

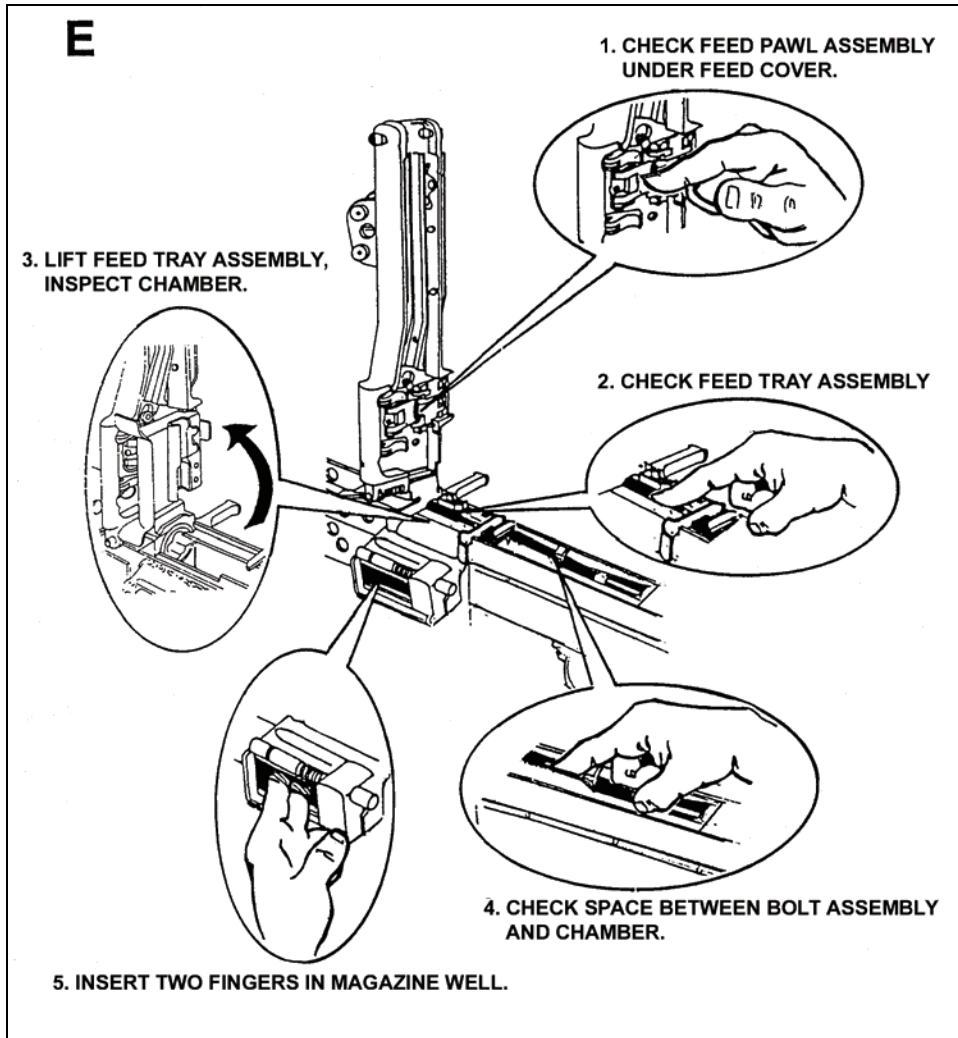


Figure 1-8. Clearing procedures (continued).

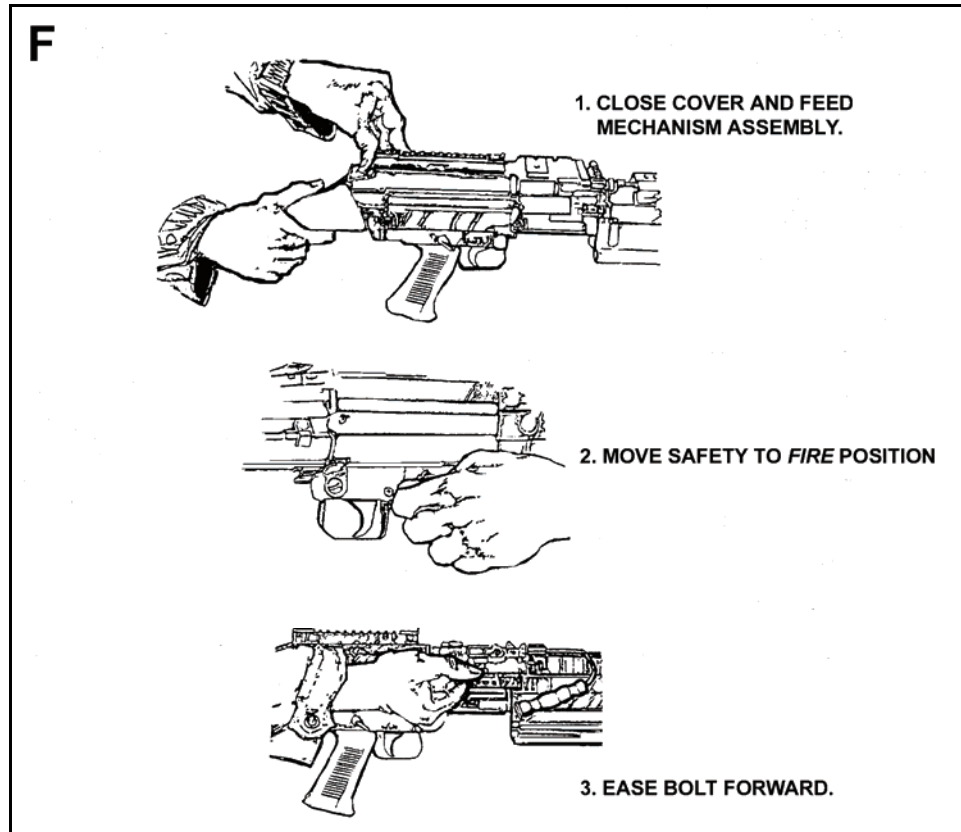


Figure 1-8. Clearing procedures (continued).

### CAUTION

#### BOLT POSITION

Each time you pull the bolt to the rear, return the cocking handle manually to the forward and locked position. Failure to do this could result in damage to the weapon.

## GENERAL DISASSEMBLY

1-19. General disassembly is removing and replacing the eight major groups (Figure 1-9). The unit armorer performs detailed disassembly. The gunner may not disassemble the weapon beyond the point explained in this manual; only ordnance personnel may disassemble it further. During general disassembly, the gunner places each part on a clean, flat surface such as a table or mat. This aids in assembly in reverse order and avoids the loss of parts. Before disassembly, the gunner releases the bipod legs from under the receiver and places into the bipod mode.

**DANGER****BOLT AND SPRING GUIDE**

Ensure that the bolt is in the forward position before disassembly. If the gunner retracts the operating rod spring with the bolt pulled to the rear, the spring guide can cause him to suffer injury or death.

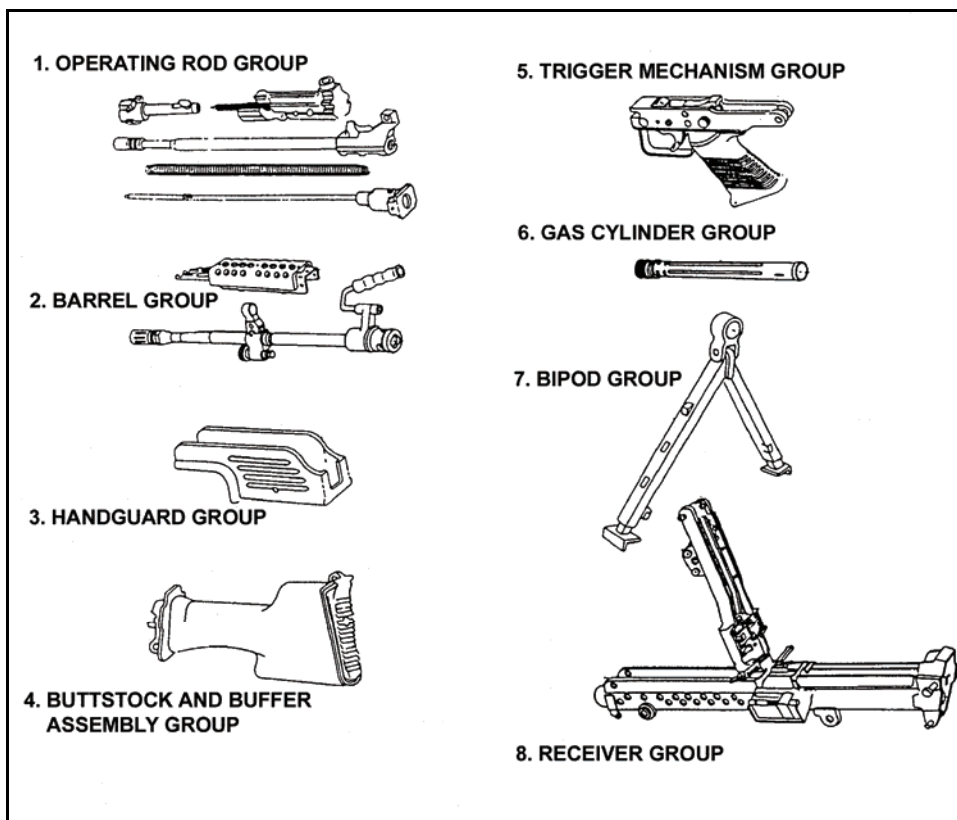


Figure 1-9. Eight major groups.

**REMOVAL OF THE OPERATING ROD GROUP**

1-20. The operating rod group (Figure 1-10), consists of operating rod spring, slide assembly, piston assembly, and bolt assembly consists of the spring guide rod.

- To remove the operating rod, pull the upper retaining pin at the rear of the receiver to the left. Allow the buttstock to pivot downward and place it on a surface to support the weapon for disassembly.
- To release the operating rod assembly from the positioning grooves inside the receiver, hold the weapon with one hand on the buttstock assembly. Use the thumb of the other hand to push in and upward on the rear of the operating rod assembly.
- Pull the operating rod, spring from the receiver group, and separate the parts.
- Hold the buttstock assembly with your left hand to stabilize the weapon. With your right hand, pull the cocking handle to the rear to lock the bolt. Return the cocking handle to the forward

position. Place a finger on the face of the bolt and push until your finger makes contact with the bridge at the end of the receiver. This leaves the piston, slide, and bolt assemblies exposed.

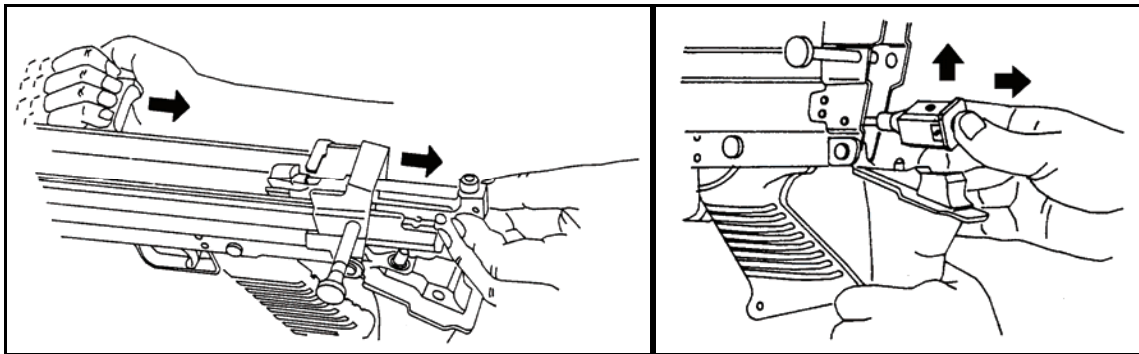


Figure 1-10. Removal of the operating rod group.

- To separate the operating rod group (Figure 1-11), hold the piston assembly in one hand, place your other hand on the bolt assembly, and rotate the bolt to disengage it from the slide assembly. Then, although you may remove the firing pin spring from the firing pin, doing so is strongly discouraged, because it can damage the spring and affect operation of the weapon.

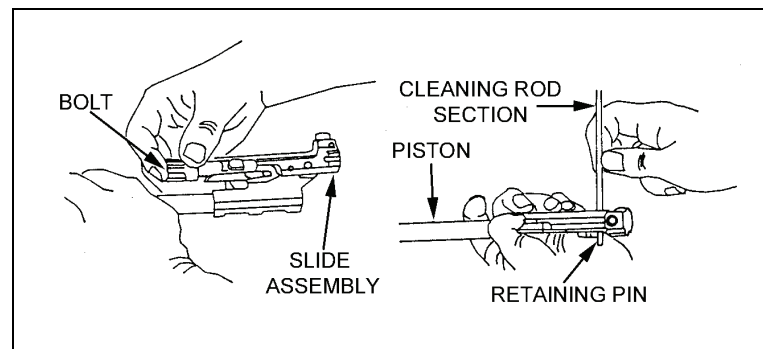


Figure 1-11. Separation of the operating rod group.

## REMOVAL OF THE BARREL GROUP

1-21. The barrel group consists of barrel, heat shield, flash suppressor, front sight, gas regulator, and gas regulator collar. The following steps correspond to the callouts in Figure 1-12.

### DANGER

#### BARREL SWAPPING

**Unless direct-support personnel certify the headspace on both weapons, avoid swapping barrels between weapons. Doing so could destroy the barrel and cause the gunner injury or death.**

- To remove the barrel from the receiver, close the cover and feed mechanism assembly. Depress the barrel-locking lever with your left hand, then lift the carrying handle using your right hand and push the barrel forward. To remove the heat shield, place the barrel with the

muzzle end on a hard, flat surface, with the heat shield facing away from your body. Place the index fingers of each hand inside the chamber. Use your thumbs to push up on the top clip.

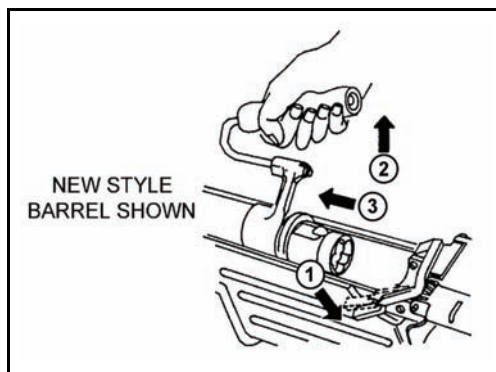


Figure 1-12. Removal of the barrel.

- Raise the feed cover.
- To remove the gas regulator and collar, rotate the gas collar pin out of the notch. Place the tip of the scraper with the concave side facing the pin of the collar inside the notch. (Be careful not to use too much pressure, so as not to break the tip of the scraper.) Rotate the collar counterclockwise over the concave portion of the tip, which is on the scraper, and past the notch until the collar slides off (Figure 1-13). The gunner reports any deficiencies that he cannot correct to the squad leader or NCOIC.

*Note:* The newest style barrel has an internal gas system, which remains assembled.

- To remove the gas regulator (Figure 1-14), separate it from the gas block.

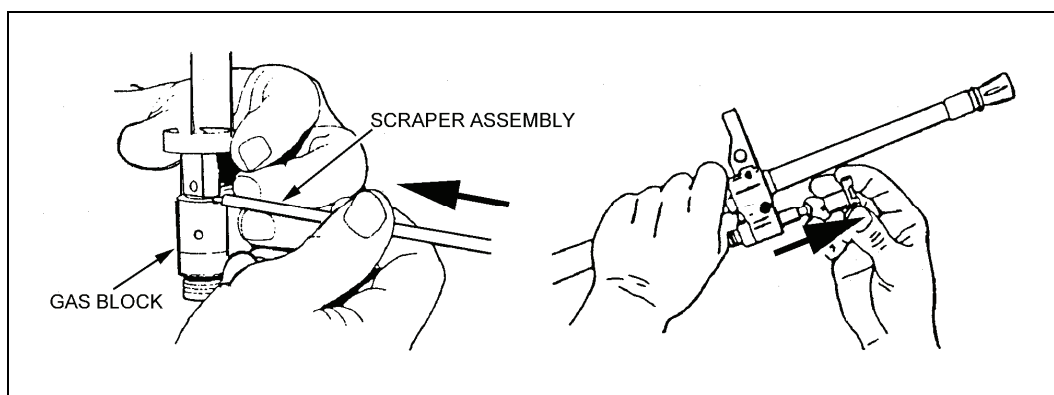


Figure 1-13. Removal of the collar.



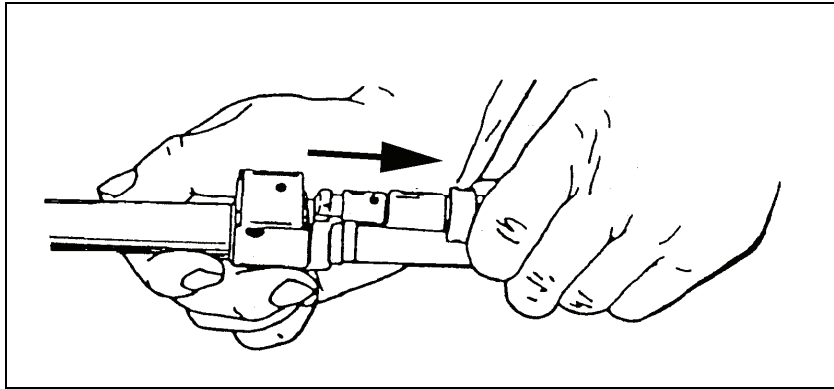


Figure 1-14. Removal of the gas regulator.

### REMOVAL OF THE HANDGUARD GROUP

1-22. The handguard group (Figure 1-15) consists of the handguard, handguard retaining pin, and cleaning equipment-retaining clip. Push the handguard retaining pin to the left using a cartridge or the spring guide rod; then pull the handguard down.

#### **DANGER**

#### **BOLT AND SPRING GUIDE**

Ensure that the bolt is in the forward position before disassembly. If the gunner retracts the operating rod spring with the bolt pulled to the rear, he could suffer injury or death.

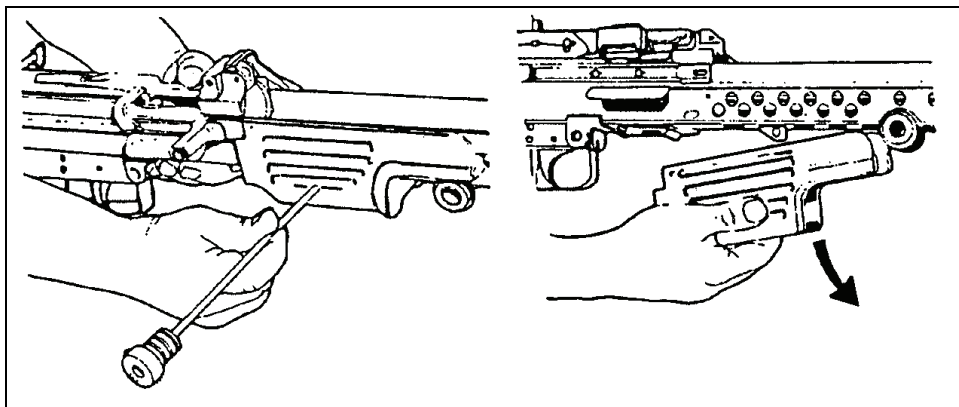


Figure 1-15. Removal of the handguard.

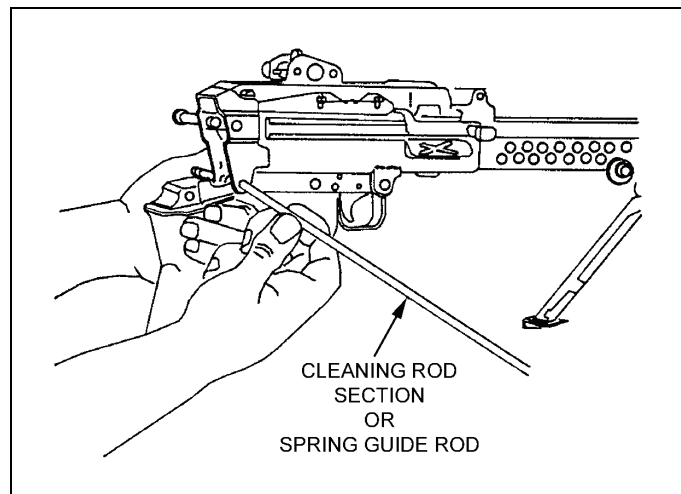
**CAUTION**

**HANDGUARD RETAINING PIN**

Leave the handguard retaining pin alone. It must stay where it is, because it is a "captured" pin.

**REMOVAL OF THE BUTTSTOCK AND BUFFER ASSEMBLY GROUP**

1-23. To remove the buttstock and buffer assembly (Figure 1-16), use a cartridge or the spring guide rod to push the lowermost retaining pin on the rear of the receiver to the left. It is a captured pin; it is not removable. Remove the buttstock and shoulder assembly by pulling them rearward, while supporting the trigger mechanism.



**Figure 1-16. Removal of the buttstock and buffer assembly.**

**REMOVAL OF THE TRIGGER MECHANISM GROUP**

1-24. After the release of the support, the trigger mechanism automatically comes out, because the lowermost retaining pin holds it on.

**REMOVAL OF THE GAS CYLINDER GROUP**

1-25. To remove the gas cylinder from the receiver (Figure 1-17), grasp the gas cylinder at the top of the bipod legs, turn it to the left or right to release the locking spring, and then pull the cylinder away from receiver.

**CAUTION****UPPER AND LOWER RETAINING PINS**

Leave the upper and lower retaining pins in place. They are also "captured" pins.

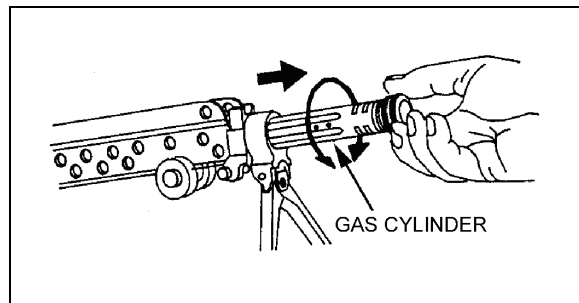


Figure 1-17. Removal of the gas cylinder group.

**REMOVAL OF THE BIPOD GROUP**

1-26. Once the gunner removes the gas cylinder group, he removes the bipod group (Figure 1-18) by pulling it away from the receiver.

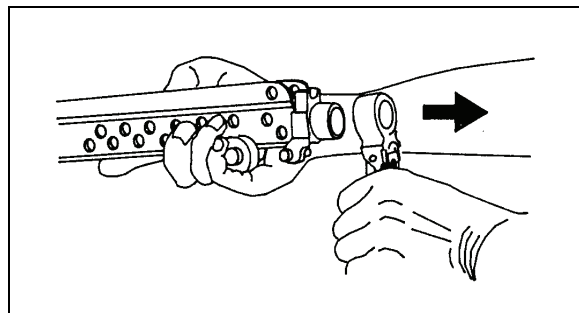


Figure 1-18. Removal of the bipod group.

**REMOVAL OF THE RECEIVER GROUP**

1-27. Once the gunner removes the bipod group, only the receiver group remains. Disassembly is complete.

**INSPECTION**

1-28. Inspection begins with the weapon disassembled in its major groups. Shiny surfaces do not mean the parts are unserviceable. The gunner inspects the parts of the weapon and related equipment. He repairs or replaces any broken or missing parts IAW TM 9-1005-201-10. Every 90 days, he performs preventive maintenance checks and services (PMCS). If he has not used the weapon has in 90 days, he performs PMCS IAW the operator's manual. If he notices any rust on the weapon, he performs PMCS immediately:

## OPERATING ROD GROUP

1-29. The operating rod should not be bent, broken, or cracked. The buffer spring should not have breaks. Lug pins should protrude equally on both sides of the buffer spacer. The operating rod spring should not have kinks, or separated or broken strands. It can have a maximum of one break on any one strand.

- Check the bolt assembly for visible damage. The cartridge extractor should not be cracked or chipped.
- Check the slide assembly for visible damage. Check the feed roller for spring tension when compressed, and to ensure that the pivot slide is locked onto the slide assembly.
- Check the firing pin for straightness and cracks. Ensure the tip is completely rounded.
- Ensure the firing pin spring is not crushed or bent. Ensure the beveled end is not stretched.
- Check the sear notch on the piston assembly for signs of excessive wear or burring. Slight rotation of the piston on its housing is normal and is not cause for rejection.

## BARREL GROUP

1-30. The flash suppressor should not be cracked, and it should be fastened securely. The front sight post and front sight base must not be bent, cracked, or broken. Weapons already zeroed should not be adjusted. The gunner—

- Inspects the heat shield assembly for damage, cracks, or broken retaining clamps.
- Checks the gas regulator and collar for cracks or burrs.
- Checks the barrel for bulges, cracks, bends, obstructions, or pits in the chamber or bore.
- Checks the gas plug for obstructions, cracks, and bulges.
- Checks the carrying handle is checked to ensure it is not cracked, broken, or missing; that it can be folded under spring pressure to the right and left; and that it remains locked in an upright position.

## HANDGUARD GROUP

1-31. The handguard should not be cracked or broken. The retaining clip must be attached to the handguard retaining pin.

## BUTTSTOCK AND BUFFER ASSEMBLY GROUP

1-32. The gunner—

- Checks the buttstock for cracks, bends, or breaks, and for missing components.
- Checks for linkage and tension on the buffer rod.
- Checks the shoulder rest to ensure it is not bent or broken and that it locks in both positions.

## TRIGGER MECHANISM GROUP

1-33. The shoulder of the sear should not show excessive wear. The safety should function properly. That is, the sear should move only slightly when the safety is on "S" and freely when the safety is on "F." The sear pin should not protrude from the trigger mechanism, because, if it does protrude, the trigger mechanism will not go back in place.

## GAS CYLINDER GROUP

1-34. The gas cylinder should not be cracked, bent, or broken.

## BIPOD GROUP

1-35. The bipod group should not be cracked, bent, or broken. The bipod legs should extend and collapse easily.

## RECEIVER GROUP

1-36. The cover latch should work properly. All parts inside the cover assembly should move under spring tension. The gunner checks all spot welds for cracks. The cover assembly should remain open without support. The belt-holding pawl must be under spring tension. The receiver should not be bent or cracked. The cocking handle should slide freely within its guide and lock in its forward position. The windage and elevation knobs on the rear sight should be movable and legible. The windage scale screws should not be worn or burred.

## CLEANING AND LUBRICATING PROCEDURES AND PREVENTIVE MAINTENANCE

1-37. The gunner should clean the M249 machine gun immediately after firing. Before doing so, he disassembles it into its major groups. After he cleans it and wipes it dry, he applies a thin coat of CLP by rubbing with a cloth. This lubricates and preserves the exposed metal parts during all normal temperature ranges. When not using the gun, he inspects it weekly, and cleans and lubricates it as needed.

## CLEANING

1-38. All metal components and surfaces that have been exposed to powder fouling should be cleaned using CLP on a bore-cleaning patch. The gunner uses the same procedure to clean the receiver.

### CAUTION

#### CLEANER, LUBRICANT, PRESERVATIVE

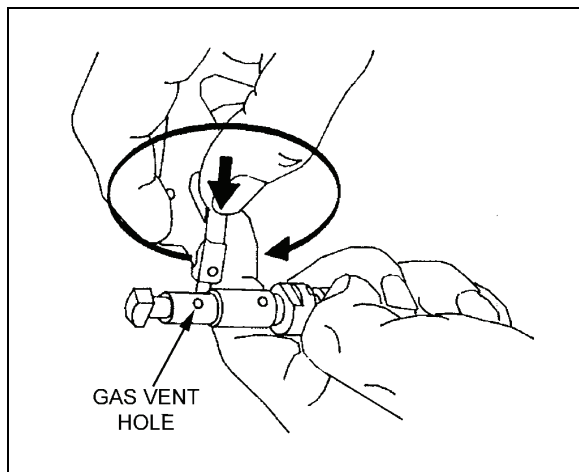
Use CLP alone, because it works poorly when mixed with other cleaners.

- Clear and disassemble the weapon.
- Clean the bore and chamber using CLP and fresh swabs.
- Clean the gas regulator with the special tool (scraper). Remove all carbon dust. *Do not use CLP on the collar, gas block, or body.*

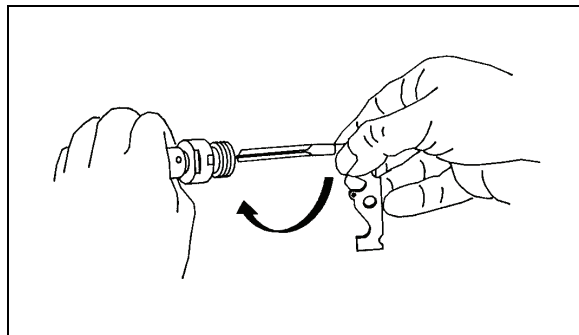
1-39. Clean the gas-vent hole (Figure 1-19).

1-40. Clean the central hole with the appropriate part of the scraper by turning it clockwise and pushing it inward toward the bottom of the housing (Figure 1-20).

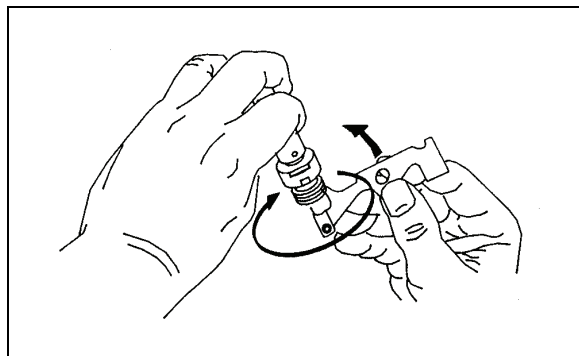
1-41. Use the protruding tips of the scraper to clean the two grooves of the body (Figure 1-21).



**Figure 1-19. Cleaning of the gas vent hole.**



**Figure 1-20. Cleaning of the central hole.**



**Figure 1-21. Cleaning of the grooves of the body.**

- 1-42. Clean the gas cylinder and piston with the special tool (scraper). Do not use CLP on the gas cylinder or piston.
- 1-43. Clean the front interior of the gas cylinder (repositioned in receiver with bipod in place) by inserting and turning the flat side of the scraper in a 360-degree circular motion (Figure 1-22).
- 1-44. Clean the internal grooves of the front side of the gas cylinder the same as, except insert the scraper farther into the gas cylinder (Figure 1-22).

1-45. Clean the three grooves of the piston using a 360-degree circular motion (Figure 1-23). Remove all carbon dust from the piston, inside and out.

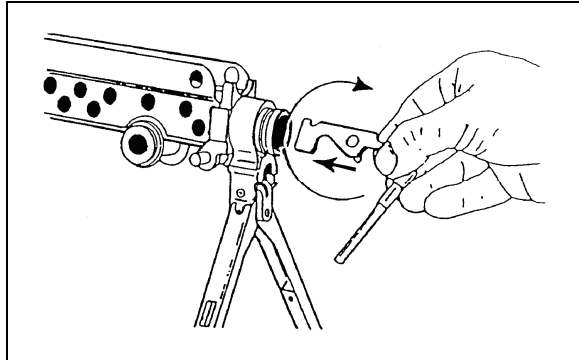


Figure 1-22. Cleaning of the front interior and internal grooves of the gas cylinder.

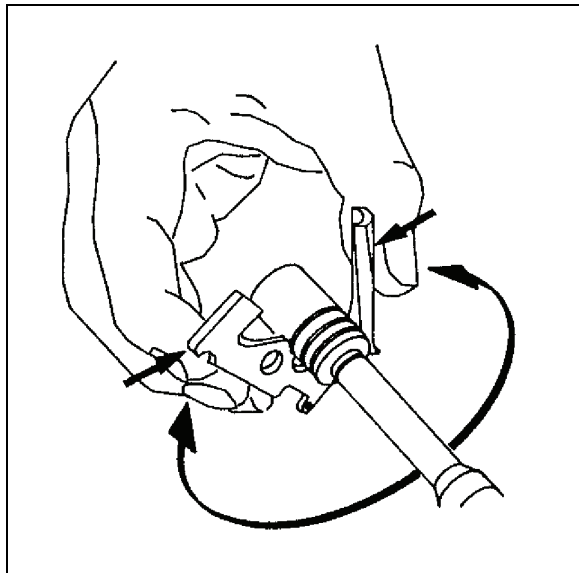
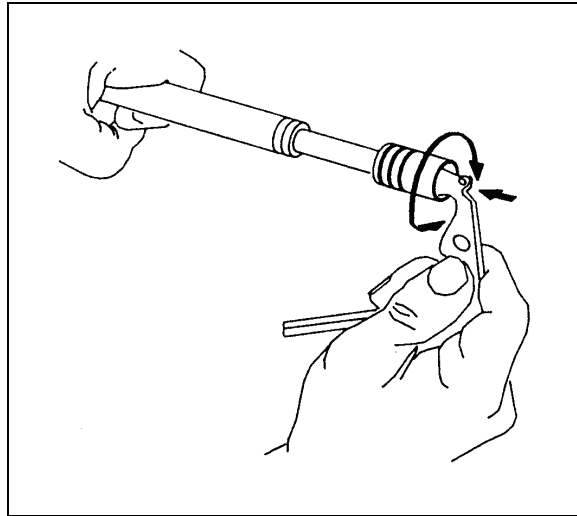


Figure 1-23. Cleaning of the grooves of the piston.

1-46. Clean the hole in the front of the piston by inserting and turning the flat side of the scraper in a 360-degree circular motion (Figure 1-24).

- Clean carbon and dirt from all other parts of the weapon.
- Use a cloth saturated in CLP on exterior surfaces to prevent corrosion.



**Figure 1-24. Cleaning of the hole in the front of the piston.**

### **Lubricating**

1-47. After the M249 machine gun is cleaned and wiped dry, a thin coat of CLP is applied by rubbing it on with a cloth. This lubricates and preserves the exposed metal parts during all normal temperature ranges. The gunner also lubricates all moving parts with CLP, which he then rubs into the components by hand.

### **Operating Rod Group**

1-48. Use CLP on the operating rod and spring, the slide assembly, the feed roller, and the bolt-locking lug.

### **Barrel Group**

1-49. Use CLP on the cam surfaces of the bolt-locking lugs, the heat shield, and along the outer surfaces of the barrel clamp.

### **Receiver Group**

1-50. Use CLP on all moving parts on the cover assembly and the receiver rails.

## **PREVENTIVE MAINTENANCE**

1-51. Weapons that are seldom fired or stored for prolonged periods should have a light film of CLP applied to the interior of the gas plug, the gas regulator, and the piston immediately after cleaning or inspecting. The gunner performs preventive maintenance every 90 days, unless inspection reveals the need for more frequent servicing. The use of the lubricant does not eliminate the need for cleaning and inspecting to ensure that corrosion has not formed. The gas regulator, gas plug, and piston must be clean and free of oil and lubricants before using the weapon. If it is not clean and oil free, stoppages will occur. CLP is the only lubricant to use on the M249 machine gun. The following procedures apply to cleaning and lubricating the M249 machine gun during unusual conditions:

- Extreme heat—use CLP, grade 2.
- Damp or salty air—use CLP, grade 2. Clean and apply frequently.



- Sandy or dusty areas—use CLP, grade 2. Clean and apply frequently. Remove excess with a rag after each application.
- Temperature below minus 18 degrees Celsius (0 degrees Fahrenheit)—use CLP grade 2 generously. Lubricate heavily enough to spread the lubricant with a finger. Although CLP provides effective between 0 degrees Fahrenheit and minus 35 degrees Fahrenheit, it will not flow from a 1/2-ounce bottle at temperatures below 0 degrees Fahrenheit.

## GENERAL ASSEMBLY

1-52. The gunner assembles the M249 machine gun in reverse order of the disassembly.

### REPLACEMENT OF THE RECEIVER AND BIPOD GROUPS

1-53. Place the bipod group on the receiver group with the bipod legs open and pointed downward. (Figure 1-18.)

### REPLACEMENT OF THE GAS CYLINDER GROUP

1-54. Push the gas cylinder through the bipod yoke into the receiver. Push the cylinder to the rear while countering the pressure of the locking spring and guiding the end of the cylinder into the receiver with the other hand applying downward pressure. Position the recess in the cylinder near the spring. Turn the cylinder until the spring clicks into the recess at the rear of the gas cylinder (Figure 1-25).

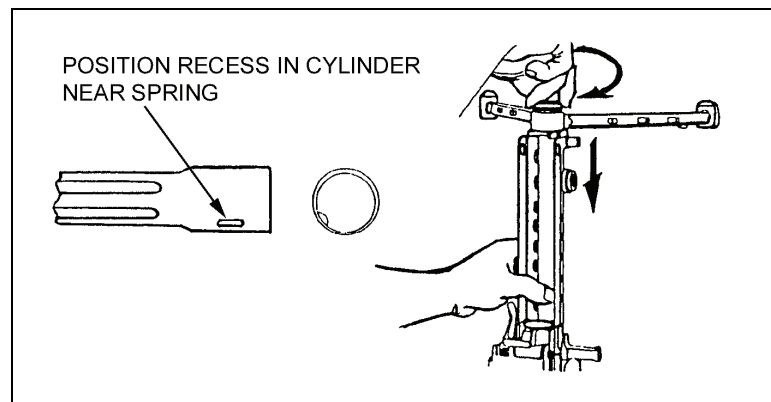


Figure 1-25. Replacement of gas cylinder group.

### REPLACEMENT OF THE TRIGGER MECHANISM GROUP

1-55. Align the trigger mechanism (Figure 1-26) with the slot on the bottom of the receiver. Hold the trigger mechanism in position to accomplish the next step.

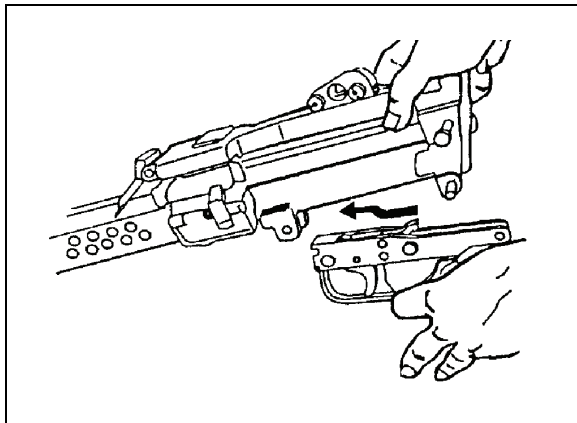


Figure 1-26. Replacement of the trigger mechanism group.

### REPLACEMENT OF THE BUTTSTOCK AND BUFFER ASSEMBLY GROUP

1-56. Align the lower hole in the buttstock and buffer assembly with the rear hole in the trigger mechanism; then push the lower retaining pin to the right (Figure 1-27).

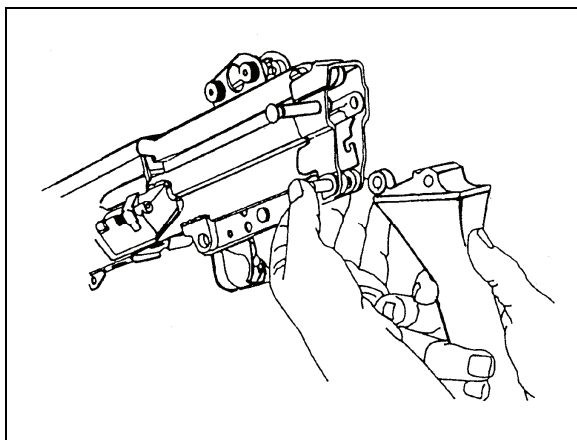


Figure 1-27. Replacement of the buttstock and buffer assembly group.

### REPLACEMENT OF THE HANDGUARD GROUP

1-57. To replace the handguard, place it on the receiver from the bottom and push it to the rear until it stops. Using the guide rod, push the handguard retaining pin to the right. This locks the handguard into position. Push the handguard down to make sure it is locked.

### REPLACEMENT OF THE BARREL GROUP

1-58. Insert the gas regulator into the gas block and align the notch on the gas regulator with the notch of the gas block. With the gas regulator already installed and supported on a firm surface, place the gas regulator collar onto the protruding end of the body and align the spring with the stud. Push the gas regulator collar downward firmly and rotate it until it slips into place. Then, press it in and rotate it to lock it in place. Depress the barrel-locking lever to the rear with your left hand, while holding the carrying handle with your right hand. Pull the barrel rearward and push downward; align the gas regulator with the

gas cylinder and lock it by releasing the barrel-locking lever. Check the barrel to ensure it is locked into the receiver by pulling or lifting on the carrying handle. Replace the heat shield by placing the hook end of the heat shield under the front sight post and press down until the clamps lock on the barrel. (Figure 1-28).

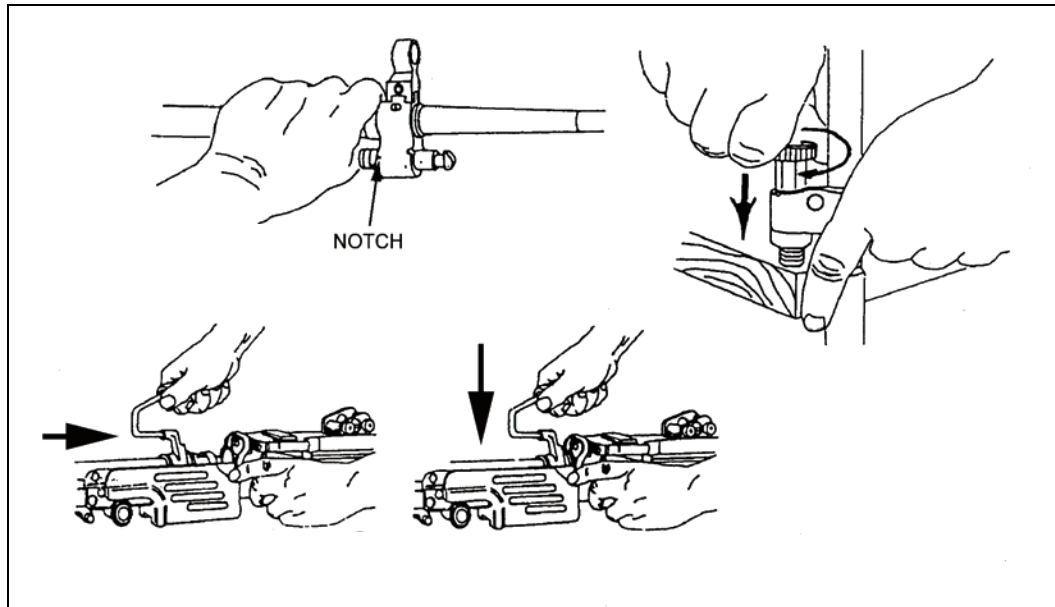


Figure 1-28. Replacement of the barrel group.

## REPLACEMENT OF THE OPERATING ROD GROUP

1-59. Hold the piston in one hand with the face of the piston facing outward and the sear notches downward. With the other hand, place the slide assembly onto the rear of the piston with the firing pin toward the front of the piston. (Check the slide assembly-retaining pin to make sure it is out.) (Figure 1-29).

- Push the slide assembly-retaining pin to the right. This locks together the piston assembly and the slide assembly.
- Put the firing pin spring on the firing pin of the slide assembly. Place the bolt on the slide assembly, aligning the driving lug of the bolt with the slot of the slide assembly. Apply pressure to the face of the bolt to compress the firing pin spring. Then, rotate the bolt to hook the driving lug into the slide assembly. Open the cover assembly on the receiver. Insert the face of the piston into the receiver, aligning the bolt lugs onto the receiver rails. Pull the trigger and push the moving parts forward until the bolt seats in the chamber.
- Place the operating rod tip into the operating rod spring. Then, insert the free end of the operating rod and spring into the rear of the piston. Depress the rear of the operating rod assembly until the two lugs on the buffer are positioned in the receiver grooves.
- Pivot the buttstock upward into position and push the upper retaining pin to the right, locking the buttstock to the receiver.

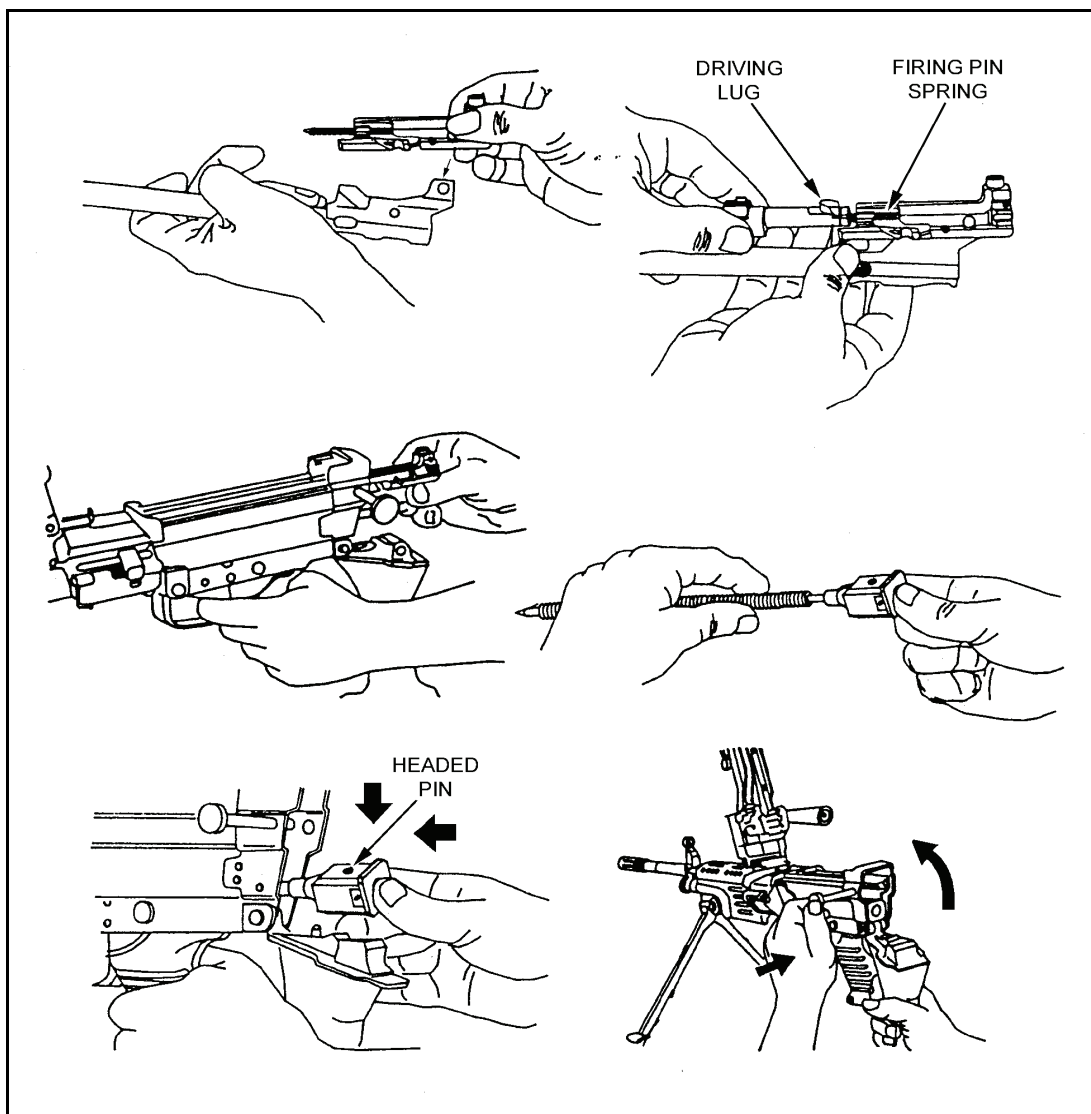


Figure 1-29. Replacement of the operating rod group.

## FUNCTION CHECK

1-60. The gunner must perform a function check to ensure that the M249 machine gun has been assembled correctly. The procedures, in order, are as follows:

- Grasp the cocking handle with the right hand, palm up, and pull the bolt to the rear, locking it in place.
- While continuing to hold the resistance on the cocking handle, use the left hand to move the safety to the safe position.
- Push the cocking handle forward into the forward lock position.
- Pull the trigger (The weapon should not fire).
- Grasp the cocking handle with the right hand, palm up, and pull and hold it to the rear.
- Move the safety to the fire position.

- While continuing to hold resistance on the cocking handle, use the left hand to pull the trigger and ease the bolt forward to prevent it from slamming into the chamber area and damaging the face of the bolt.
- If the weapon fails the function check, check for missing parts or repeat the reassembly procedures. Before disassembling the weapon, make sure it is positioned where the guide rod and spring cannot cause bodily harm if the bolt is locked to the rear. The cover and feed mechanism assembly can be closed with the bolt in either the forward or the rearward position.

**CAUTION**

**BOLT MOVEMENT**

To avoid damaging the other parts of the weapon, *ease* the bolt forward.

## **MAINTENANCE PROCEDURES**

1-61. To properly maintain the M249 machine gun, the gunner must perform certain actions before, during, and after firing:

- Before firing—
  - Wipe the bore dry.
  - Inspect the weapon as outlined in the operator's TM.
  - Lubricate the weapon.
- During firing—
  - Inspect the weapon periodically to ensure that it remains lubricated.
  - When malfunctions or stoppages occur, follow the procedures in Section IV.
- After firing—
  - Immediately clear and clean the weapon.
  - Every 90 days during inactivity, clean and lubricate the weapon, unless inspection reveals more frequent servicing is necessary.

## **MAINTENANCE IN CHEMICAL, BIOLOGICAL, RADIOLOGICAL, OR NUCLEAR CONDITIONS**

1-62. If the M249 machine gun is contaminated by chemical, biological, or radiological (nuclear) agents, the appropriate action must be taken to reduce exposure and penetration.

### **CHEMICAL**

1-63. Use towelettes from the M258A1 kit to wipe off the weapon. If these are not available, wash the weapon with hot, soapy water, and rinse.

### **BIOLOGICAL**

1-64. Use towelettes or hot, soapy water and rinse the weapon as above.

**RADIOLOGICAL OR NUCLEAR**

1-65. Brush or wipe the weapon, or wash with water, and rinse (FM 3-5).

**SECTION III. OPERATION AND FUNCTION**

This section discusses the operation and function of the M249 machine gun. They include loading, firing, unloading, cycle of functioning, adjusting the sight, and using the bipod.

**OPERATION**

1-66. The M249 machine gun operations are loading, firing, unloading, and using belted ammunition or, in an emergency, a 20- or 30-round M16 magazine. The firing operation works on gas pressure created as a fired round passes through the barrel. The M249 is loaded, fired, unloaded, and cleared from the open-bolt position. The safety must be in the fire position before the gunner can pull the bolt to the rear. Before using belted ammunition, the gunner checks it to ensure it is properly linked with the double link or the link tab at the open end of the box. It must be free of dirt and corrosion. When using a magazine of ammunition, it must be loaded into the magazine well and be free of dirt and corrosion.

**LOADING PROCEDURES**

1-67. To load the M249, the gunner must first clear it as described. (With the feed cover raised, the gunner makes sure his face is not exposed to the open chamber area while loading.) (Figure 1-30).

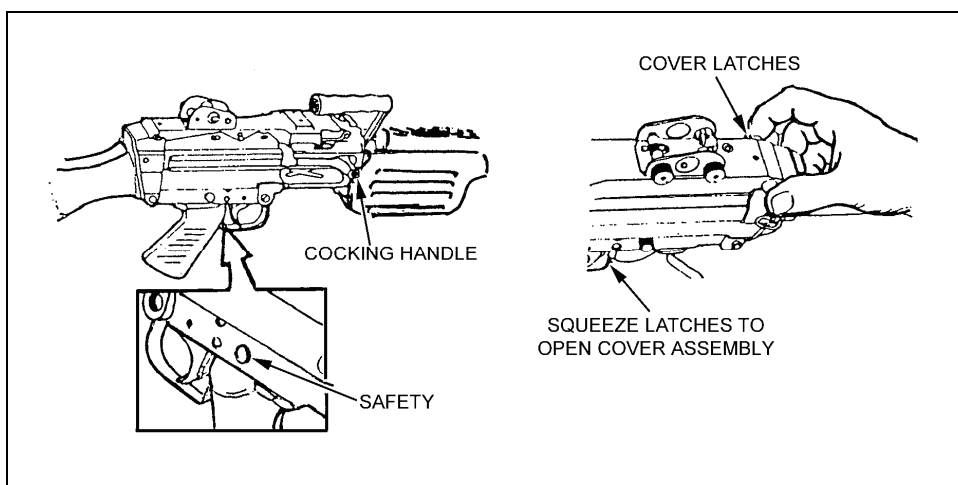


Figure 1-30. Loading procedure.

**BELT**

1-68. When loading belted ammunition (Figure 1-31), always cant the weapon to the right. Make sure the open side of the links is facing down, and place the lead link tab or first round of the belt in the tray groove against the cartridge stop. Place the rounds flat across the feed tray. With your left hand, count five to six rounds down to hold ammunition in place on the feed tray, while at the same time closing the feed cover with your right hand. When closing the feed cover, always place your hand in front of the rear sight to prevent accidentally changing the sight adjustment.

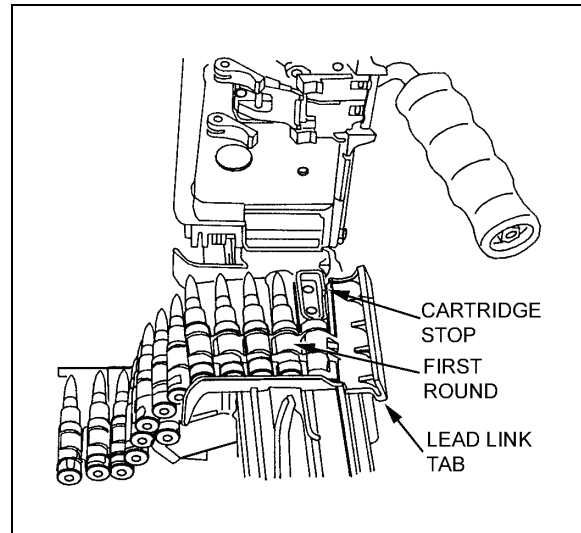


Figure 1-31. Belt-fed ammunition.

### CAUTION

#### MAGAZINES

Use the 20- or 30-round magazine *only* when linked ammunition is unavailable.

#### MAGAZINE

1-69. Load the 20- or 30-round magazine by inserting it into the magazine well on the left side of the receiver. Push the magazine firmly into the well until it seats and the release tab clicks into the recess on the magazine (Figure 1-32).

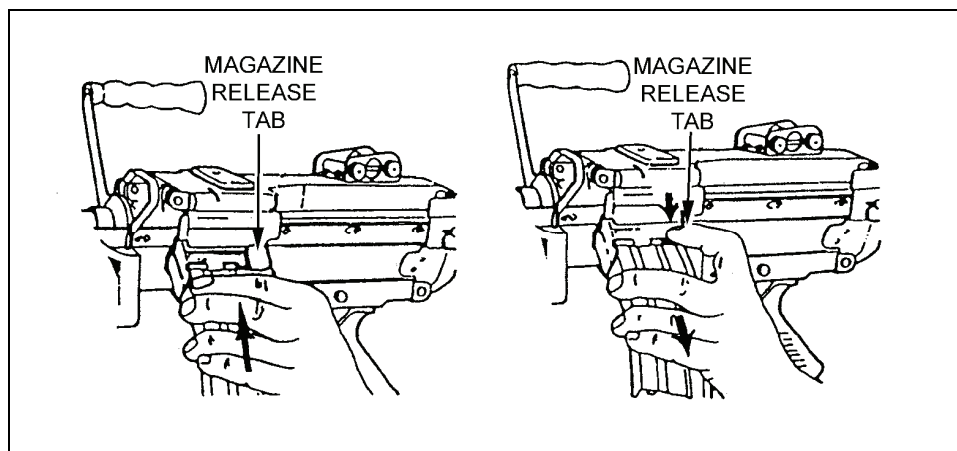


Figure 1-32. Loading of a magazine.

**DANGER**

**HOT WEAPON--FEED COVER**

**Before opening the feed cover on a hot gun, place the weapon on the ground away from your face.**

**If the weapon is on your shoulder with the cover open when a round cooks off, you could suffer injury or death.**

## UNLOADING PROCEDURES

1-70. To unload the weapon--

- Grasp the cocking handle with the right hand, palm facing upwards.
- Pull the cocking handle to lock the bolt to the rear.
- Hold the cocking handle with your right hand, and *place the weapon on safe*.
- With your left hand, push the cocking handle to the forward locked position.
- Depending on whether you are using belt-fed or magazine-fed ammunition, do the following:
  - Raise the feed cover and remove any ammunition or links from the feed tray.
  - Perform the five-point safety check.
  - Push the magazine release tab down and pull the magazine from the magazine well.
  - Raise the feed cover and perform the five-point safety check.

## CYCLE OF FUNCTIONING

1-71. The gunners can recognize and correct stoppages when they know how the M249 machine gun functions. The weapon functions automatically as long as ammunition feeds into it, and the gunner holds the trigger to the rear. Each time a round is fired the parts of the weapon function in a cycle or sequence. Many of the actions occur at the same time. This manual separates these actions only for instructional purposes. The cycle begins when the gunner places the first round of the belt in the tray groove, or when he inserts the magazine into the magazine well. Then, the gunner pulls the trigger, which releases the sear from the sear notch. When the gunner pulls the trigger to the rear, the rear of the sear lowers and disengages from the sear notch. This procedure allows the expansion of the operating rod spring to drive the piston and bolt forward. The cycle stops when the gunner releases the trigger, and the sear again engages the sear notch on the piston. The sequence of functioning follows:

## FEEDING

1-72. The forward movement of the bolt forces the feed lever to the right, causing the feed-pawl assembly to turn in the opposite direction. This in turn forces the feed-pawl assembly over the next round in the belt. The feed-pawl assembly is ready to place the next round into the tray groove when the rearward action occurs again. As the bolt moves to the rear after firing, the feed roller forces the feed lever to turn to the left, which moves the feed pawl to the right, placing a round in the tray groove.

## CHAMBERING

1-73. As the bolt travels forward, the upper stripping (belt-fed or magazine-fed) lug engages the rim of the round. The pressure of the front and rear cartridge guides holds the round so that it makes positive contact with the upper stripping lug of the bolt. The front cartridge guide prevents forward movement of the link as the round is stripped from the belt. The upper locking lug carries the round forward. The



chambering ramp causes the nose of the round to be cammed downward into the chamber. When the round fully seats in the chamber, the extractor snaps over the rim of the round, depressing the ejector on the rail inside the receiver.

## **LOCKING**

1-74. As the round chambers, the bolt enters the barrel socket. The upper and lower locking lugs contact the bolt camming surfaces inside the barrel and start the bolt turning clockwise. The action of the bolt into the slide assembly, as the piston continues forward, turns the bolt to complete its 90-degree (one-quarter turn) clockwise rotation. Locking is now complete.

## **FIRING**

1-75. After the bolt travels fully forward and locks, the piston continues to move forward independently of the bolt for a short distance. The piston assembly carries the firing pin through the face of the bolt. The firing pin strikes the primer of the round, and the primer fires the round.

## **UNLOCKING**

1-76. After the round fires and the bullet passes the gas port, part of the expanding gases go into one block (new style) or into the gas regulator through the gas plug. The rapidly expanding gases enter into the gas cylinder from the gas regulator, forcing the piston to the rear. As the piston continues to the rear, the slide assembly's simultaneous movement to the rear causes the bolt to begin its counterclockwise rotation. The upper and lower locking lugs of the bolt contact the bolt camming surfaces inside the barrel socket and, as the bolt continues toward the rear, it completes a one-quarter turn counterclockwise. The rotation and movement to the rear unlocks the bolt from the barrel socket.

## **EXTRACTING**

1-77. Extracting begins during the unlocking cycle. The rotation of the bolt loosens the cartridge case in the chamber. As the piston and bolt move to the rear, the extractor pulls the cartridge case from the chamber.

## **EJECTING**

1-78. As the cartridge case is pulled from the chamber, the bolt passes by the ejector. This procedure causes the ejector clip to expand, forcing the ejector to push the expended cartridge. The extractor grips the right side of the cartridge and causes it to spin from the weapon as it reaches the ejection port. The empty belt links are forced out of the link ejection port as the rearward movement of the bolt causes the next round to be positioned in the tray groove.

## **COCKING**

1-79. The piston assembly acts against the firing pin, pulling the firing pin from the primer of the spent cartridge case. The action of the piston assembly, continuing to the rear with the firing pin, releases the compression of the firing pin spring. As long as the gunner holds the trigger to the rear, the M249 will continue to complete the eight steps of functioning automatically. When the gunner releases the trigger and the sear again engages the sear notch, the cycle of functioning stops and the weapon is cocked. To prevent undue wear to the sear and sear notch, the automatic rifleman must hold the trigger firmly to the rear during firing.

## SIGHTS

1-80. This paragraph provides information on how to set the sights for elevation and windage for the M249 machine gun. It also includes information on how to make corrections if the initial setting on the windage knob or peep sight is not accurate. On a 10-meter target, each paster is 1/2 cm. Therefore, two clicks on the windage knob in either direction moves the strike of the round left or right 1 cm, and two turns on the peep sight moves the strike of the round up or down 1 cm. For example, if the shot group was 2 cm above and 1 cm to the right of the paster, sight corrections are made first by correcting the windage. In this case, the windage knob is rotated two clicks toward the buttstock (clockwise). The elevation knob is rotated four turns toward the buttstock (clockwise) to lower the strike of the round (Figure 1-33 and Table 1-3). (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

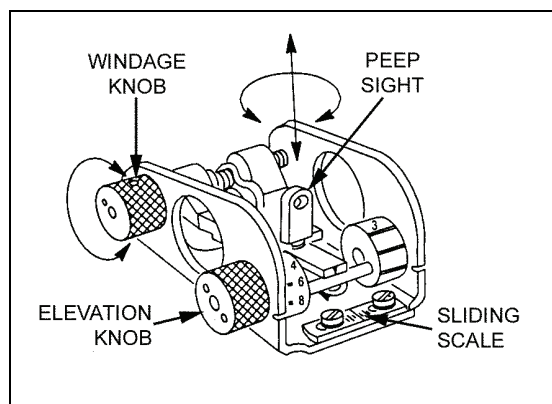


Figure 1-33. Sliding scale on sight.

## ELEVATION

1-81. Adjustments for elevation (range) require the automatic rifleman to turn the elevation knob (closest to the buttstock) on the rear sight to the desired range setting. Range settings are graduated increments from 300 to 1,000 meters. Even-numbered settings are on the left side of the scale wheel and are numbered 4, 6, 8, 10, which represent 400, 600, 800, and 1,000 meters, respectively. Odd-numbered settings on the right side of the scale wheel, marked with the number 3 and 3 index lines, represent 300, 500, 700, and 900 meters, respectively. Rotation of the elevation knob toward the muzzle (counterclockwise) increases the range, while rotation toward the buttstock (clockwise) decreases the range. The gunner makes fine adjustments, like zeroing, by adjusting the peep sight. Each 180-degree turn equals a half-mil change in elevation, which equals a half-cm change in impact at a range of 10 meters. Clockwise (to the right) rotations decrease elevation, while counterclockwise (to the left) rotations increase elevation. The gunner can turn the peep sight nine 180-degree turns from top to bottom. To make the peep sight easier to grasp, he turns the elevation knob to its highest point (1,000 meters). He makes the appropriate adjustment for the peep sight, and then returns the sight to the desired range. Whenever readjusting the range, he never changes the point of aim. The point of aim is the center base of the target.

## WINDAGE

1-82. The gunner adjusts for windage by traversing the rear sight right and left along the sliding scale. The sliding scale is marked or graduated with index lines. Each index line is equal to a half-mil change in direction or a half-cm change of impact at 10 meters. Rotation of the windage knob (closest to the muzzle end) toward the muzzle (counterclockwise) moves the rear sight aperture to the right, which in turn moves the strike of the rounds right. Rotation toward the buttstock (clockwise) moves the aperture left, which moves the strike of the rounds left.

## 10-METER ZERO, SETTING OF THE SIGHTS (MECHANICAL ZERO)

1-83. The gunner indexes or places the elevation knob on a range of 500 meters. He centers the rear peep sight by rotating it clockwise (right) as far as it will go, then rotating counterclockwise (left) five clicks or half-turns. He rotates the windage knob toward the muzzle until the peep sight is *completely* to the right, then rotates the windage knob toward the buttstock twelve clicks to the left. This places the peep sight in the approximate center of the sight. Each sight may vary as to how many clicks are needed. To check the sight, the gunner starts with the sight all the way to the right and, while counting the clicks, rotates the windage knob until it stops on the left side. He divides the clicks by two. If the click is an uneven number, he rounds it up. To center the sight, he rotates the windage knob toward the center (right) while counting the appropriate number of clicks. He adjusts the sliding scale at the rear of the sight to center the large index line under the zeroed windage mark on the sight. Two threads should be showing on the front sight post. If more or less are showing, the gunner turns in the weapon for maintenance. (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

100 meters	One click moves the strike 5 cm (2 inches).
200 meters	One click moves the strike 10 cm (4 inches).
300 meters	One click moves the strike 15 cm (6 inches).
400 meters	One click moves the strike 20 cm (8 inches).
500 meters	One click moves the strike 25 cm (10 inches).
600 meters	One click moves the strike 30 cm (12 inches).
700 meters	One click moves the strike 35 cm (14 inches).
800 meters	One click moves the strike 40 cm (16 inches).
900 meters	One click moves the strike 45 cm (18 inches).

**Table 1-3. Windage and elevation (peep sight) correction chart.**

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*Note:* Zero the primary and spare barrels by adjusting the front sight.

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## M122 TRIPOD

1-84. The M122 tripod provides a stable mount for the M249, and permits accuracy and control. The tripod is recommended for all marksmanship training and defensive employment, unless the newer M192 tripod is available, in which case see Appendix C. (See also Appendix A for employment.) When available, the gunner can use the M192 lightweight ground mount (tripod; Appendix C.) (Appendix A provides more detailed information about employment.)

### MOUNTING THE M122 TRIPOD

1-85. The tripod assembly provides a stable and relatively lightweight base, superior to the bipod. The gunner can easily extend and collapse the tripod. The tripod has a head, one front leg and two rear legs, and a traversing bar. The traversing bar connects the two rear legs. The traversing bar has hinges on one side and a sleeve and sleeve latch on the other. This procedure allows the tripod to collapse to a closed position for carrying or storage, or to lock in an open, extended position for use. The traversing bar also supports the T&E mechanism. Engraved on the bar is a scale, which measures direction in mils. It is graduated in 5-mil increments. It is numbered every 100 mils to 425 mils right of center, and it is numbered every 100 mils to 450 mils left of center.

- The T&E mechanism provides controlled manipulation and the ability to engage predetermined targets.
  - The traversing portion of the mechanism consists of the traversing handwheel and traversing slide-lock lever. As the traversing handwheel is turned, the muzzle of the weapon will turn to the left or right, depending on the direction it is turned. Each click of the traversing handwheel represents a 1-mil change in direction of the muzzle, that is, one click equals 1 mil. The weapon can traverse 100 mils: 50 mils right and 50 mils left of center.
  - The elevating portion of the mechanism consists only of the elevating handwheel. The elevating handwheel has a mil-click device built into it (1 click equals 1 mil). A scale engraved into the handwheel is divided into 5-mil divisions and 1-mil subdivisions, for 50 mil increments. There are 200 mils above and 200 mils below the zero mark, for a total of 400 mils in elevation change. The gunner reads elevation in two parts. He takes the major reading from the elevation screw plate. He takes the minor reading from the handwheel. When he records the two readings, he separates them with a slash (“/”).
  - The traversing slide-lock lever allows rapid lateral adjustments along the traversing bar. Direction readings are taken from the scale on the traversing bar, using the left side of the traversing slide as an index. The direction of the reading comes from the position of the muzzle, not the position of the slide.
- To set up the tripod, unfold the front leg and spread the rear legs until the leg lock engages. Insert the pintle assembly and rotate the pintle lock-release cam to lock. Ensure that the locking lever of the pintle is facing forward toward the front leg (Figure 1-34).
- Attach the traversing and elevating mechanism (which requires a special adapter). Ensure that the adapter pin is to the right and the opening between it is to the rear. Center the elevating and traversing handwheels. To do this, he rotates the elevation handwheel until about 1-1/2 inches (two fingers) are visible on the upper elevating screw; he rotates the traversing slide until about two fingers are visible on the lower elevating screw. He rotates the traversing handwheel towards his body as far as it will go, then turns it away two complete revolutions. He checks the traversing handwheel scale to ensure the “0” on the scale is aligned with the “0” index line before and after the two revolutions. The T&E is now roughly centered. At night, he positions the traversing mechanism by turning the traversing handwheel toward his body as far as it will go, and then turning it away 50 clicks (two revolutions) (Figure 1-34).
- With the T&E roughly centered, he lowers the traversing slide on to the traversing bar with the locking lever to the rear, and the traversing handwheel to the left, and secures it by turning the locking lever clockwise (Figure 1-34).
- The weapon attaches to the M122 tripod. First, he extends the bipod legs forward. Then, he engages the mounting pins (Located between the front of the handguard and the bipod legs) of the M249 into the pintle of the tripod by squeezing the locking lever of the pintle. He lowers the rear of the weapon so that the hole above the trigger guard engages the locking pin of the T&E adapter. He aligns the hole with the pin of the adapter and pushes the pin from right to left to secure the M249 to the M122 tripod (Figure 1-34).
- After the gunner attaches the M249 and secures it to the tripod, he attaches a special ammunition adapter to the M249. He inserts the adapter into the magazine well, as if inserting a magazine. This procedure allows the gunner to use the 200-round drum of ammunition (Figure 1-34).

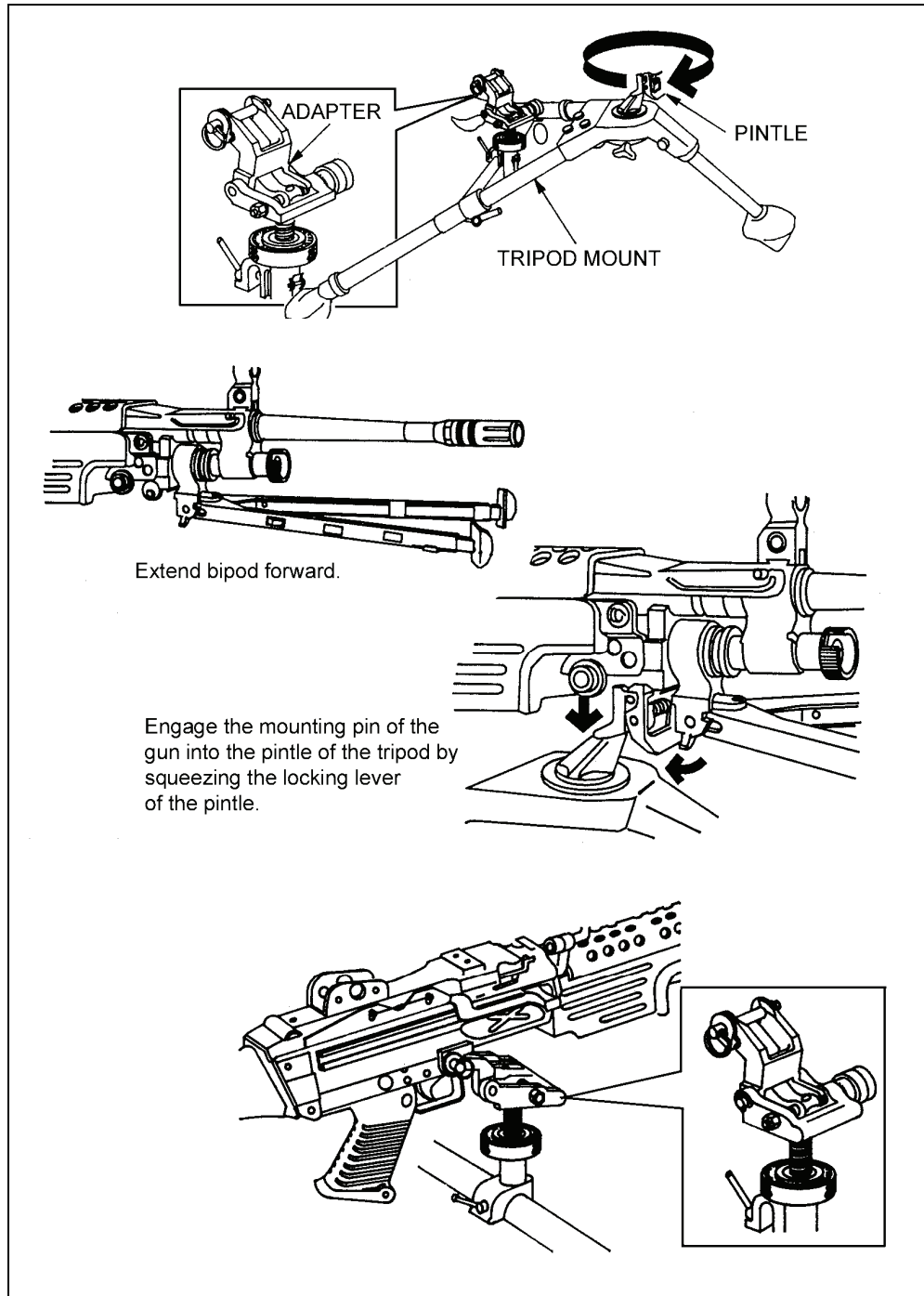


Figure 1-34. Tripod mount.

### DISMOUNTING THE M249 FROM THE M122 TRIPOD

1-86. The gunner dismounts the M249 from the M122 tripod by first removing the traversing and elevation mechanism from the weapon. He pulls the locking pin of the adapter to release the T&E from the trigger guard. He grasps the carrying handle with his left hand and squeezes the pintle-locking lever with his right hand. He lifts the weapon from the pintle assembly and the tripod.

## BIPOD OPERATION

1-87. The bipod group is used to fire from the prone position. The shoulder rest on the buttstock provides support for the gunner when fired in the bipod mode. The gas cylinder group holds the bipod group in place. Once the gunner removes the gas cylinder, he can remove the bipod group from the receiver.

- **To lower** the bipod legs, hold the legs together and pull down and away from the handguard. Release the legs so that they lock in the vertical position.
- **To extend** the bipod legs, grasp the foot of each leg and pull down (Figure 1-35).

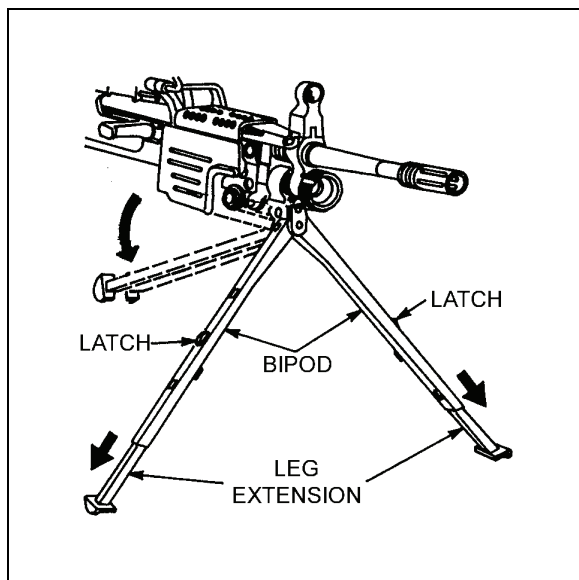


Figure 1-35. Lowering of the bipod.

- **To retract** the bipod legs, push in the latches and push in the legs.
- **To transport** the weapon, you must first fold the bipod legs. To close the legs, hold them together, pull them back under the handguard, and then release them so the hooks on the legs grip the handguard. You can only fold the bipod when the legs are in the closed position (Figure 1-36).

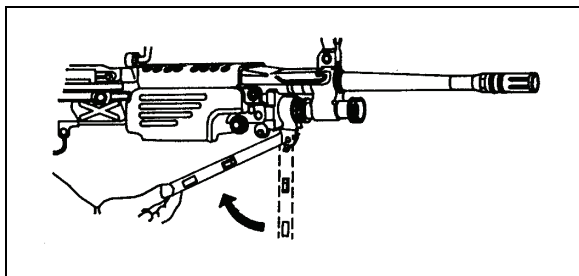


Figure 1-36. Folding of bipod under the handguard.

## VEHICULAR MOUNT

1-88. The standard vehicular mount for the M249 machine gun is the M6 pedestal mount used on the (HMMWV). One component of the pedestal mount is the M197 machine gun mount (travel lock). This mount also adapts to other vehicles (Figure 1-37).

- To mount the weapon, the gunner ensures that the release lever of the pintle is facing forward. To extend the bipod legs forward, he places the front mounting pins of the M249 into the pedestal by squeezing the locking lever of the pintle. He ensures that the M60 machine gun adapter assembly pivots away from the M249 fork (clevis). He lowers the rear of the weapon so that the locking pin of the machine gun mount can engage the hole above the trigger guard. The gunner engages this part of the weapon into the fork of the mount and pushes in the locking pin.
- To dismount the weapon, the gunner pulls the locking pin of the mount. He raises the rear of the weapon slightly and squeezes the locking lever of the pintle. Once he releases the front mounting pins, the gunner lifts the weapon from the mount.

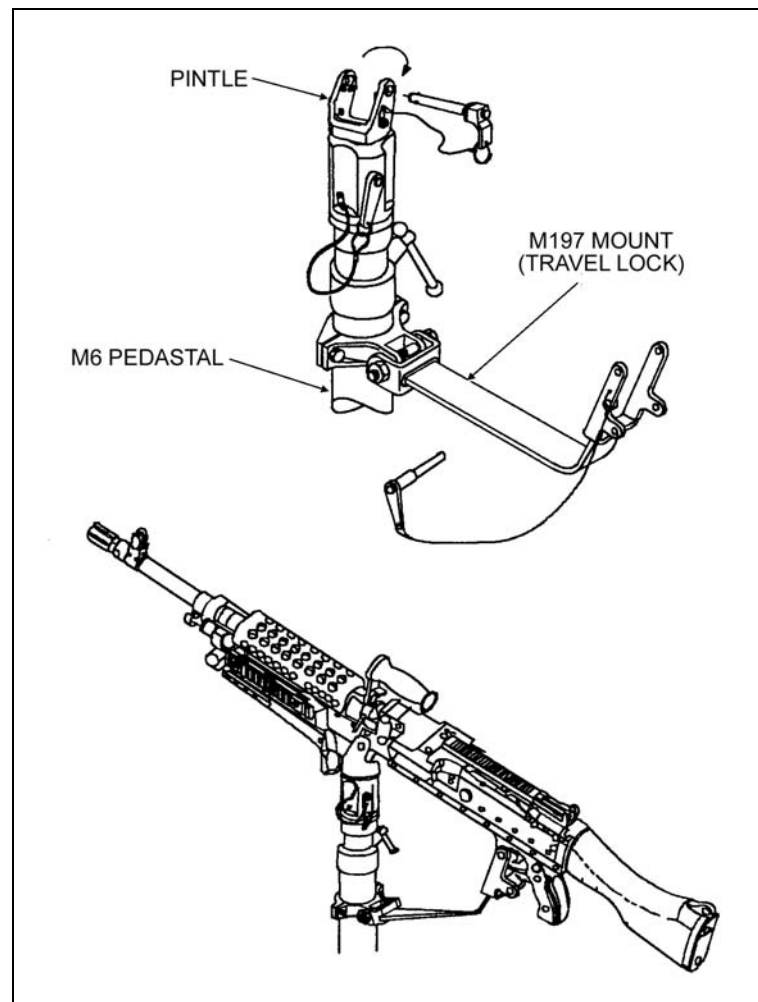


Figure 1-37. Vehicular mount.

## TRIPOD OPERATION

1-89. The M122 tripod provides a stable mount for the M249, and it permits a high degree of accuracy and control. To use a tripod, the gunner unfolds the front leg and positions it toward the target. Then, he spreads the rear legs of the tripod until the leg lock engages. When available, the gunner can use the M192 lightweight ground mount (tripod; Appendix C.) (Appendix A provides more information about employment.)

## SECTION IV. PERFORMANCE PROBLEMS AND DESTRUCTION

This section identifies some of the problems that cause the M249 to perform improperly. It also explains how to identify unserviceable parts and how to destroy the M249 when authorized to do so.

### MALFUNCTIONS

1-90. A malfunction occurs when a mechanical failure causes the M249 to fire improperly. Defective ammunition or improper operation by the automatic rifleman is not considered a malfunction. If cleaning and lubricating the weapon fails to fix the problem, then the gunner turns it in to the unit armorer. Table 1-4 shows the types of malfunctions, their probable causes, and corrective actions.

<i>Malfunction</i>	<i>Probable Causes</i>	<i>Corrective Actions</i>
Sluggish operation.	Lack of lubricant.	Lubricate.
	Carbon buildup.	Clean gas regulator, piston, and cylinder.
	Burrs.	Notify unit maintenance.
Runaway weapon or one that fails to cock.	Broken, worn, or burred sear.	Notify unit maintenance.
	Worn sear notch.	Notify unit maintenance.
	Stuck sear.	Notify unit maintenance.
	Short recoil.	Clean and lubricate the bolt and slide assemblies.
	Carbon buildup.	Clean the gas regulator, piston, and cylinder.

**Table 1-4. Malfunctions.**

### STOPPAGES

1-91. A stoppage is any interruption in the cycle of functioning caused by faulty action of the weapon or faulty ammunition.

- Stoppages are classified by their relationship to the cycle of functioning. Table 1-5 shows the types of interruptions or stoppages, their probable causes, and the corrective actions.



<b>Stoppage</b>	<b>Probable Causes</b>	<b>Corrective Actions</b>
Failure to feed.	Insufficient lubrication.	Lubricate as required.
	Defective ammunition link.	Remove and replace ammunition.
	Obstruction in receiver.	Remove obstruction.
	Insufficient gas pressure.	Clean gas regulator, piston, and cylinder.
	Unlatched cover.	Latch cover.
	Long or short rounds.	Align rounds in link belt.
	Inverted link belt.	Reinstall link belt with open end of link facing down.
	Damaged, weak, or worn operating parts.	Notify the unit maintenance.
Failure to fire.	Safety on.	Push safety left to expose red ring.
	Link belt improperly loaded.	Reinstall link belt properly.
	Defective ammunition.	Eject round.
	Faulty ammunition.	Replace ammunition.
	Broken or damaged firing pin.	Notify unit maintenance.
	Broken or weak driving spring.	Notify unit maintenance.
Failure to extract.	Dirty chamber or bolt and slide assembly.	Clean chamber or bolt slide assembly. If problem continues, notify unit maintenance.
	Carbon buildup in gas system.	Clean gas regulator, cylinder, and piston.
	Damaged extractor or spring.	Notify unit maintenance.
Failure to chamber.	Dirty ammunition.	Clean ammunition.
	Carbon buildup in gas cylinder.	Clean gas cylinder.
	Carbon buildup in the receiver.	Clean receiver.
	Damaged round.	Remove round and recock weapon.
	Damaged or weak driving spring.	Notify unit maintenance.
	Dirty chamber.	Clean the chamber.
	Damaged gas regulator.	Notify unit maintenance.
Failure to eject.	Short recoil.	Clean and lubricate the eject bolt and slide assembly. If problem still exists, notify unit maintenance.
	Damaged ejector or spring.	Notify unit maintenance.
	Carbon buildup in the gas system.	Clean the gas regulator, piston, and cylinder.

Table 1-5. Stoppages.

**DANGER****HOT WEAPON**

A "hot" weapon, that is, one through which 200 or more successive rounds have just been fired, can "cook off" a round without any action by the firer.

If a "hot" weapon fails to fire, and you must clear it while the barrel is still hot--

1. Keep the cover closed, get the weapon off your shoulder, and point it downrange.
2. Place the weapon on safe (no red showing).
3. Place the weapon on the ground, still pointed downrange.
4. Before clearing and applying immediate or remedial action, you must first wait--
  - Training situations: 15 minutes.
  - Tactical situations: 5 seconds.

- If *any part* of a round is in the chamber, then before applying immediate or remedial action on a cold or hot gun, first remove the ammunition from the feed tray, then close the cover and try to fire. If the weapon fires, the gunner reloads and continues firing. If it fails to fire, clear the weapon. To do so, use a clearing rod (*only*) and remove the round with the cover closed. Then, inspect the weapon and ammunition.

**IMMEDIATE ACTION**

1-92. The gunner takes immediate action to reduce a stoppage without seeking the cause. For example, the gunner conducts immediate action when a misfire or cook off occurs. The gunner keeps the M249 on his shoulder while performing immediate action procedures. If the M249 stops firing, he takes the following immediate actions.

**DEFINITIONS**

- A ***misfire*** is the failure of a chambered round to fire. Such failure can be due to an ammunition defect or faulty firing mechanism.
- A ***cook off*** is the firing of a round due to the heat of a hot barrel and not to the firing mechanism. Cook offs can be avoided by applying immediate action within 10 seconds of a failure to fire.
- One effective ***memory aid*** is POPP, which stands for *pull, observe, push, and press*:
  - ***Pull*** and lock the cocking handle to the rear while you
  - ***Observe*** the ejection port to see if a cartridge case, belt link, or round ejects. Ensure that the bolt remains to the rear to prevent double feeding if a round or cartridge case is not ejected. If a cartridge case, belt link, or round ejects
  - ***Push*** the cocking handle to its forward position, take aim on the target, and
  - ***Press*** the trigger. If the weapon does not fire, take remedial action. If a cartridge case, belt link, or round fails to eject, take remedial action.

## REMEDIAL ACTION

1-93. Remedial action is taken to determine the cause of a stoppage and restore the weapon to operational condition. The gunner conducts remedial action *only* if immediate action fails to remedy the problem.

## COLD WEAPON

1-94. If immediate action fails to return a cold weapon to operational condition--

- With the weapon still on your shoulder, **grasp** the cocking handle with your right hand, palm up.
- **Pull** the cocking handle to the rear to lock the bolt.
- **Keep** resistance on the cocking handle, put the weapon on safe, and then **return** the cocking handle.
- **Place** the weapon on the ground or away from your face.
- **Open** the feed cover and **perform** the five-point safety check.
- **Reload** and **continue** to fire.
- If the weapon fails to fire, **clear** it, and **inspect** it and the ammunition.

## HOT WEAPON

1-95. A hot weapon is one through which at least 200 rounds have been fired in a 2 minute period, or as noted previously for training.

- **Put** the weapon on safe.
- **Let** it cool for 5 seconds in combat or 15 in training
- **Continue** as you would for a cold weapon.

## JAMMED COCKING HANDLE

1-96. If a stoppage occurs, whether the bolt is fully forward and locked, or only partially forward, and the cocking handle resists your attempts to pull it to the rear, then take the following steps:

- **Try** again to pull the cocking handle *by hand*.

### CAUTION

#### COCKING HANDLE

Ease the cocking handle to the rear. Avoid forcing it, either by hand or using your foot or a heavy object, because doing so could damage the weapon.

- If the weapon is hot enough to cause a cook off, **move** all Soldiers a safe distance from the weapon and **keep** them away for 15 minutes.
- After the gun has cooled, **open** the cover and **disassemble** the gun. **Keep** rearward pressure on the cocking handle until after you and the assistant gunner remove the buffer.

- **Remove** the round or fired cartridge. If needed, **use** the cleaning rod or ruptured cartridge extractor.

1-97. *In training*, after you complete the remedial action procedures, hold off on firing the weapon until after an ordnance specialist has inspected it and said it is good to go.

1-98. *In combat*, after you correct the stoppage, change the barrel and try to fire. If the weapon still fails to function properly, send it to the unit armorer.

## DESTRUCTION PROCEDURES

1-99. Destruction of any military weapon is only authorized as a last resort to prevent enemy capture or use. In combat, the commander may destroy weapons, but must report doing so through channels. The field-expedient means discussed in this paragraph supplement, rather than replace, other published policies:

- **Disassemble** the weapon as completely as time permits.
- **Use** the barrel to destroy the bolt, operating rod group, bipod, sights (rear and front), and receiver.
- **Bury** the disassembled weapon or dump the parts into a stream, sump, or latrine.
- **Burn** the weapon.
- **Find** a place near cover,
- **Lay** the weapon down.
- **Place** an incendiary grenade on the receiver group over the bolt.
- **Let** the feed cover rest on the grenade.
- As soon as you pull the pin, **take** cover.

### DANGER

#### DESTRUCTION OF WEAPON

**Before you use a grenade to destroy a weapon, find some nearby cover.**

**As soon as you pull the pin, take cover.**

## Chapter 2

# M60 Machine Gun

The 7.62-mm M60 machine gun supports the rifleman in both offense and defense. It provides the heavy volume of close and continuous fire that the rifleman needs to accomplish his mission. The M60 can place controlled and accurate fire on targets beyond the ranges of individual weapons. Its long-range, close defensive, and final protective fires form an integral part of a unit's defensive fires. Section I describes the weapon, its components, and its ammunition, and provides other general data about the M60. Section II discusses maintenance; Section III discusses operation and function; and Section IV discusses performance problems and destruction (Section IV).

### SECTION I. DESCRIPTION AND COMPONENTS

This section describes the M60 machine gun, its components and their purposes, its ammunition, and installation and use of its blank firing attachments.

#### DESCRIPTION AND DATA

2-1. The M60 is a gas-operated, air-cooled, belt-fed, automatic machine gun that fires from the open-bolt position (Figure 2-1). Its maximum rate of fire is 550 rounds per minute. Ammunition feeds into the weapon from a 100-round bandoleer with a disintegrating, metallic, split-link belt. A gunner can fire the M60 from the shoulder, hip, or underarm position, or from a bipod or tripod. Table 2-1 shows the general data for the M60.

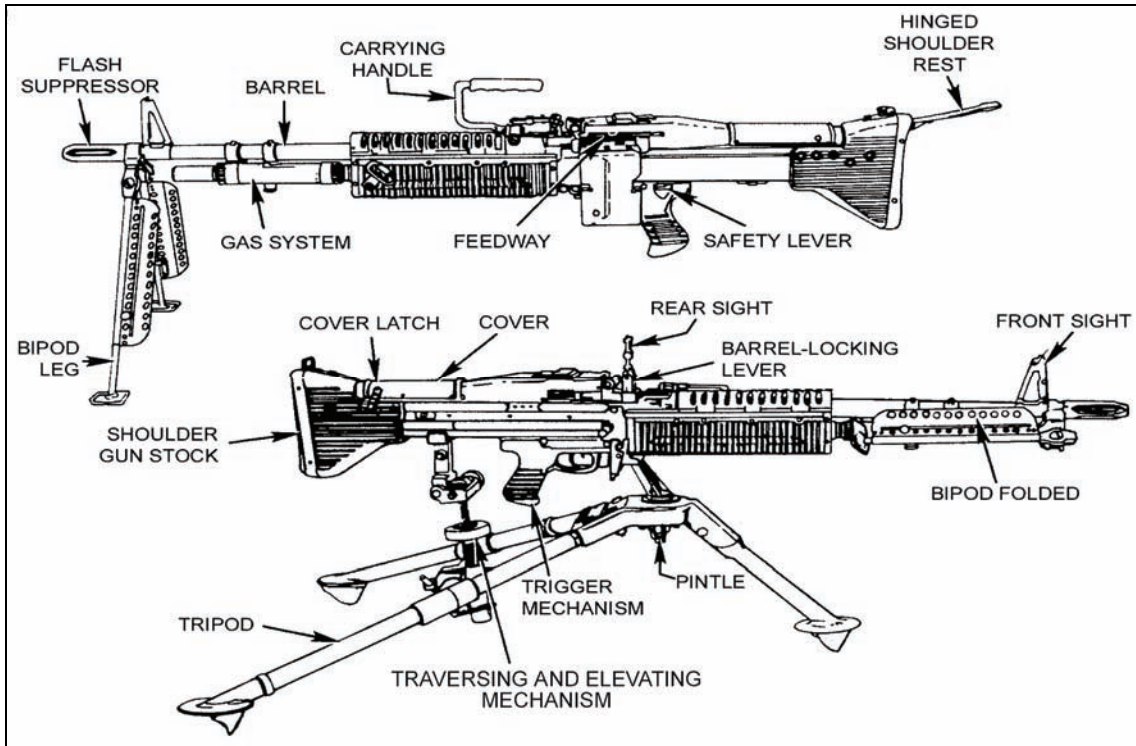


Figure 2-1. M60 machine gun, bipod- and tripod-mounted.

## DANGER

### BARREL SWAPPING

Unless direct-support personnel certify the headspace on both weapons, avoid swapping barrels between weapons. Doing so could destroy the barrel and cause you injury or death.

Length of Weapon .....	43.50 inches
Height of Weapon (on Tripod M122) .....	16.50 inches
Weight:	
M249.....	23.00 pounds
M122 Tripod Mount with T&E, pintle.....	16.00 pounds
Ammunition.....	7.62-mm ball, tracer, blank, and armor piercing. (Armor piercing not authorized for training.)
Rates of Fire:	
Sustained.....	<ul style="list-style-type: none"> <li>• 100 rounds per minute,</li> <li>• Fired in 6- to 9-round bursts,</li> <li>• With 4 to 5 seconds between bursts,</li> <li>• Barrel changed every 10 minutes.</li> </ul>
Rapid .....	<ul style="list-style-type: none"> <li>• 200 rounds per minute,</li> <li>• Fired in 10- to 13-round bursts,</li> <li>• With 2 to 3 seconds between bursts,</li> <li>• Barrel changed every 2 minutes.</li> </ul>
Cyclic.....	<ul style="list-style-type: none"> <li>• 550 rounds per minute,</li> <li>• Fired in a continuous burst,</li> <li>• Barrel changed every minute.</li> </ul>
Basic load.....	600 to 900 rounds for a 3-Soldier crew
Tracer burnout.....	900 meters
Ranges:	
Maximum .....	3,725 meters
Maximum effective.....	1,100 meters (with tripod and T&E)
Maximum for grazing fire over .....	600 meters
Area Target:	
On tripod.....	1,100 mils
On bipod.....	800 mils
Point Target:	
On tripod.....	800 mils
On bipod.....	600 mils
Depression:	
On tripod.....	-200 mils
On bipod.....	-445 mils
Elevation:	
On tripod.....	+200 mils
On bipod.....	+445 mils
Traverse, with T&E mechanism.....	100 mils
Normal sector of fire, with tripod.....	875 mils

Table 2-1. General data.

## COMPONENTS

2-2. Table 2-2 and Figures 2-2 and 2-3 show the major components of the M60 and their purposes. Figures 2-4 and 2-5 show the sights and safety lever.

### SIGHTS

2-3. The front sight is attached to the barrel. The rear sight is mounted on a spring-type dovetail base, and it can be folded down when the gun is moved (Figure 2-1).

### SAFETY LEVER

2-4. The safety lever is on the left side of the trigger group (Figure 2-1). It has “S” (safe) and “F” (fire) positions. When the gun is on safe (“S”), the bolt cannot be pulled to the rear or released to go forward.

<i>Components</i>	<i>Purposes</i>
1. Stock assembly	Provides a shoulder support for aiming and firing the M60. Has a shoulder rest.
2. Buffer assembly	Absorbs recoil from the bolt and operating rod assembly at the end of the recoil movement.
3. Bolt assembly	Powered by propellant gasses and the recoil spring, feeds, chambers, and fires the round, and then extracts the cartridge. Houses the firing pin.
4. Operating rod assembly	Transfers power from propelling gases to the bolt and slide assemblies.
5. Cover, hanger, and feed assembly	Feeds link-belted ammunition. Positions the cartridges for stripping, feeding, and chambering.
6. Barrel assembly	Houses cartridges for firing, directs projectiles, supports fixed front sight, and serves as a passageway for operating gasses. The bipod supports the M60 in the prone position. The telescopic legs adjust to three lengths.
7. Trigger assembly	Controls weapon fire.
8. Forearm assembly	Insulates the gunner's hands from heat. Slotted top allows air to circulate around and cool the barrel.
9. Receiver assembly	Supports all assembly major components and houses the action of the weapon.
10. Rear sight assembly	Adjustable for both windage and elevation, allowing the gunner to make changes rapidly.
11. Cocking handle assembly	Pulls the moving parts rearward. Moves in a guide rail fixed to the right side of the receiver.
12. Tripod (M122) assembly	Along with the T&E mechanism and pintle, provides a stable mount and permits a higher degree of accuracy and control.

**Table 2-2. Components and purposes.**



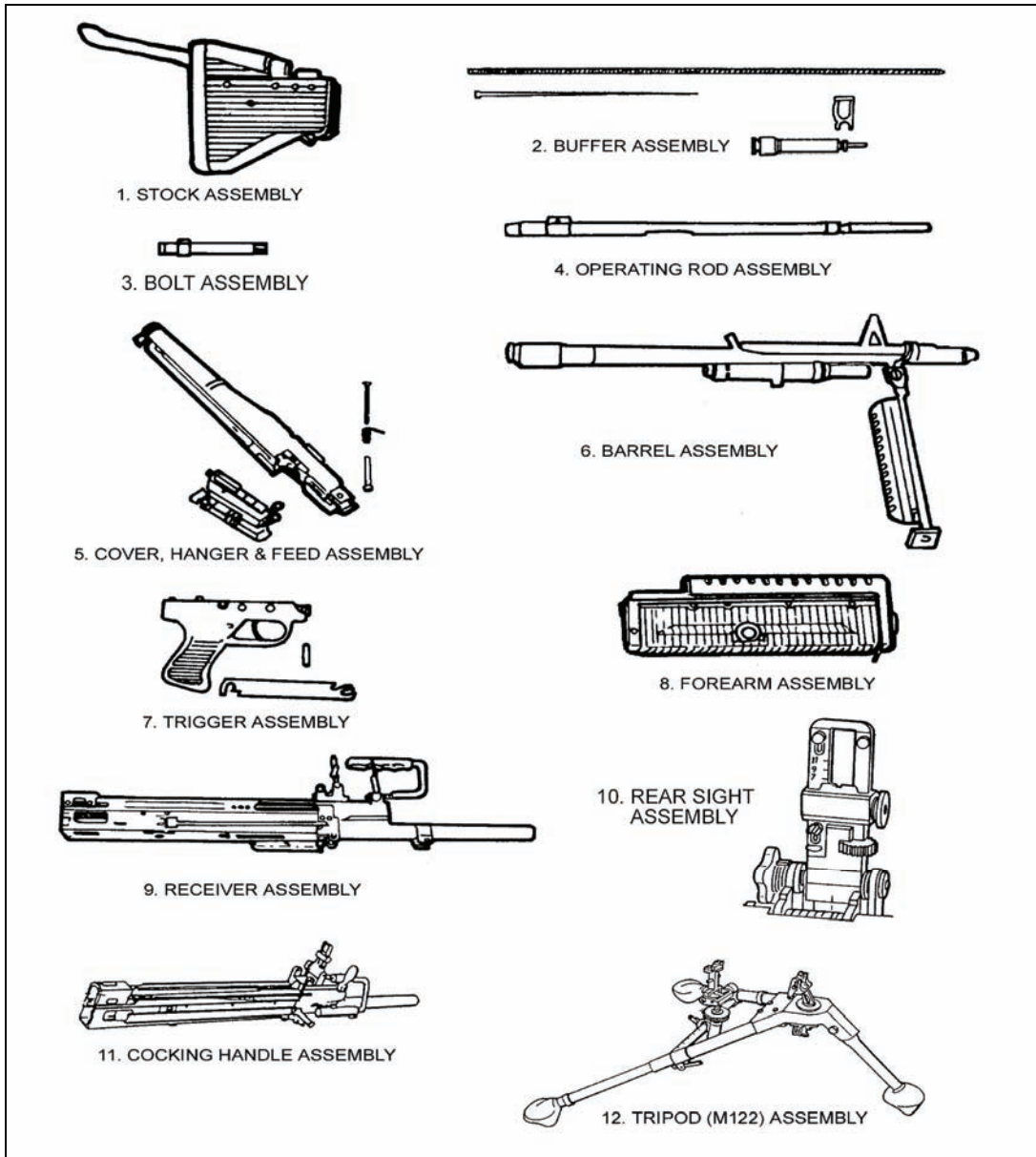


Figure 2-2. M60 and tripod components.

**WARNING**

**COCKING HANDLE AND BOLT POSITIONS**

Push the cocking handle to its forward position each time you pull the bolt to the rear. This prevents damage to the cocking mechanism and injury to the gunner.

## AMMUNITION

2-5. The M60 machine gun uses several different types of 7.62-mm standard military ammunition. Figure 2-3 shows the specific type ammunition and their characteristics. Soldiers must only use authorized ammunition that is manufactured to US and NATO specifications. The ammunition is issued in a disintegrating, metallic, split-link belt (Figure 2-4).

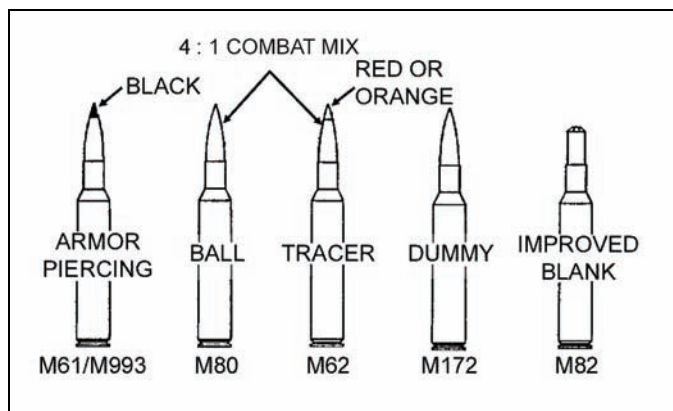


Figure 2-3. Cartridges, 7.62-mm, M60 machine gun.

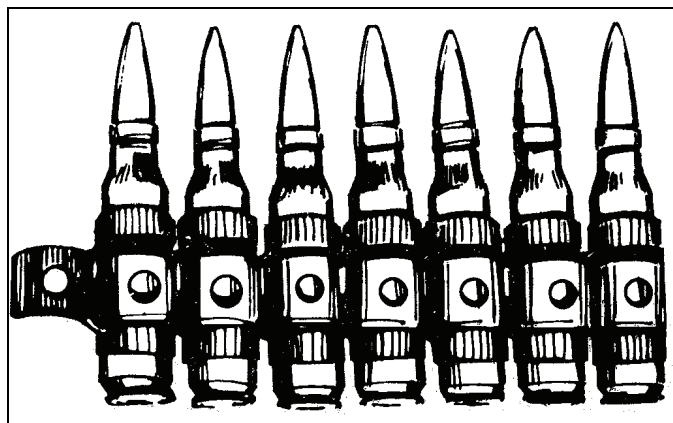


Figure 2-4. Cartridges, 7.62-mm, M60 machine gun, in metallic belt.

### TYPES

2-6. The M60 machine gun uses the following rounds:

#### Cartridge, 7.62-mm Ball M80

2-7. This round is used for--

- Training--range
- Combat--Light materials and personnel.

**Cartridge, 7.62-mm Armor-Piercing M61**

2-8. Used for lightly armored targets.

**Cartridge, 7.62-mm Tracer M62**

2-9. Mixed with ball ammunition in a ratio of four ball rounds to one tracer round and used for--

- Observation of fire.
- Incendiary effects.
- Signals.
- Training.

**Cartridge, 7.62-mm Dummy M63**

2-10. Used for mechanical training.

**Cartridge, 7.62-mm Blank M82**

2-11. Used in training to simulate live fire. Used with a blank firing attachment.

**STORAGE**

2-12. All M60 ammunition is stored under cover.

- If you must keep ammunition in the open, then keep it at least 6 inches aboveground and cover it with a double thickness of tarpaulin.
- Ensure that the cover protects the ammunition, but allows ventilation.
- Dig trenches to divert water away from the ammunition.

**CARE, HANDLING, AND PRESERVATION**

2-13. The gunner should leave ammunition in its airtight containers until he is ready to use it. Removing it could cause it to corrode, especially in damp climates.

2-14. He protects ammunition from mud, dirt, and moisture. If ammunition gets wet or dirty, he wipes it off before use. If he finds light corrosion on the ammunition, he immediately wipes off the corrosion, using the lightest possible pressure. He turns in heavily corroded, dented, or loose projectiles.

- Protect ammunition from the direct rays of the sun, also. Excessive pressure from the heat can cause premature detonation.
- Avoid using oil on ammunition, because it collects dust and other abrasives that could damage the operating parts of the weapon.

**PACKAGING**

2-15. The ammunition box contains two cartons. Each carton has a bandoleer for carrying purposes. Each carton contains 100 rounds and weighs about 7 pounds. Ammunition in the bandoleers may be linked

together, attached to the hanger assembly, and fired from the container; or, the gunner may remove the bandoleers for firing.

## BLANK FIRING ATTACHMENTS M13 AND M13A1

2-16. The gunner uses the M13 BFA on the M60 machine gun in training where live fire is impractical. An improved model, the M13A1 BFA, is also available for the M60. The gunner can tighten the restrictor tube on the M13A1 (using a flat tip screwdriver) for a more secure fit to prevent gas leakage.

### **DANGER**

#### **BLANK AMMUNITION**

**Avoid firing blank ammunition at anyone within 20 feet of you, because fragments of a closure wad or particles of unburned propellant could cause them injury or death.**

## INSTALLATION OF THE M13

2-17. Fasten and adjust the BFA to fit the machine gun barrel. The orifice tube slips inside the flash suppressor and snugly against the muzzle to keep gasses from escaping during fire. Using the wing nut, tightly clamp the BFA to the front sight (Figure 2-5). During manufacture, the distance the orifice tube screws into the restrictor bushing is fixed and fitted by *staking* the restrictor bushing. This fixed distance works for some tubes, but others require adjustment to work properly. The distances between the muzzles and the forward ends of the flash suppressors vary. To compensate for this, the gunner might have to break the stake mark in the restrictor bushing, adjust the tube, and then restake the restrictor bushing.

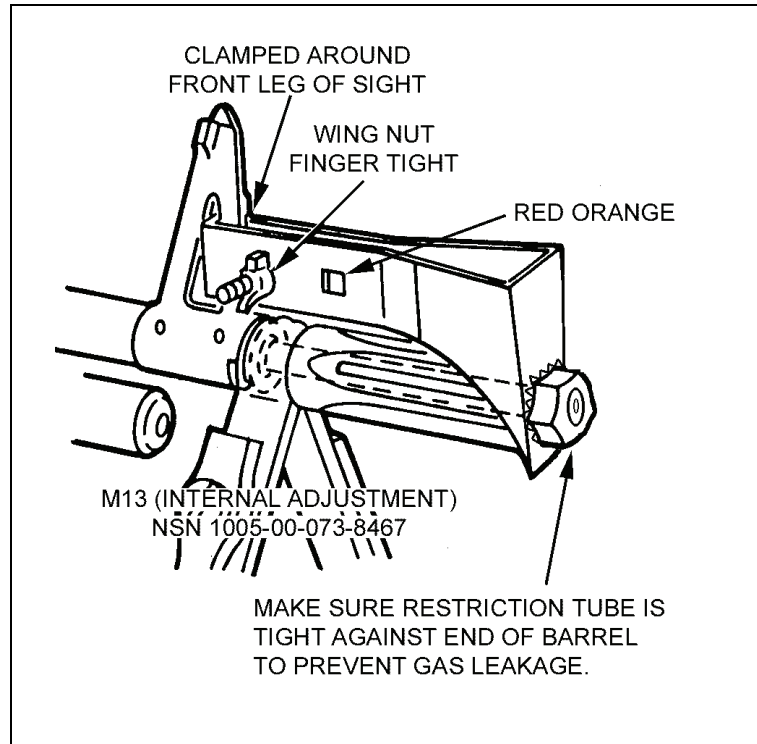


Figure 2-5. Blank firing attachment, M13.

### INSTALLATION OF THE M13A1

2-18. The gunner installs the M13A1 by loosening the lock nut (Figure 2-6), and then by turning the restrictor tube out and loosening the wing nut a few turns each. He inserts the restrictor tube in the flash suppressor as far as possible, and clamps it around the front sight. He hand tightens the wing nut. He screws in the restrictor tube until it seats tightly against the muzzle end of the barrel to prevent gas leakage, and then he tightens the lock nut.

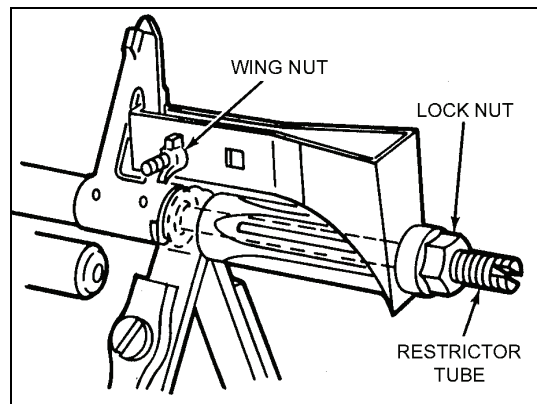


Figure 2-6. Blank firing attachment, M13A1.

## CARE OF THE M60 WHILE USING THE BFA

2-19. A buildup of carbon inside the weapon causes friction between the moving parts. Carbon deposits build rapidly when the gunner fires blanks. Stoppages occur when these deposits grow too large. Therefore, you must keep the weapon clean, especially the gas system and chamber, during blank firing. For the best performance with a BFA--

- Inspect the weapon before firing for damaged parts, excessive wear, cleanliness, and proper lubrication.
- Before attaching the BFA, test fire the weapon using ball ammunition, when feasible.
- Adjust the BFA to fit the weapon.
- Apply immediate action when stoppages occur.
- Clean the weapon including barrel assembly, gas cylinder, gas piston, gas port, chamber bore, and BFA.
- Clean and lubricate the entire weapon after 1,000 rounds.

### **DANGER**

#### **BLANK AMMUNITION**

**When the blank firing attachment is in place, load only blank ammunition.**

**Avoid firing at anyone within 20 feet of you, because doing so could cause injury or death.**

## **SECTION II. MAINTENANCE**

Proper maintenance contributes to weapon effectiveness as well as unit readiness. Maintenance of the M60 includes inspection; cleaning and lubrication; as well as maintenance before, during, and after firing, and in CBRN conditions. This section discusses maintenance tasks, including clearing, general assembly and disassembly, and function checks, in detail.

### **CLEARING PROCEDURES**

2-20. The first step in maintenance is to clear the weapon. This applies in all situations, not just after firing. The gunner must always assume the M60 is loaded. To clear the M60, the gunner performs the following procedures (Figure 2-7).

- Move the safety lever to the “F” position.
- With your right hand, palm up, pull the cocking handle in the rear. Move the safety lever to the “S” position. Return and lock the cocking handle in the forward position.
- Raise the cover and conduct a *four-point safety check* for brass, links, or ammunition.
  - Check the feed pawl assembly under the cover.
  - Check the feed tray.
  - Lift the feed tray and hanger assembly and inspect the chamber.
  - Check the space between the face of the bolt and the chamber.
- Close the cover and move the safety lever to the “F” position. Pull the cocking handle to the rear position. Pull the trigger and at the same time ease the bolt forward by manually riding the cocking handle forward.

- Place the safety lever on “S” and raise the cover. (If not disassembling the gun, keep the cover down.)

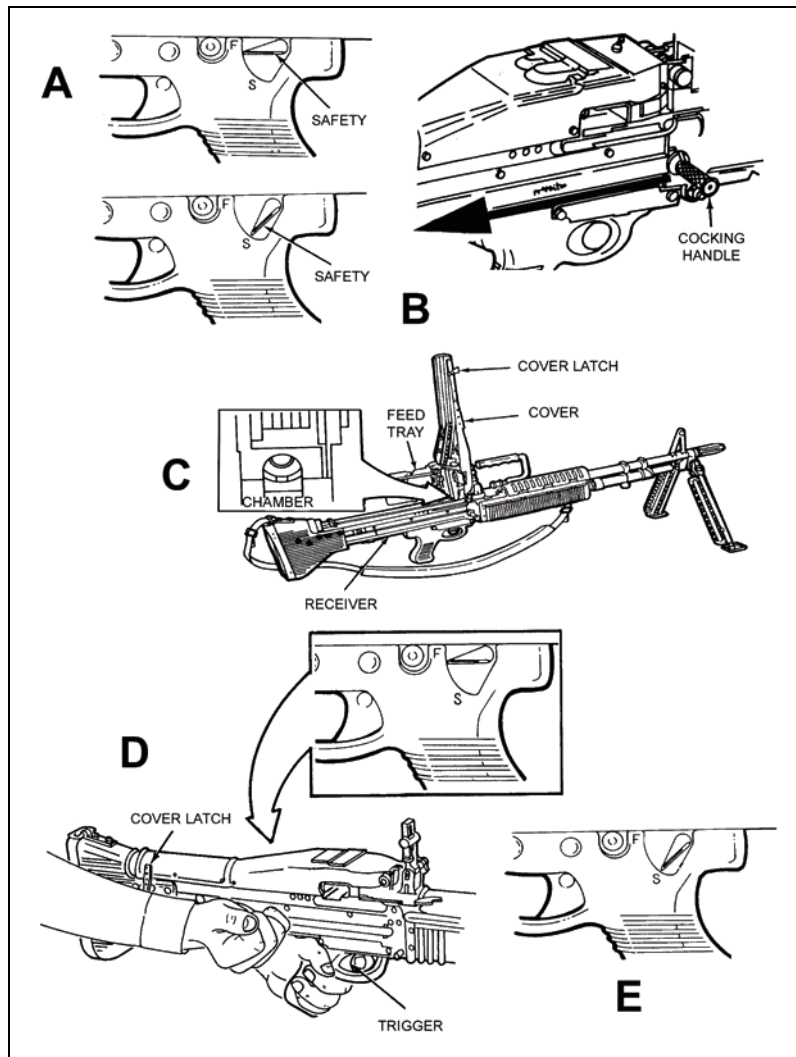


Figure 2-7. Clearing procedures.

### CAUTION

#### BOLT POSITION

Each time you pull the bolt to the rear, return the cocking handle manually to the forward and locked position. Failure to do this could result in damage to the weapon.

## GENERAL DISASSEMBLY

2-21. The gunner performs general disassembly, which is removing and replacing the eight major groups (Figure 2-8). (The unit armorer performs the detailed disassembly. Disassembly beyond this point is

prohibited except by ordnance personnel.) During general disassembly, the gunner clears the weapon and places each part on a clean flat surface such as a table or mat. This aids in assembly in reverse order and avoids the loss of parts.

**DANGER**  
**BOLT POSITION**  
Be sure the bolt is in the forward position before disassembly.  
If you retract the operating rod spring with the bolt pulled to the rear, the spring guide can cause you to suffer injury or death.

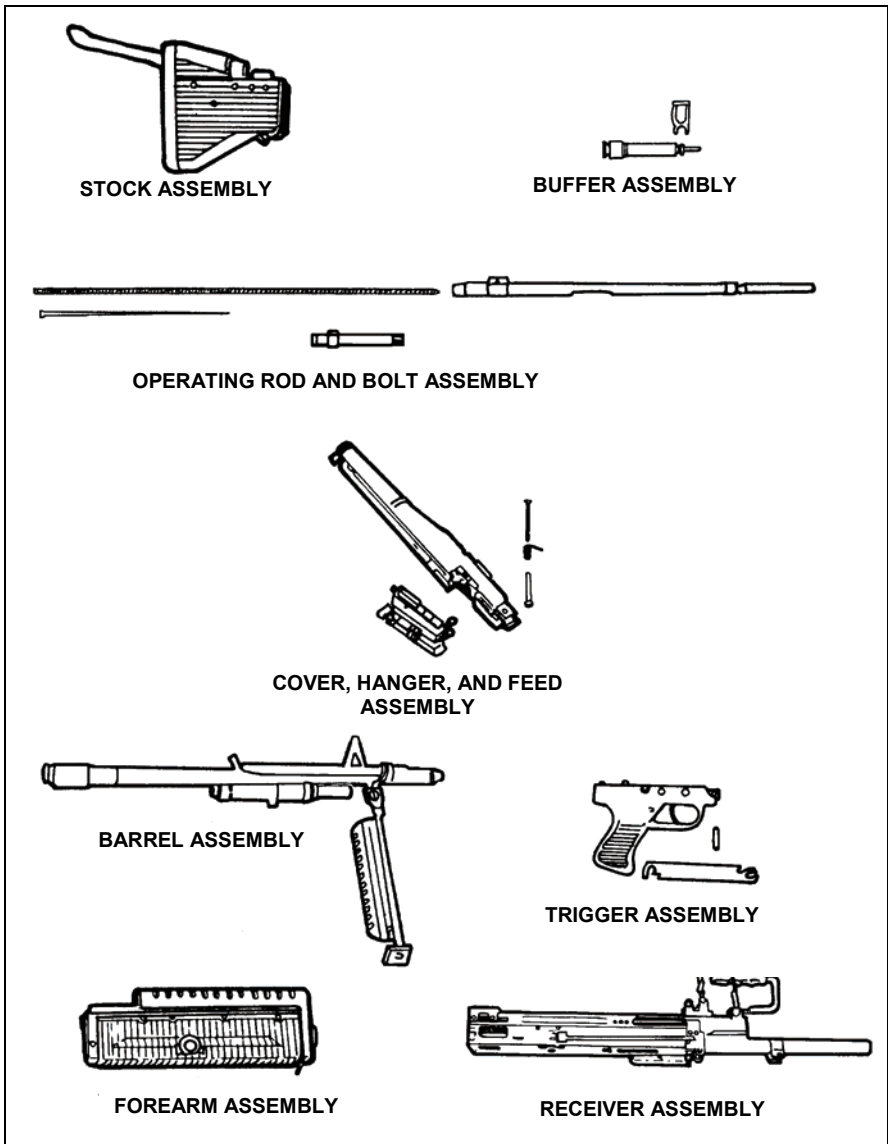


Figure 2-8. Eight major assemblies of the M60 machine gun.



## REMOVAL OF THE STOCK ASSEMBLY

2-22. Ensure that the bolt is forward. To remove the stock, raise the shoulder rest and insert a cleaning rod into the hole to release the latch. Pull the shoulder stock from the receiver, turn the latch lever, and open the cover (Figure 2-9).

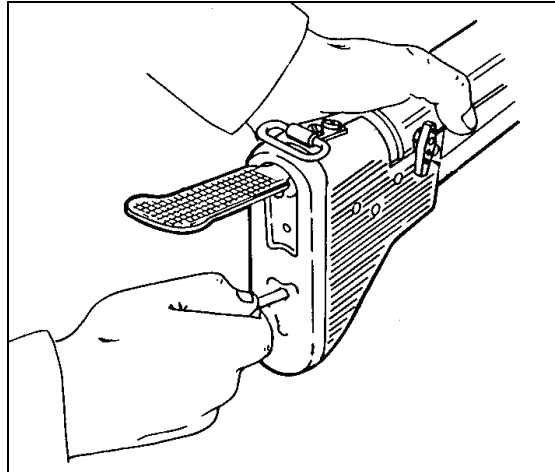


Figure 2-9. Removal of the stock.

## REMOVAL OF THE BUFFER, OPERATING ROD, AND BOLT ASSEMBLIES

2-23. To remove the buffer assembly--

- Apply slight palm pressure to the rear of the hydraulic buffer assembly.
- To remove the yoke from the receiver, reach inside the receiver and pull up and out on the yoke.
- Reach into the back of the receiver and pull out the guide rod and drive spring (Figure 2-10).
- Remove the operating rod assembly and bolt assembly as a unit.
- Reach in the top of the receiver, place a finger on the face of the bolt, and push rearward until the bolt and operating rod assemblies extend past the rear of the receiver.
- Pull them out as a unit.
- To separate the bolt from the operating rod, place the operating rod in your left hand and, with your right hand, pull the bolt down and away.

**WARNING**

**BOLT ASSEMBLY**

Be careful when handling the bolt assembly; it is under spring tension, so it can twist and hurt your hand.

**CAUTION**

**USE OF DRIVING SPRING GUIDE ASSEMBLY AS A TOOL**

Using the tip of the driving spring guide assembly as a tool could damage the weapon.

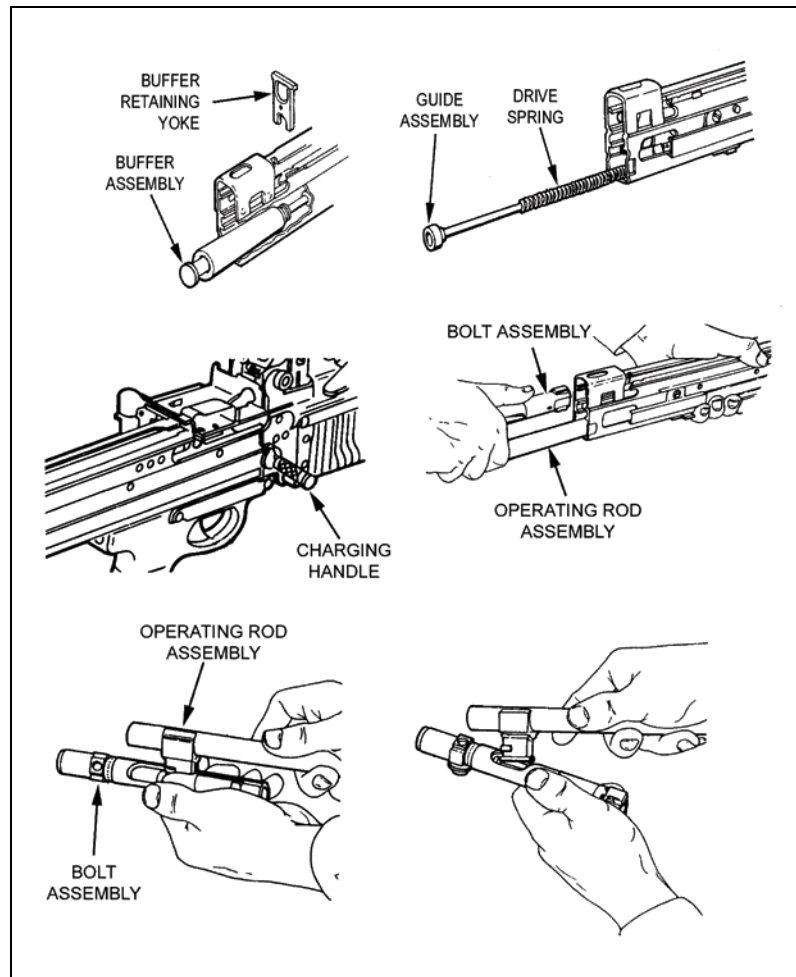
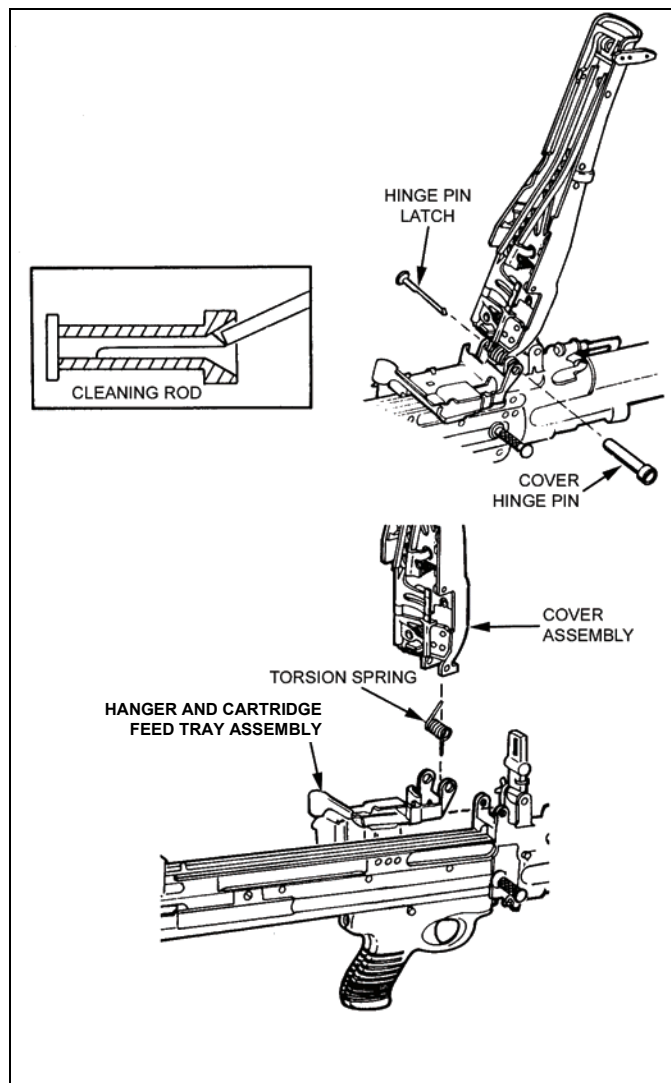


Figure 2-10. Removal of the buffer, operating rod, and bolt assemblies.

**REMOVAL OF THE COVER, HANGER AND CARTRIDGE FEED TRAY ASSEMBLIES**

2-24. To remove these parts--

- Use a cleaning rod to unlatch the hook of the hinge pin latch.
- Remove the hinge pin latch and cover hinge pin.
- Remove the cover assembly, torsion spring, and hanger and cartridge feed tray assembly (Figure 2-11).



**Figure 2-11. Removal of the cover, hanger, and cartridge feed tray assemblies.**

**REMOVAL OF THE BARREL ASSEMBLY**

2-25. Push in the spring detent, raise the barrel lock, and remove the barrel assembly (Figure 2-12).

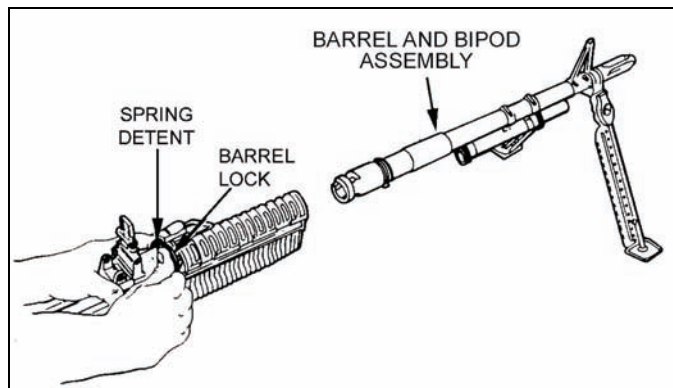


Figure 2-12. Removal of the barrel assembly.

### REMOVAL OF THE TRIGGER MECHANISM GRIP ASSEMBLY

2-26. Push in and remove the flat leaf spring. Push out the *front pin* and slide the trigger mechanism grip assembly slightly forward, and then pull it out to remove it (Figure 2-13).

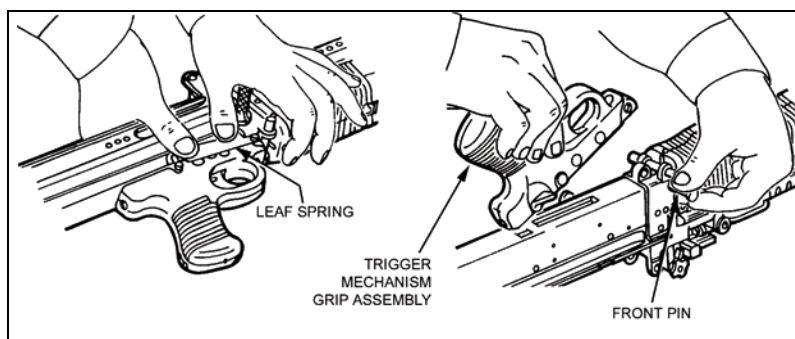


Figure 2-13. Removal of the trigger mechanism grip assembly.

### REMOVAL OF THE FOREARM ASSEMBLY

2-27. Insert a cleaning rod or the reamer portion of a combination wrench through the round opening in the forearm assembly, and then push down on the spring. Lift and gently slide the forearm assembly from the receiver (Figure 2-14).

**CAUTION****USE OF DRIVING SPRING GUIDE ASSEMBLY AS A TOOL**

Using the tip of the driving spring guide assembly as a tool could damage the weapon.

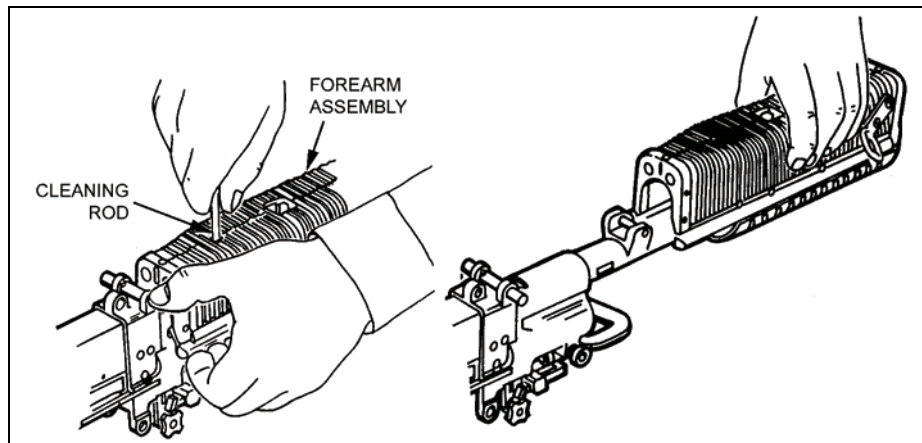


Figure 2-14. Removal of the forearm assembly.

**REMOVAL OF THE RECEIVER ASSEMBLY**

2-28. Once the gunner removes the forearm assembly, the only remaining part is the receiver assembly. Once he removes this, he is done with the general disassembly.

**INSPECTION**

2-29. The gunner begins inspection by disassembling the weapon into its major groups. Shiny surfaces are acceptable. The gunner inspects each area of the weapon and related equipment for the conditions indicated. The gunner should repair or replace any broken or missing parts IAW TM 9-1005-224-10. He performs preventive maintenance checks and services (PMCS) every 90 days. If he has not used the weapon in 90 days, he should perform the PMCS in the operator's manual, regardless. If he sees rust on a weapon, he should perform PMCS immediately.

**STOCK ASSEMBLY**

2-30. The stock assembly should not be cracked and must fit securely on the receiver assembly. The shoulder rest and latch lever should function correctly.

**BUFFER ASSEMBLY**

2-31. The buffer yoke and recess should not be burred, cracked, or bent. The buffer plunger must fit easily into the recess in the spring guide.

### **OPERATING ROD ASSEMBLY**

2-32. The operating rod, yoke, sear notch, and pins should not have burrs, cracks, or chips. The roller should operate freely. The driving spring should have tension and should not have kinks, breaks, or wear. The guide assembly stop should be tight. If it is loose, the gunner notifies unit maintenance.

### **BOLT ASSEMBLY**

2-33. The gunner checks the bolt assembly for burrs or cracks, especially in the locking lug area.

- The roller should operate freely and remain intact (no cracks).
- The spring should be straight and evenly coiled, rather than kinked.
- The threads on the bolt plug assembly and in the breech bolt should be intact.

### **COVER ASSEMBLY**

2-34. The gunner checks the cover assembly for burrs, cracks, looseness, or missing parts. He also checks the spring action of the front and rear cartridge guides, feed pawls (beneath the cartridge guides), and feed cam assembly. The feed cam assembly should be secure and operate freely.

### **HANGER AND CARTRIDGE FEED TRAY ASSEMBLY**

2-35. The gunner checks the hanger and cartridge feed tray assembly for burrs, cracks, and missing or loose parts. The feed tray should fit on the receiver, and the cartridge-retaining pawl should work properly. The gunner also checks the hanger for obstructions.

### **BARREL ASSEMBLY**

2-36. The gunner checks the barrel assembly for burrs, cracks, and wear, especially in the barrel socket area. He checks the sight and flash suppressor to ensure that they are tight. The bipod should work properly, the legs should be straight, and connections should be tight. The bipod plungers should operate smoothly.

### **TRIGGER MECHANISM GRIP ASSEMBLY**

2-37. The gunner checks the sear for chips, cracks, or signs of wear. He also checks the sear plunger and spring for wear.

### **FOREARM ASSEMBLY**

2-38. The gunner checks the forearm assembly for damage.

### **RECEIVER ASSEMBLY**

2-39. The gunner checks the receiver rails for burrs and wear. The cocking handle should move freely.

**M122 MOUNT**

2-40. The T&E mechanism should not bind. The numbers on the scales and dials must be legible.

- The gunner must hear distinct clicks when he turns the handwheels. He calibrates the index lines to the indicator.
- The pintle should fit snugly in the pintle bushing, and the pintle lock should hold the pintle securely.
- The sleeve latch should function properly, and the traversing bar should be tight when the tripod legs are extended and latched.

**CARRYING CASE**

2-41. All maintenance tools and equipment should be complete and serviceable. The case should be serviceable. To preserve waterproofing and avoid shrinkage, the gunner should wash the case only occasionally.

**CLEANING AND LUBRICATING PROCEDURES AND PREVENTIVE MAINTENANCE**

2-42. The gunner must clean the M60 machine gun immediately after firing it. Before cleaning it, he disassembles it into its major groups. He uses a bore-cleaning patch soaked in CLP to clean all metal components and surfaces that have been exposed to powder fouling. He also uses CLP on the bristles of the receiver brush when he cleans the receiver. After he has cleaned the M60 and wiped it dry, he rubs on a thin layer of CLP with a cloth. This lubricates and preserves the exposed metal parts in normal temperatures.

**CAUTION****CLEANER, LUBRICANT, PRESERVATIVE**

When cleaning the weapon, keep CLP out of the gas cylinder by turning the barrel upside down.

- The gunner removes and cleans the components of the gas cylinder only when inspection shows that the piston fails to move within the cylinder, or when the barrel is tilted upside down. Unit maintenance personnel must supervise disassembly of the gas system. The gunner may use the receiver brush and the swab-holding section of the cleaning rod to clean inside the gas cylinder. When he uses CLP, he must wipe the gas cylinder and gas piston dry before assembly. After assembling the weapon, the gunner checks the piston to ensure it moves freely. The unit armorer must replace safety wire. The gunner cleans the rest of the weapon as follows:
  - Cleans the bore using CLP and a bore brush attached to a cleaning rod. Pushes the bore brush completely through the bore before returning it back through. This prevents the brush from scratching the bore.
  - Runs the brush through the bore several times, until he has removed most of the powder fouling and other foreign matter.
  - Swabs the bore several times using a cleaning rod and a swab wet with CLP.
  - Swabs the bore several times using a cleaning rod and dry swab.
  - Cleans the chamber using CLP and a chamber brush attached to a cleaning rod.

- Runs the brush through the chamber several times until he has removed most of the powder fouling and other foreign matter.
- Swabs the chamber several times using a cleaning rod and a swab wet with CLP.
- Swabs the chamber several times using a cleaning rod and dry swab.
- Cleans the receiver using a receiver brush and CLP.
- Brushes the receiver until he has removed most of the powder fouling and other foreign matter.
- Swabs the receiver several times using a cleaning rod section and a swab wet with CLP.
- Swabs the receiver several times using a cleaning rod section and dry swab.
- Wipes all the parts of the weapon, except those that are rubber coated, with a rag wet with CLP.
- Dries completely all parts cleaned with CLP.
- Lubricates the following moving parts with CLP as instructed:

### ***Barrel Assembly***

2-43. The gunner lubricates the camming surfaces of the bolt-locking lugs.

### ***Operating Rod Assembly***

2-44. The gunner lubricates the rollers and the surfaces just below the yoke that ride within the receiver rails.

### ***Cover Assembly***

2-45. The gunner lubricates inside the feed cam assembly.

### ***Bolt Assembly***

2-46. The gunner lubricates the bolt locking lugs and cam actuator roller, and inside the camming recess (for the operating rod). After lubricating, he cycles the components by hand to spread the CLP. Weapons fired infrequently or stored for prolonged periods should have a light film of CLP applied to the interior of the gas cylinder and the gas piston immediately after cleaning or inspection. He performs preventive maintenance every 90 days, unless inspection reveals more frequent servicing is necessary. The use of the lubricant does not eliminate the requirement for cleaning and inspecting to ensure that corrosion has not formed. Before the weapon is used, the gas system and components must be clean and free of oil and lubricants. The gunner wipes down all exposed surfaces of the M122 tripod, pintle assembly, and T&E mechanism with a clean rag. For stubborn areas with hard-to-remove dirt, he uses a steel brush or bore brush to loosen the particles. Then, he uses a clean rag to wipe them down and CLP to lubricate them. To clean and lubricate the M60 in unusual conditions--

### ***Below 0 Degrees Fahrenheit***

2-47. Use lubricating oil, arctic weather (LAW). Oil lightly to prevent the weapon from freezing up.

### ***Extreme Heat***

2-48. Use a light coat of CLP.

### ***Damp or Salty Air***

2-49. Use CLP. Clean and apply frequently.



*Sandy or Dusty Areas*

2-50. Use CLP. Clean and apply frequently. Wipe with a rag after each application to remove excess.

**GENERAL ASSEMBLY**

2-51. After cleaning, lubricating, and inspecting the weapon, the gunner reassembles it in the reverse order of disassembly.

**CAUTION****FOREARM ASSEMBLY RIBS**

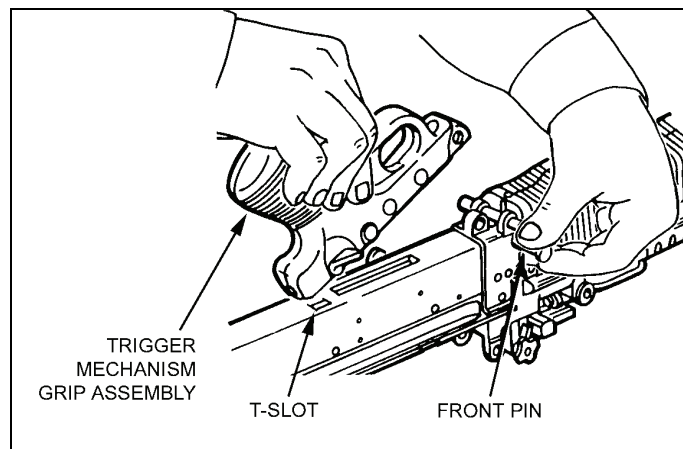
When installing the forearm assembly, avoid damaging the internal ribs.

**REPLACEMENT OF RECEIVER ASSEMBLY AND FOREARM ASSEMBLY**

2-52. To replace the forearm assembly, the gunner slides it onto the receiver. He presses in on the bottom of forearm assembly to latch it. He shakes the forearm assembly up and down to ensure it is seated.

**REPLACEMENT OF THE TRIGGER MECHANISM GRIP ASSEMBLY**

2-53. To replace the trigger mechanism grip assembly, the gunner positions it on the bottom of the receiver, aligns it with the T-slot, and installs the front pin from the left side. He slides the slotted end of the flat leaf spring on the front pin. (The hooked end of the flat leaf spring should bend outward.) He pushes down and slides the hooked end of the flat leaf spring onto the grooved pin (Figure 2-15).



**Figure 2-15. Replacement of the trigger mechanism grip assembly.**

**REPLACEMENT OF THE BARREL ASSEMBLY**

2-54. To replace the barrel assembly, the gunner ensures that the barrel lock is up (unlocked) before inserting the barrel in the forearm assembly. To relock the barrel, he pushes the barrel lock down. Then, he lifts the barrel up by the bipod and shakes it, to ensure that it seats.

### **REPLACEMENT OF THE COVER, HANGER AND CARTRIDGE FEED TRAY ASSEMBLY**

2-55. The gunner positions the hanger and cartridge feed tray assembly on the receiver. He installs the torsion spring and cover assembly, and then he ensures that the ends of the torsion spring stick in the holes of the cover and receiver. (He inserts the hinge pin from right to left.) He applies slight pressure to align the torsion spring, and then he inserts the cover hinge pin. He installs the hinge pin latch through the hinge pin until it locks. He keeps the cover assembly open until he has finished assembling the machine gun.

### **REPLACEMENT OF THE BOLT ASSEMBLY, OPERATING ROD ASSEMBLY, AND BUFFER ASSEMBLY**

2-56. The gunner places the yoke of the operating rod assembly against the spool of the firing pin in the slot of the bolt assembly (Figure 2-16). Then, he pushes the spool forward. He seats the yoke between the spools of the firing pin, and lets the yoke slide back in the bolt assembly, then he--

- Slides the operating rod assembly with the bolt assembly into the weapon.
- Turns the bolt assembly to align the stripping lugs with the upper rails; pushes in on the bolt assembly until the stripping lugs engage the rails.
- Turns the roller straight up, and then pushes the bolt and operating rod assemblies into the weapon as a unit.
- Pulls the trigger and holds it while pushing the bolt assembly into the receiver until it locks in place.
- Installs the drive spring and guide assembly in the rear of the receiver.
- Inserts the buffer assembly against the end of the guide assembly and pushes. Continues pushing until the groove on the buffer assembly aligns with the slot for the buffer retaining yoke. Inserts the buffer retaining yoke.

### **REPLACEMENT OF THE STOCK**

2-57. The gunner positions the stock on the rear of the receiver and pushes until it snaps in place. He pulls the cocking handle to the rear to lock the bolt assembly to the rear, and then he places the safety on "S." He closes the cover. While holding the charging handle, he pulls the trigger and eases the charging handle forward.

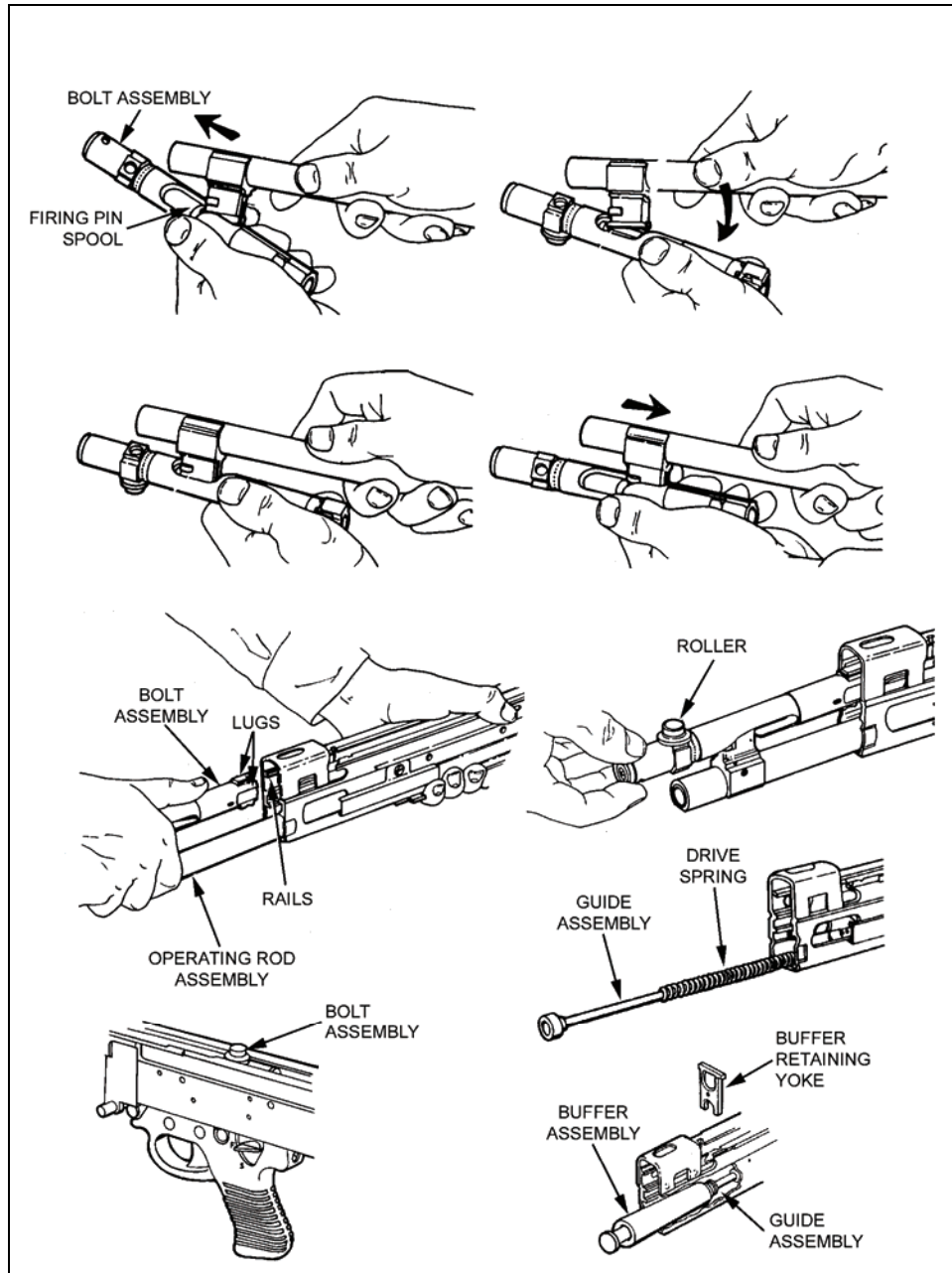


Figure 2-16. Replacement of the bolt assembly, operating rod assembly, and buffer assembly.

## FUNCTION CHECK

2-58. The gunner must perform a function check to ensure that the M60 is correctly assembled. The procedures follow:

- Open the cover and pull the cocking handle to the rear.
- Place the safety on "S" position.
- Return the cocking handle to the forward position.
- Close the feed tray cover.

- Place the safety on “F” position.
- Grasp the cocking handle with the right hand, pull the trigger with the left hand, and ease the bolt forward.

## **MAINTENANCE PROCEDURES**

2-59. To maintain the M60 properly, the gunner must do the following. (Section IV discusses immediate and remedial action):

- Before firing—
  - Wipe the bore dry.
  - Inspect the weapon in accordance with its operator's technical manual.
  - Inspect the spare barrel.
  - Lubricate the weapon.
- While firing—
  - To lengthen barrel life, change barrels based on rate of fire.
  - Periodically inspect the weapon to ensure that it is properly lubricated.
  - When malfunctions or stoppages occur, take immediate or remedial action.
- After firing—
  - Clear and clean the weapon immediately.
  - Every 90 days during inactivity, clean and lubricate the weapon unless inspection reveals more frequent servicing is necessary (TM 9-1005-224-10).

## **MAINTENANCE IN CHEMICAL, BIOLOGICAL, RADIOLOGICAL, OR NUCLEAR CONDITIONS**

2-60. If the M60 machine gun is contaminated by chemical, biological, or radiological (nuclear) agents, the gunner takes appropriate action. He first reduces his exposure and that of his weapon, and then he reduces the penetration of the contaminant on and in the weapon:

### **CHEMICAL**

2-61. Cleans weapon with towelettes from the M258A1 kit or washes the weapon with soap and water.

### **BIOLOGICAL**

2-62. Wipes weapon with towelettes or washes it with soap and water.

### **RADIOLOGICAL OR NUCLEAR**

2-63. Wipes weapon with warm soapy water, if available. If not, uses towelettes or rags. (FM 3-5 provides more detail about this.)

## SECTION III. OPERATION AND FUNCTION

This section covers operation of the M60 (loading, firing, unloading, sight adjustment, use of bipod and tripod and vehicular mounts) and its cycle of functioning.

### OPERATION

2-64. The gunner loads, fires, unloads, and clears the M60 machine gun from the open-bolt position. Before pulling the bolt to the rear, he must place the weapon on "F." Before firing the M60, he joins belted ammunition with a double link at the open end of the bandoleer. The weapon must be free of dirt and corrosion.

### LOADING PROCEDURES

2-65. The gunner ensures that the weapon is clear and places the safety on "F," then he--

- With his palm up, pulls the cocking handle to the rear, and then he pushes it forward until it locks.
- With the bolt to the rear, places the safety on "S," and then manually returns the cocking handle to the forward position.
- Turns the latch lever and opens the cover.
- Raises the cartridge feed tray and places the bandoleer on the bandoleer hanger.
- Places the first round of the belt in the feed groove, with the double link first and the open side of the links down.
- Ensures that the round remains in the feed groove.
- While closing the cover, holds the belt up (about six rounds from the loading end; Figure 2-17).

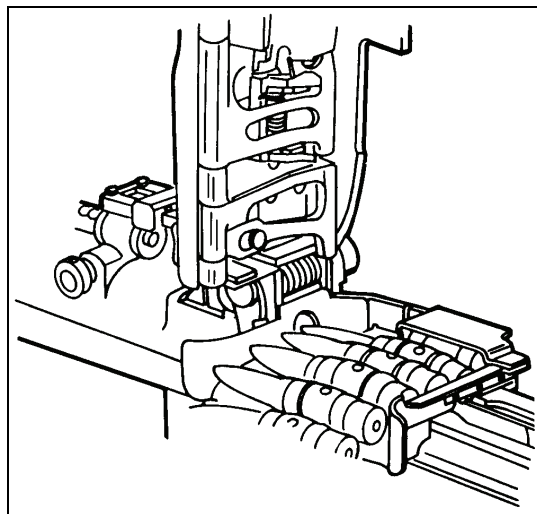


Figure 2-17. Loading of the M60.

### UNLOADING PROCEDURES

2-66. The gunner unloads the M60 by pulling and locking the bolt to the rear. He places the safety lever on "S," raises the cover and tray, and removes any ammunition or links from the tray. He performs the *four-point safety check* (Section II).

## CYCLE OF FUNCTIONING

2-67. The M60 gunners can recognize and correct stoppages when they know how the weapon functions. The weapon functions automatically as long as ammunition feeds into it and the gunner holds the trigger to the rear. Each time the gunner fires a round, the parts of the weapon function in a cycle or sequence. Many of the actions occur at the same time. These actions are separated in this manual only for instructional purposes. The gunner places the first round of the belt in the tray groove to start the cycle. Then he pulls the trigger, releasing the sear from the sear notch (the rear of the sear lowers and disengages from the sear notch). This allows the operating rod spring to expand and drive the operating rod and bolt forward. The cycle stops when the gunner releases the trigger and the sear reengages the sear notch on the operating rod.

### FEEDING

2-68. As the bolt starts its forward movement, the feed cam is forced to the right, causing the feed cam lever to turn in the opposite direction and forcing the belt feed pawl over the next round in the bolt. The next round is then ready to be placed into the tray groove when the rearward action occurs again. As the bolt moves to the rear after firing, the cam roller forces the feed cam to the left. The feed cam lever is forced to turn, which moves the feed pawl to the right and places a round in the tray groove.

### CHAMBERING

2-69. As the bolt travels forward, the upper locking lug engages the rim of the round. The pressure of the front and rear cartridge guides holds the round so that positive contact is made with the upper locking lug of the bolt. The front cartridge guide prevents forward movement of the link as the round is stripped from the belt. The upper locking lug carries the round forward. The chambering ramp causes the nose of the round to be cammed downward into the chamber. When the round seats fully in the chamber, the extractor snaps over the rim of the round, and the ejector on the rail inside the receiver is depressed.

### LOCKING

2-70. As the round chambers, the bolt enters the barrel socket. The upper and lower locking lugs contact the bolt camming surfaces inside the barrel and start turning the bolt clockwise. The action of the operating rod yoke against the bolt camming slot as the operating rod continues forward turns the bolt, completing its 90-degree (one-quarter turn) clockwise rotation. Locking is now complete.

### FIRING

2-71. After the bolt is fully forward and locked, the operating rod continues to go forward, independent of the bolt, for a short distance. The yoke, engaged between the firing pin spools, carries the firing pin through the face of the bolt. The firing pin strikes the primer of the round and the primer fires the round.

### UNLOCKING

2-72. After the round is fired and the bullet passes the gas port, part of the expanding gases go into the gas regulator through the gas plug. The rapidly expanding gases enter the hollow gas piston, forcing the piston to the rear. As the operating rod continues to the rear, the operating rod yoke acts against the bolt camming slot. This causes the bolt to begin its counterclockwise rotation. The upper and lower locking lugs of the bolt contact the bolt camming surfaces inside the barrel socket and, as the bolt continues toward the rear, it completes a one-quarter turn counterclockwise. The rotation and movement to the rear unlocks the bolt from the barrel socket. Unlocking begins as the yoke of the operating rod contacts the curve of the bolt camming slot and ends as the bolt clears the end of the barrel socket.

## **EXTRACTING**

2-73. Extracting begins during the unlocking cycle. The rotation of the bolt loosens the cartridge case in the chamber. As the piston and bolt move to the rear, the extractor pulls the cartridge case from the chamber.

## **EJECTING**

2-74. As the cartridge case is pulled from the chamber, the bolt passes by the ejector. This procedure causes the ejector clip to expand, forcing the ejector to push the expended cartridge. The extractor grips the right side of the cartridge and causes it to spin from the weapon as it reaches the ejection port. The empty belt links are forced out the link ejection port as the rearward movement of the bolt causes the next round to be positioned in the tray groove.

## **COCKING**

2-75. As the expanding gases force the gas piston to the rear, the operating rod first moves independently of the bolt. The yoke of the operating rod acts against the rear firing pin spool, pulling the firing pin from the primer of the spent cartridge case. The action of the piston assembly, continuing to the rear with the firing pin, releases the compression of the firing pin spring. As long as the trigger is held to the rear, the M60 continues to complete the eight steps of functioning automatically. When the trigger is released and the sear engages the sear notch, the cycle of functioning is stopped and the weapon is cocked. To prevent undue wear to the sear and sear notch, the gunner must hold the trigger firmly to the rear during firing.

## **SIGHTS**

2-76. The range scale on the rear sight is marked for each 100 meters from 300 to 1,100 meters. It can be adjusted for zeroing. To change the range, the gunner either uses the scale retaining and adjusting screw (major adjustments), or the elevation knob (minor adjustments such as during zeroing; Figure 2-18).

## **ELEVATION**

2-77. Before the gunner adjusts for elevation, he places the range knob at its highest setting. If the center of the shot group is above or below the aiming point, he rotates the elevation knob by moving the rear sight slide in the direction of the desired change. One 180-degree turn in either direction moves the strike of the round 1/4 centimeter at 10 meters; four clicks moves it 1 centimeter. Four clicks on the elevation knob equal a 1 cm change in elevation or the point of aim. From the rear of the weapon, the gunner turns the elevation knob counterclockwise to raise the rear sight and lower the strike of the round, and vice versa.

## **WINDAGE**

2-78. If the center of the group is to the left or right of the black aiming paster, the gunner must correct for windage. To do so, he rotates the windage knob to move in the direction of the desired change. For example, he rotates the windage knob toward the muzzle (counterclockwise) to move the strike of the round to the right; he rotates the windage knob toward the buttstock [clockwise] to move the strike of the round to the left. One click in either direction moves the strike of the round 1/2 cm at 10 meters. He adjusts the rear sight for windage, 5 mils right or left of the zero index line. The windage knob is on the left side of the rear sight. One click on the windage knob equals a 1 cm change in deflection or point of aim. To move the strike of the round to the right, he turns the windage knob toward the muzzle of the weapon. To move the sight and the strike of the round to the left, he turns the windage knob to the rear.

## 10-METER ZEROING, SET THE SIGHTS (MECHANICAL ZERO)

2-79. The gunner indexes or places the range scale on a range of 500 meters. He aligns the windage by placing zero windage on the index line. He assumes a prone position and sights on the target.

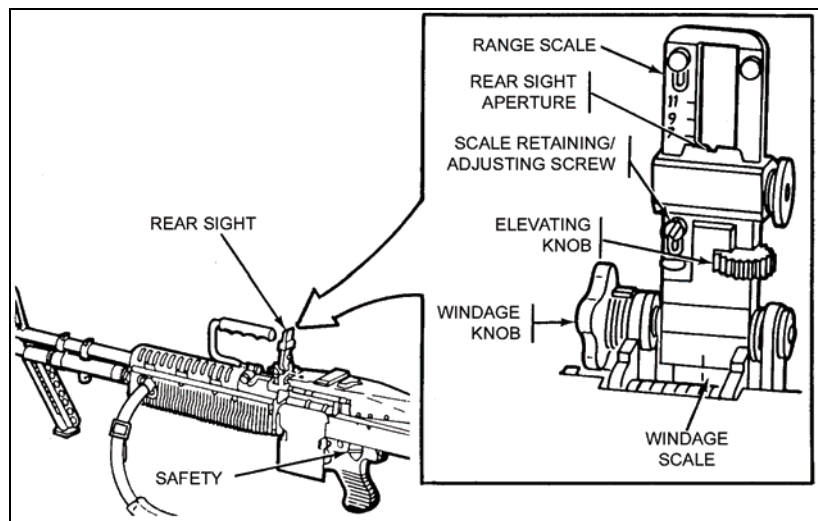


Figure 2-18. Sight settings.

## M122 TRIPOD

2-80. The M122 tripod provides a stable mount for the M60, and it permits accuracy and control. The gunner should use the tripod for marksmanship training and defensive employment (*see also* Appendix A).

### MOUNTING M60 ON THE TRIPOD

2-81. The tripod assembly provides a stable and relatively lightweight base that is far superior to the bipod. The gunner can easily extend and collapse the tripod. It consists of a tripod head, one front leg and two rear legs, and traversing bar. The traversing bar connects the two rear legs. It has hinges on one side, and a sleeve and sleeve latch on the other. These allow the gunner to collapse and close the tripod for carriage or storage, or to lock it open in an extended position so he can use it. The traversing bar also supports the T&E mechanism. Engraved on the bar is a scale that measures direction in mils. It is graduated in 5-mil increments. It is numbered every 100 to 425 mils right of center and numbered every 100 to 450 mils left of center.

2-82. The T&E mechanism is to provide controlled manipulation and the ability to engage predetermined targets.

2-83. The traversing portion of the mechanism consists of the traversing handwheel and traversing slide-lock lever. As the traversing handwheel is turned, the muzzle of the weapon turns to the left or right, depending on the direction it is turned. Each click of the traversing handwheel indicates a 1 mil change in direction of the muzzle: one click equals 1 mil. The total of 100 mils traverse includes 50 mils right and 50 mils left of center.

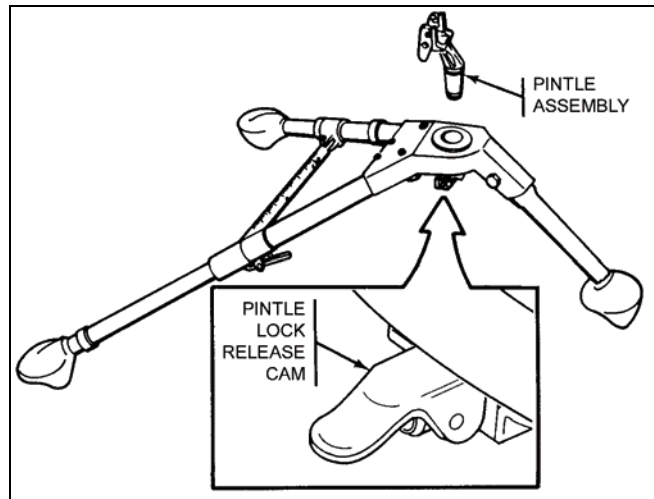
2-84. The elevating portion of the mechanism consists only of the elevating handwheel. The elevating handwheel has a mil-click device built into it (one click = 1 mil). Engraved into the handwheel is a scale divided into 5-mil divisions and 1-mil subdivisions, for a total of 50-mil increments. There are 200 mils above and 200 mils below the zero mark, for a total of 400 mils in elevation change. Elevation readings are



taken in two parts. The gunner takes the major reading from the elevation screw plate. He takes the minor reading from the handwheel. When he records them, he separates the two readings with a slash (/).

2-85. The traversing slide-lock lever allows rapid lateral adjustments along the traversing bar. The gunner takes direction readings from the scale on the traversing bar, using the left side of the traversing slide as an index. He gets the direction from the position of the muzzle, not the position of the slide.

2-86. To set up the tripod, the gunner unfolds the front leg and spreads the rear legs until the leg lock engages. He inserts the pintle assembly and rotates the pintle lock release cam to lock (Figure 2-19).



**Figure 2-19. M122 tripod.**

2-87. To mount the M60, the gunner places the ends of the M60's front mounting pin on top of the pintle assembly. He presses the bottom of the latch to open the pintle assembly. The ends of the M60 mounting pin should lock in place on the pintle assembly (Figure 2-20).

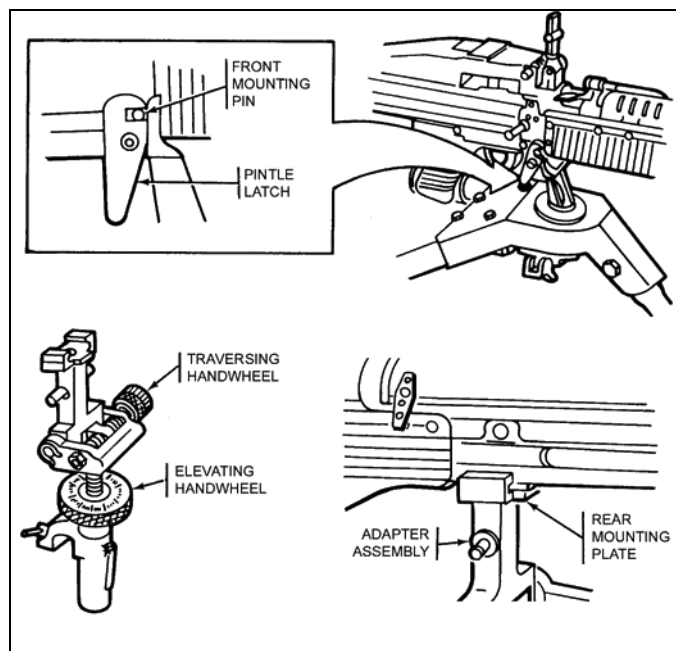


Figure 2-20. Mounting of the M60 on the tripod.

2-88. To attach the T&E mechanism to the weapon mounted on the tripod (Figure 2-21), the gunner centers the elevating and traversing handwheels. To do this, he turns the traversing handwheel toward his body as far as it will go, and then turns it away two complete revolutions. He checks the traversing handwheel scale to ensure the "0" on the scale is aligned with the "0" index line before and after the two revolutions. At night, the gunner positions the traversing mechanism by turning the traversing handwheel toward his body as far as it will go, turns it away 50 clicks (two revolutions), and then allows the weapon to go forward.

2-89. With the slide lock lever to the rear and the traversing handwheel to the left, the gunner places the mounting plate recess on the rear of the mounting plate. He pulls down the locating pin release and pushes the adapter assembly forward. (The locating pin automatically locks into position in the bottom of the mounting plate.)

2-90. The gunner lowers the rear of the weapon, places the traversing slide on the traversing bar with the locking lever to the rear, and locks it into position. He indexes the left edge of the slide lock at zero.

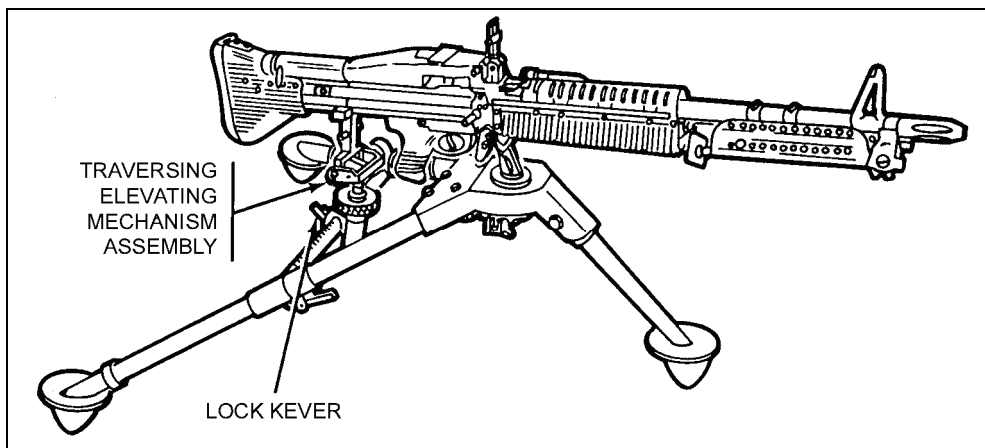


Figure 2-21. Attachment of the T&E mechanism.

## DISMOUNTING M60 FROM THE M122 TRIPOD

2-91. The gunner dismounts the M60 from the tripod by first removing the T&E mechanism. He releases the lock lever and raises the rear of the weapon. He grasps the carrying handle with his left hand and depresses the pintle latch with his right hand. He lifts the weapon from the pintle assembly.

## BIPOD OPERATION

2-92. The bipod assembly is used to fire from the prone position. The shoulder rest on the buttstock provides support for the weapon when fired in the bipod mode. The bipod group is held in place between the front sight and flash suppressor.

- To lower a bipod leg, the gunner pulls it to the rear (compressing the lock spring) and rotates it downward (Figure 2-22). The leg automatically locks when in the down position. To return the legs up, the gunner pulls down on the legs and rotates upward.

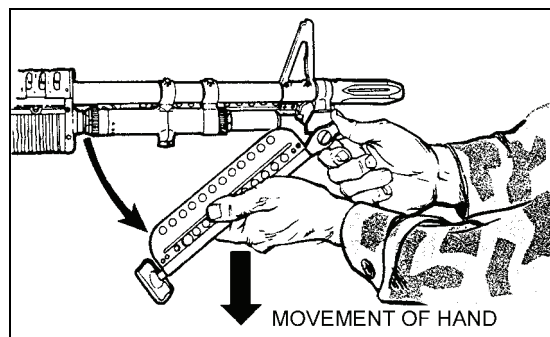


Figure 2-22. Lowering of the bipod.

- To extend a bipod leg, the gunner pulls down on the foot. The bipod leg plunger engages a notch in the bipod leg extension and holds it in the desired position. To shorten the bipod leg, the gunner depresses the bipod leg plunger and pushes up on the bipod foot (Figure 2-23).

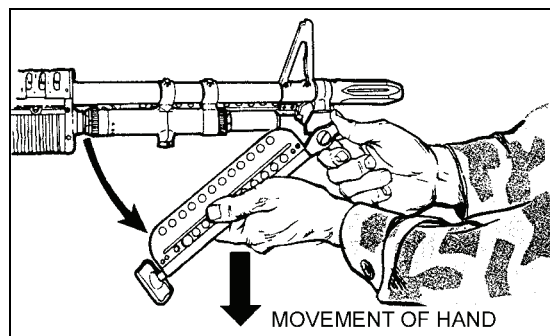


Figure 2-23. Adjustment of the bipod leg extension.

## VEHICULAR MOUNT

2-93. The standard vehicular mount for the M60 machine gun is the M4 pedestal mount used on the HMMWV. One component of the pedestal mount, the M142 machine-gun mount, (which serves as a cradle for the weapon), is also adaptable to other vehicles (Figure 2-24).

- To mount the weapon, the gunner locks the platform in the horizontal position by inserting the travel-lock pin into the travel lock. He places the front mounting pin (in the forearm assembly) into the front mounting lug. He lowers the receiver so that the rear locating pin snaps into the platform latch.
- To dismount the weapon, the gunner ensures that the travel lock is engaged (holding the platform in a horizontal position). He grasps the carrying handle with one hand and depresses the platform latch with the other. He raises the rear of the weapon slightly and lifts it from the mount.

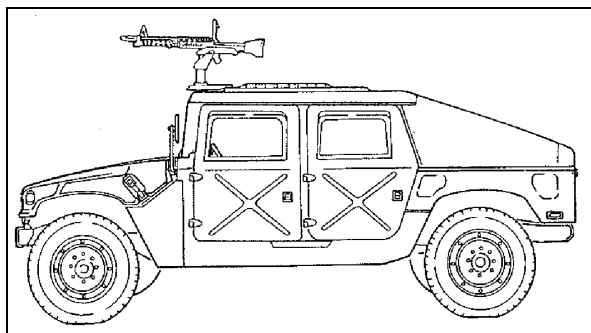


Figure 2-24. M60 mounted on a HMMWV.

## TRIPOD OPERATION

2-94. The M122 tripod provides a stable mount for the M60, and it permits a high degree of accuracy and control. The gunner unfolds the front leg, positions it toward the target, then spreads the rear legs until the leg lock engages.

## SECTION IV. PERFORMANCE PROBLEMS AND DESTRUCTION

This section identifies some of the problems that cause the weapon to perform improperly. It also explains how to identify unserviceable parts, and how to destroy the M60 when authorized to do so.

## MALFUNCTIONS

2-95. A malfunction occurs when a *mechanical failure* causes the *weapon to fire improperly*. Neither defective ammunition nor improper operation by the gunner is considered a malfunction. If cleaning and lubricating the weapon does not fix the problem, then the gunner turns it in to the unit armorer. Table 2-3 shows malfunctions, their probable causes, and the corrective actions.

<i>Malfunction</i>	<i>Probable Cause</i>	<i>Corrective Action</i>
Sluggish operation.	Carbon buildup in the gas system.	Clean gas regulator, piston, and cylinder.
	Lack of lubricant	Lubricate.
	Burred parts	Notify unit maintenance.
Uncontrolled fire (runaway weapon).	Worn or broken sear	Send to DS maintenance.
	Worn or broken operating rod sear notch.	Send to DS maintenance.
	Sear installed backwards	Install correctly.
	<b>Note:</b> Always install the rod yoke between the two firing pin spools.	
	Carbon buildup in gas port	Clean gas port.

Table 2-3. Malfunctions.

## STOPPAGES

2-96. A stoppage is any interruption in the cycle of functioning caused by *faulty action or ammunition*. Stoppages are classified by their relationship to the cycle of functioning. Table 2-4 shows types of interruptions or stoppages, their probable causes, and the corrective actions.

<i>Stoppage</i>	<i>Probable Cause</i>	<i>Corrective Action</i>
Failure to chamber	Ruptured cartridge case	Remove cartridge IAW TM 9-1005-224-10.
	Carbon buildup in gas cylinder	Remove carbon.
	Carbon buildup in receiver	Remove carbon.
	Damaged round	Remove round and reload gun.
	Dirty chamber	Clear barrel, and clean and lubricate as required.
	Weak or short operating rod	Replace.
Failure to lock	Weak or short operating rod spring.	Replace.
	Foreign matter in chamber of receiver.	Clean and lubricate as required.
Failure to fire	Faulty ammunition	Replace.
	Broken or damaged firing pin or firing pin spring.	Replace.
	Defective trigger	Send to DS maintenance.
	Broken or deformed sear plunger or spring.	Send to DS maintenance.
	Failure to lock	See "Failure to Lock."
Failure to extract	Gas piston installed backwards.	Install properly IAW TM 9-1005-224-10.
	Broken extractor spring	Replace.
	Chipped or broken extractor	Replace.
	Defective extractor plunger	Replace.
	Short recoil	Clean gas port and operating rod tube, and lubricate as required. Replace operating rod spring.
Failure to cock	Broken sear	Send to DS maintenance.
	Worn operating rod sear notch.	Send to DS maintenance.
	Broken, defective, or missing sear plunger or spring.	Send to DS maintenance.
	Short recoil	Clean gas port and operating rod tube, and lubricate as required. Replace operating rod spring.

Table 2-4. Stoppages.

**DANGER****HOT WEAPON**

A "hot" weapon, that is, one through which 200 or more successive rounds have just been fired, can "cook off" a round without any action by the firer.

If a "hot" weapon fails to fire, and you must clear it while the barrel is still hot--

1. Keep the cover closed, get the weapon off your shoulder, and point it downrange.
2. Place the weapon on safe (no red showing).
3. Place the weapon on the ground, still pointed downrange.
4. Before clearing and applying immediate or remedial action, you must first wait--
  - Training situations: 15 minutes.
  - Tactical situations: 5 seconds.

---

*Note:* When applying immediate or remedial action on a cold or hot gun, some part of the round (ranging from the tip of the bullet to the rim) might still be in the hanger. If so, remove the ammunition from the feed tray only, then close the cover and try to fire. If the weapon fires, then reload and continue firing. If it fails to fire, then he clears the weapon (removes the round using only a clearing rod and with the cover closed), and then he inspects the weapon and ammunition.

---

**IMMEDIATE ACTION**

2-97. The gunner takes immediate action to reduce a stoppage without seeking the cause. For example, the gunner conducts immediate action when a misfire or cook off occurs. The gunner keeps the weapon on his shoulder while performing immediate action procedures. If the weapon stops firing, he takes the following immediate actions.

**DEFINITIONS**

2-98. (See also Table 2-5).

- A *misfire* is the failure of a chambered round to fire. Such failure can be due to an ammunition defect or faulty firing mechanism.
- A *cook off* is the firing of a round due to the heat of a hot barrel and not to the firing mechanism. Cook offs can be avoided by applying immediate action within 10 seconds of a failure to fire.
- An effective memory aid is POPP, which stands for pull, observe, push, and press:
  - *Pull* and lock the cocking handle to the rear while you
  - *Observe* the ejection port to see if a cartridge case, belt link, or round ejects. Ensure that the bolt remains to the rear to prevent double feeding if a round or cartridge case is not ejected. If a cartridge case, belt link, or round ejects

- **Push** the cocking handle to its forward position, take aim on the target, and
- **Press** the trigger. If the weapon does not fire, take remedial action. If a cartridge case, belt link, or round fails to eject, take remedial action.

Immediate Action	Action taken to reduce a stoppage without looking for the cause. The gunner takes immediate action if the weapon misfires or cooks off a round.
Misfire	The failure of a chambered round to fire. Such failure can be due to an ammunition defect or faulty firing mechanism.
Cookoff	The firing of a round caused by the heat of a hot barrel and not by the firing mechanism.

**Table 2-5. Definitions.**

## REMEDIAL ACTION

2-99. The gunner takes remedial action is taken to determine the cause of a stoppage and restore the weapon to operational condition. The gunner conducts remedial action *only* if immediate action fails to remedy the problem.

## COLD WEAPON PROCEDURES

2-100. When a stoppage occurs with a cold weapon and immediate action has failed, the gunner uses the following procedures:

- Pulls the cocking handle to the rear, locking the bolt. Moves the safety to “S” and returns the cocking handle.
- Places the weapon on the ground or away from his face, opens the cover, and performs the four-point safety check. Reloads and continues to fire.
- If the weapon does not fire, clears the weapon and inspects it and the ammunition.

## HOT WEAPON PROCEDURES

2-101. If the stoppage occurs with a hot weapon (200 rounds or more fired in 2 minutes or noted as previously for training), the gunner moves the safety to “S,” waits 5 seconds (during training, lets the weapon cool for 15 minutes), then uses the same procedures as outlined for cold weapon procedures.

## JAMMED COCKING HANDLE

2-102. If a stoppage occurs and the cocking handle cannot be pulled to the rear by hand (the bolt may be fully forward and locked or only partially forward), the gunner must take the following steps:

- Try once again to pull the cocking handle *by hand*.



**CAUTION****COCKING HANDLE**

Avoid trying to force the cocking handle to the rear with your foot or a heavy object, because doing so could damage the weapon.

- If the weapon is hot enough to cause a cookoff, move all Soldiers a safe distance from the weapon and keep them away for 15 minutes.
- After the gun has cooled, open the cover and disassemble the gun. Keep rearward pressure on the cocking handle until after he removes the buffer. (The assistant gunner helps the gunner do this.)
- Remove round or fired cartridge. If needed, use a cleaning rod or ruptured cartridge extractor.

2-103. *In a training situation*, after completing the remedial action procedures, the gunner does not fire the weapon until an ordnance specialist has inspected it.

2-104. *In a combat situation*, after the gunner corrects the stoppage, he changes the barrel and tries to fire. If the weapon fails to function properly, the gunner sends it to the unit armorer.

**DESTRUCTION PROCEDURES**

2-105. Destruction of any military weapon is only authorized as a last resort to prevent enemy capture or use. This paragraph discusses the field-expedient means of this destruction; it does not replace published policies. In combat situations, the commander has the authority to destroy weapons, but he must report this destruction through channels.

- Disassemble the weapon as completely as time permits. Use the barrel or tripod mount to destroy the bolt, buffer, and operating rod group, barrels, rear and front sights, and mounts.
- Bury the disassembled weapon or dump the parts into a stream, a sump, or a latrine.
- Burn the weapon by placing an incendiary grenade on the receiver group over the bolt (with the cover resting on the grenade) and detonating the grenade.
- Smash the T&E mechanism and pintle assembly. Bend the tripod legs.

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## Chapter 3

# M240B Machine Gun

The M240B machine gunner supports the rifleman in both offensive and defensive operations. The 7.62-mm M240B provides a heavy volume of close and continuous fire. The M240B engages targets those rifles can engage, and does so with controlled and accurate fire. The long-range, close defensive, and final protective fires delivered by the M240B form an integral part of a unit's defensive fires. This chapter describes the weapon, its components, and its ammunition in detail; and it includes a table of general data.

### SECTION I. DESCRIPTION AND COMPONENTS

This section describes the M240B and its components and purposes. It also discusses its ammunition and blank firing adapters, and the types of ammunition it fires.

#### DESCRIPTION AND DATA

3-1. The M240B is a general-purpose machine gun (Figure 3-1 and table 3-1). It mounts on a bipod, tripod, aircraft, or vehicle. It is belt fed, air cooled, gas operated, and fully automatic. It fires from an open bolt. Ammunition feeds from a 100-round bandoleer with disintegrating links. The gas from firing one round provides the energy to fire the next one. Thus, the gun fires automatically as long as it has ammunition and the gunner holds the trigger is held to the rear. As the gun fires, the links separate and eject from the side. Empty cases eject from the bottom. Each M240B is issued with a spare barrel. The gunner can change barrels quickly, because the weapon has a fixed headspace. The bore of the barrel is chromium plated, reducing barrel wear to a minimum. However, gunners should never switch barrels between weapons. This could prove fatal.

#### **DANGER**

##### **SWAPPING OF PARTS**

**Unless direct-support personnel certify the headspace on both weapons, avoid swapping barrels between weapons, because doing so could cause you to suffer injury or death.**

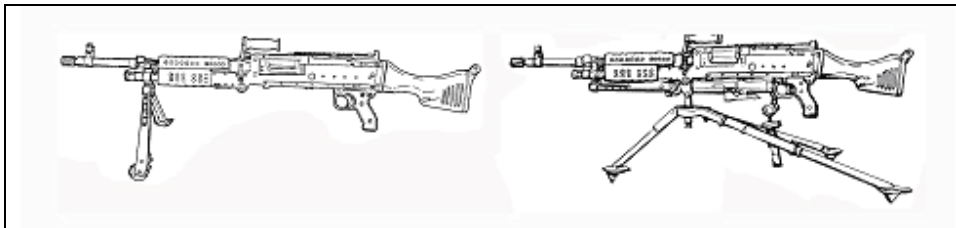


Figure 3-1. M240B machine gun, bipod and tripod mounted.

Ammunition.....	7.62-mm ball, tracer, armor-piercing, blank, dummy. Armor-piercing round is not authorized for training.
Basic load (three-man crew).....	900 to 1,200 rounds.
Tracer burnout.....	900 meters
Length of the M240B.....	49 inches
Weight of the M240B.....	27.6 pounds
Weight of tripod-mount M122A1.....	20 pounds
tripod with/flex-mount, complete	
Maximum range.....	3,725 meters
Maximum effective range.....	1,100 meters with tripod and T&E
Area:	
M122A1 Tripod.....	1,800 meters
M122A1 Bipod.....	800 meters
Point:	
Tripod.....	800 meters
Bipod.....	600 meters
Suppression.....	1,800 meters
Maximum range of grazing fire.....	600 meters
over level or uniformly sloping terrain	
Height of the M240B on the.....	17.5 inches
tripod mount M122A1	
Rates of fire:	
Sustained.....	100 rounds per minute, 6- to 9-round bursts 4 to 5 seconds apart, barrel change every 10 minutes.
Rapid.....	200 rounds per minute, 10- to 13-round bursts 2 to 3 seconds apart, barrel change every 2 minutes.
Cyclic.....	650 to 950 rounds per minute in continuous bursts (barrel change every minute).
Elevation, tripod controlled.....	+247 mils
Elevation, tripod free.....	+300 mils
Depression, tripod controlled.....	-200 mils
Traverse, controlled by T&E Mechanism.....	100 mils
Normal sector of fire (with tripod).....	875 mils
Free gun.....	6,400 mils

Table 3-1. General data for gun with the M122A1 tripod.

## COMPONENTS

3-2. The components of the M240B machine gun and their purposes are shown in table 3-2 and Figure 3-2.

<i>Component</i>		<i>Purpose</i>
1.	Barrel assembly	Holds the cartridge and directs the projectile. Includes the barrel, flash suppressor, carrying handle, heat shield, front sight assembly, and gas-regulator plug.
2.	Heat shield assembly	Protects the gunner's hand from a hot barrel.
3.	Buttstock and buffer assembly; and buffer and spade-grip assembly	Houses a buffer whose inner spring washers absorb recoil.
4.	Receiver assembly	Supports all major components (receiver, handguard, bipod, and rear sight assembly) and action; uses cams to control function of weapon.
5.	Handguard assembly (not shown)	Insulation protects gunner's hands from heat and cold.
6.	Cocking handle assembly	Pulls moving parts rearward along a rail fixed to the right side of the receiver.
7.	Trigger housing assembly	Controls fire.
8.	Sling and snap hooks	Simplifies carrying the weapon.
9.	Bipod	Supports the M240B barrel in prone position.
10.	Drive spring rod assembly	Forces the bolt and operating rod assembly back to firing position.
11.	Bolt and operating rod assembly	Feeds, strips, chambers, fires, extracts, and ejects cartridges using propellant gasses for power.
12.	Cover assembly	Feeds linked belt, and positions and holds cartridges while the bolt and operating rod assembly strips, feeds, and chambers them. Has a sight mounting rail on the top exterior.
13.	Feed tray	Guides cartridges into chamber. Slotted top allows air to circulate around (and thus cool) the barrel.
14.	Tripod assembly (not shown)	Provides a stable, flexible mount, and improves accuracy.
15.	Ejection port	Guides ejecting cartridges out of the weapon.

**Table 3-2. Components and purposes.**

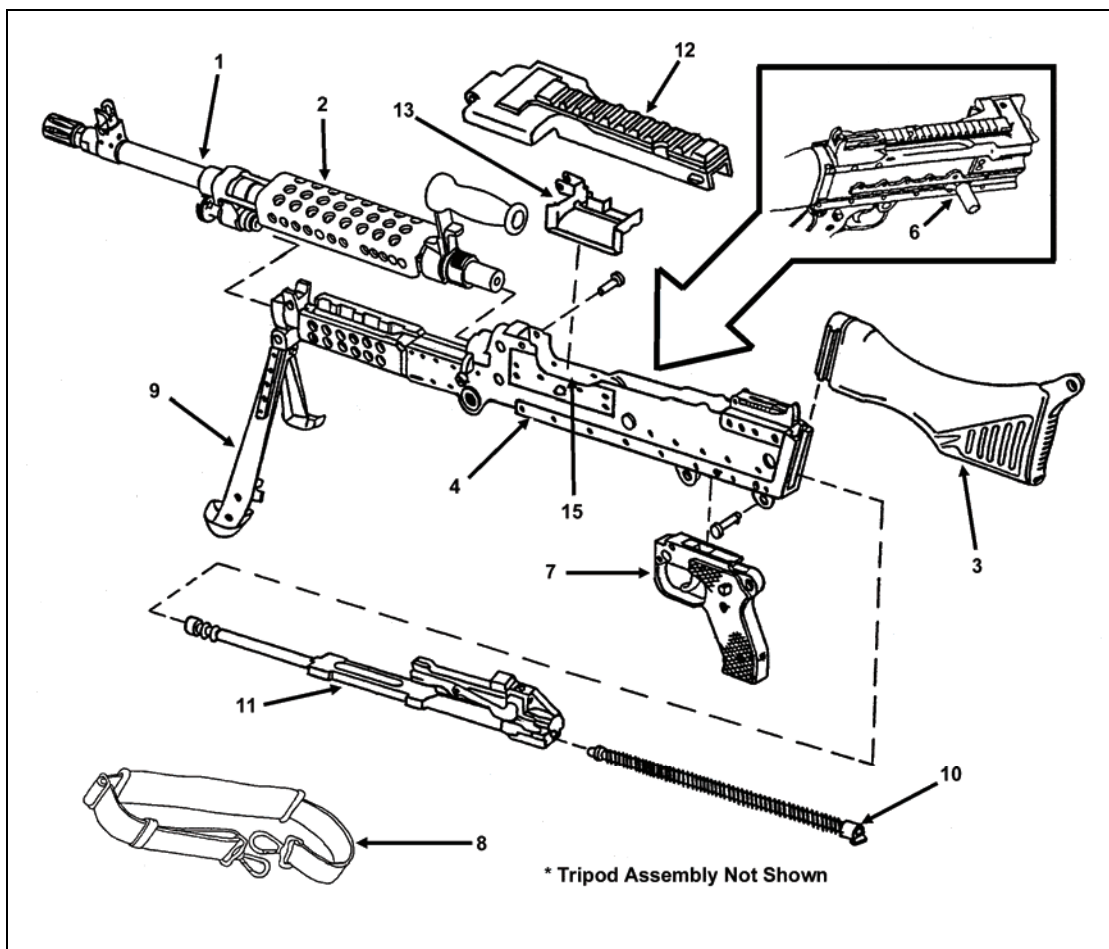


Figure 3-2. Major components of the M240B.

### *Sights*

3-3. The front sight attaches to the barrel and can be adjusted for elevation and windage to let the gunner zero the weapon. Since the gunner adjusts the sight on the barrel to zero the machine gun, the gunner must zero both barrels before combat and training. The rear sight is attached to the rear of the receiver and is marked for each 100 meters of range, from 200 to 800 meters on the upper surface of the leaf, and from 800 to 1,800 meters on the reverse (Figure 3-1). (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

### *Safety Mechanism*

3-4. The safety mechanism is on the pistol grip just behind the trigger well. To place the weapon on safe, push the selector from left to right until the letter "S" is visible. To place it in the fire mode, push the selector switch from right to left until the letter "F" is visible. The safety can only engage the bolt in the rear position. When the "S" is showing, the bolt cannot release to go forward (Figure 3-1).

## AMMUNITION

3-5. The M240B machine guns use several types of standard 7.62-mm ammunition. Figure 3-3 shows the types and their characteristics. Soldiers may only use authorized ammunition manufactured to US and

NATO specifications. Ammunition for the M240B is issued in a disintegrating, metallic, split-linked belt (Figure 3-4).

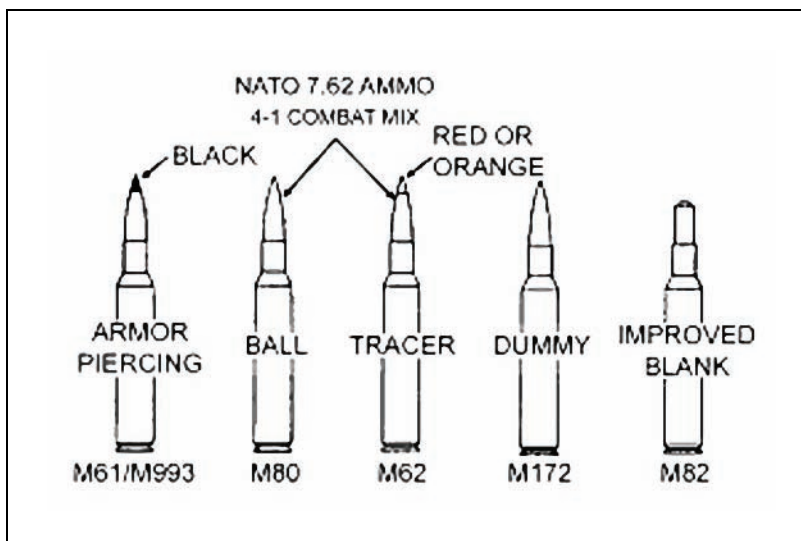


Figure 3-3. Ammunition used in the M240B machine gun.

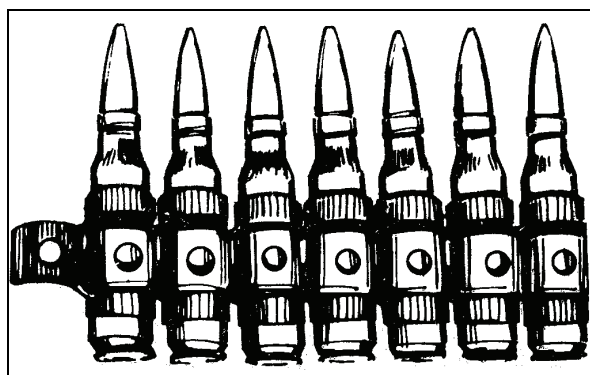


Figure 3-4. Ammunition shown in metallic belt.

## CLASSIFICATION

- 3-6. The M240B machine gun uses the following types of ammunition. See also table 3-3:
- *Cartridge, 7.62-mm Ball M80*—for use against light materials and personnel, and for range training.
  - *Cartridge, 7.62-mm Armor-Piercing M61*—for use against lightly armored targets.
  - *Cartridge, 7.62-mm Tracer M62*—for observation of fire, incendiary effects, signaling, and for training. When the gunner fires tracer rounds, they mix with ball ammunition in a ratio of four ball rounds to one tracer round.
  - *Cartridge, 7.62-mm Dummy M63*—for use during mechanical training.
  - *Cartridge, 7.62-mm Blank M82*—for use during training when simulated live fire is desired. The gunner should use a BFA to fire this ammunition.

<i>Ammunition Type</i>	<i>Uses</i>
M80 Ball	Light materials and personnel. Range training.
M61 Armor Piercing	Lightly armored targets.
<i>M62 Tracer</i> --Mixed with ball ammunition in a ratio of four ball to one tracer	Observation of fire. Incendiary effects. Signaling. Training.
M63 Dummy	Mechanical training.
<i>M82 Blank</i> -- Used with a blank firing adapter	Simulated live fire.

**Table 3-3. Types of ammunition used with the M240B.**

## STORAGE

3-7. Store ammunition under cover. If in the open, keep it at least 6 inches above the ground and cover it with two tarp layers. Ensure that the tarps protect the ammunition, but allow for ventilation. Dig trenches to divert water away from the ammunition.

## CARE, HANDLING, AND PRESERVATION

3-8. To avoid corrosion, especially in damp climates, keep ammunition in its airtight containers until ready for use.

- Keep mud, dirt, and moisture away from ammunition. Before you load ammunition, wipe off debris and moisture. Anytime you find light corrosion on ammunition, wipe it off at once. However, *never* fire rounds with heavy corrosion, dents, or loose projectiles.
- Keep oil away from ammunition. Oil attracts dust and other abrasives. Dirty ammunition could damage the operating parts of the weapon, that is, anywhere the ammunition goes.
- Protect ammunition from the direct rays of the sun. Excessive internal pressure caused by heat can detonate the round prematurely.

## PACKAGING

3-9. Each ammunition box contains two 7-pound, 100-round cartons of ammunition and a bandoleer to carry the ammunition. You can link the ammunition in the bandoleers, attach them to the hanger assembly, fire them from the container, or remove them for individual firing.

## AMMUNITION ADAPTER

3-10. The ammunition adapter lets the gunner use the 100-round carton and bandoleer (Figure 3-5).



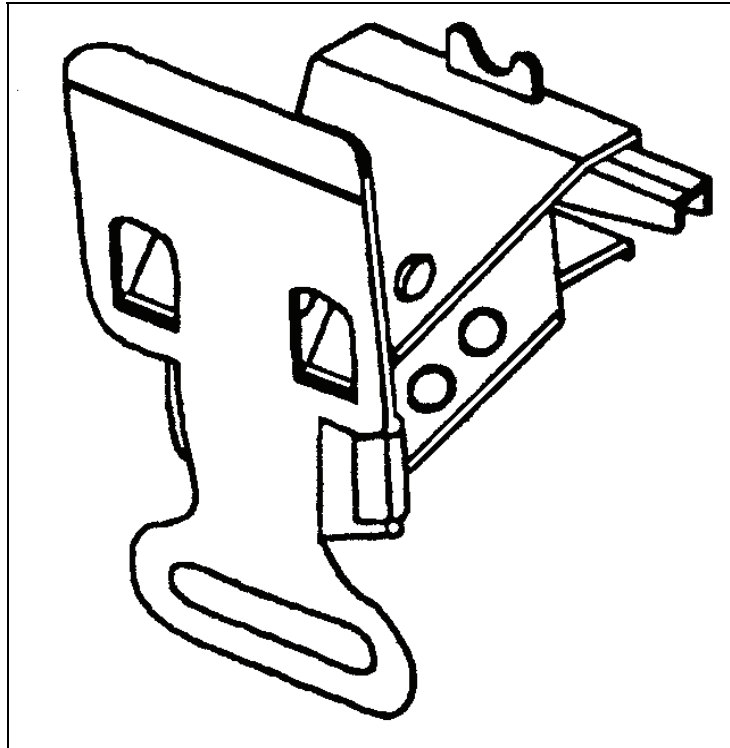


Figure 3-5. Ammunition adapter.

### ATTACHING THE AMMUNITION ADAPTER

3-11. The ammunition adapter fits on the left and under the feed tray of the receiver. Look at the left side of the receiver, and you will see a slot and a button under the feed tray (Figure 3-5). To attach the bandoleer holder to the base of the adapter, insert the tapered end (green plastic) of the holder into the adapter. Open the cover assembly and raise the feed tray. Insert the curved lip of the adapter assembly into the slot in the rail (left of the receiver), below the feed tray. Depress the lever on the adapter assembly, and push the assembly towards the receiver until it reaches the receiver. Release the lever. This allows the adapter assembly to secure itself to the button on the receiver (Figure 3-5).

### CARE OF THE AMMUNITION ADAPTER

- 3-12. Over time, the moving parts in the adapter, including the plastic parts, will wear and break.
- Inspect the adapter to determine whether it is clean, undamaged, for damaged parts, excessive wear, and cleanliness when every the weapon is taken out of the arms room.
  - When feasible, test-fit the adapter.
  - After using the adapter, inspect to ensure it is still operational.

### BLANK FIRING ATTACHMENT

3-13. The BFA adapts the M240B machine gun for simulating live fire with blank cartridges. It is used during training where or when live firing is impractical (Figure 3-6).

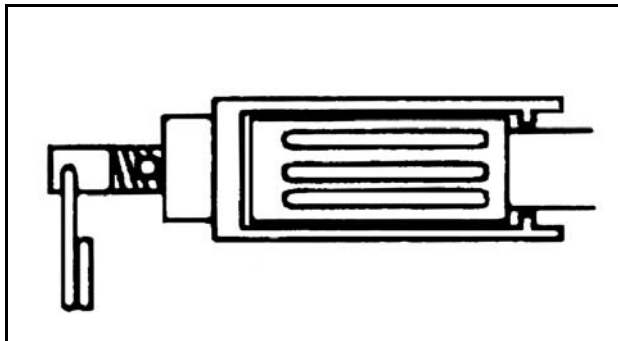


Figure 3-6. Blank firing attachment.

## DANGER

### BLANK AMMUNITION--MINIMUM FIRING RANGE

Avoid firing blank ammunition at anyone within 20 feet of you. Fragments of a closure wad or particles of unburned propellant could cause them injury or death.

### INSTALL THE BFA ON THE M240B MACHINE GUN

3-14. The BFA supports MILES force-on-force operations by simulating live-fire exercises. The BFA fits any M240B barrel. The BFA tube fits inside the flash suppressor. The other portion of the BFA fits over the outside, flush with the forward end of the flash suppressor, and flush against the gun muzzle. Secure the BFA as follows:

#### Attach the Attachment

3-15. Unscrew the shaft (1, Figure 3-7) until it slides all the way to the rear. Install the chamber device (2, Figure 3-7) over the flash suppressor (3, Figure 3-7). Slide the shaft (1) into the throat of the flash suppressor. Engage the threads on the shaft into the body of the chamber device (2). Turn clockwise until hand tight.

#### REMOVAL OF THE ATTACHMENT

3-16. Break any carbon sealed between the shaft (1, Figure 3-7) and the suppressor (2, Figure 3-7). To do so, hold the barrel and rotate the chamber of the body (3, Figure 3-7) about 180 degrees counterclockwise. Unscrew the shaft (1) until the threads disengage. Remove the chamber device from the suppressor (2).

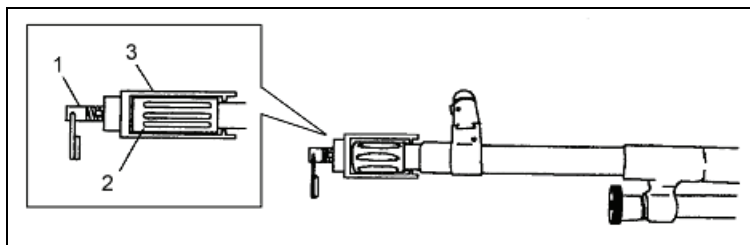


Figure 3-7. Attachment of the blank firing attachment.

## CARE OF THE M240B WHILE USING THE BLANK ADAPTER

3-17. A buildup of carbon inside the weapon causes friction between moving parts. Carbon builds up rapidly when firing blanks. Too much carbon causes stoppages. Therefore, during blank firing, you must keep your weapon clean, especially the gas system and chamber. To get the best performance with the BFA--

- Inspect the weapon for damaged parts, excessive wear, cleanliness, and proper lubrication before firing.
- When feasible, test fire the weapon with ball ammunition before you attach the BFA.
- Adjust the BFA to fit the weapon.
- Apply immediate action when stoppages occur.
- Clean the weapon including barrel assembly, gas cylinder, gas piston, gas port, chamber bore, and BFA.
- Clean and lubricate the entire weapon after firing 400 blank rounds.

### DANGER

#### BLANK AMMUNITION MINIMUM FIRING RANGE

**Avoid firing blank ammunition at anyone within 20 feet of you. Fragments of a closure wad or particles of unburned propellant could cause them injury or death.**

## SECTION II. MAINTENANCE

Proper maintenance contributes to weapon effectiveness as well as unit readiness. Maintenance of the M240B includes inspection; cleaning and lubrication; as well as maintenance before, during, and after firing, and in CBRN conditions. This section discusses maintenance tasks, including clearing, general assembly and disassembly, and function checks, in detail.

### CLEARING PROCEDURES

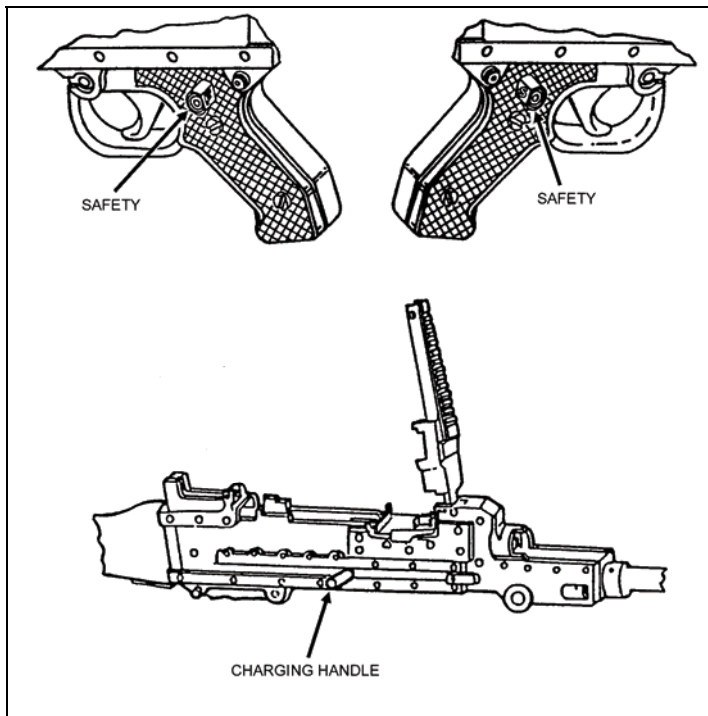
3-18. The first step in maintenance of the M240B is to clear it (Figure 3-8). This applies in all situations, not just after firing. The gunner must always assume the M240B is loaded. To clear the M240B, he must--

- Move the safety to the fire "F" position.
- With his right hand, (palm up) pull the cocking handle to the rear, ensuring that the bolt locks to the rear (bipod mode).
- Return the cocking handle to its forward position.
- Place the safety on "S."
- Raise the cover assembly and conduct the four-point safety check for brass, links, or ammunition.
  - Check the feed pawl assembly under the cover.
  - Check the feed tray.
  - Lift the feed tray and inspect the chamber.
  - Check the space between the face of the bolt and chamber as well as the space under the bolt and operating rod assembly.
- Close the feed tray and cover assembly. Place the safety on "F." Pull the cocking handle to the rear, and pull the trigger while manually riding the bolt forward. Close the ejection port cover.

**CAUTION**

**BOLT POSITION**

Each time you pull the bolt to the rear, return the cocking handle manually to the forward and locked position. Failure to do this could result in damage to the weapon.



**Figure 3-8. Clearing procedures.**

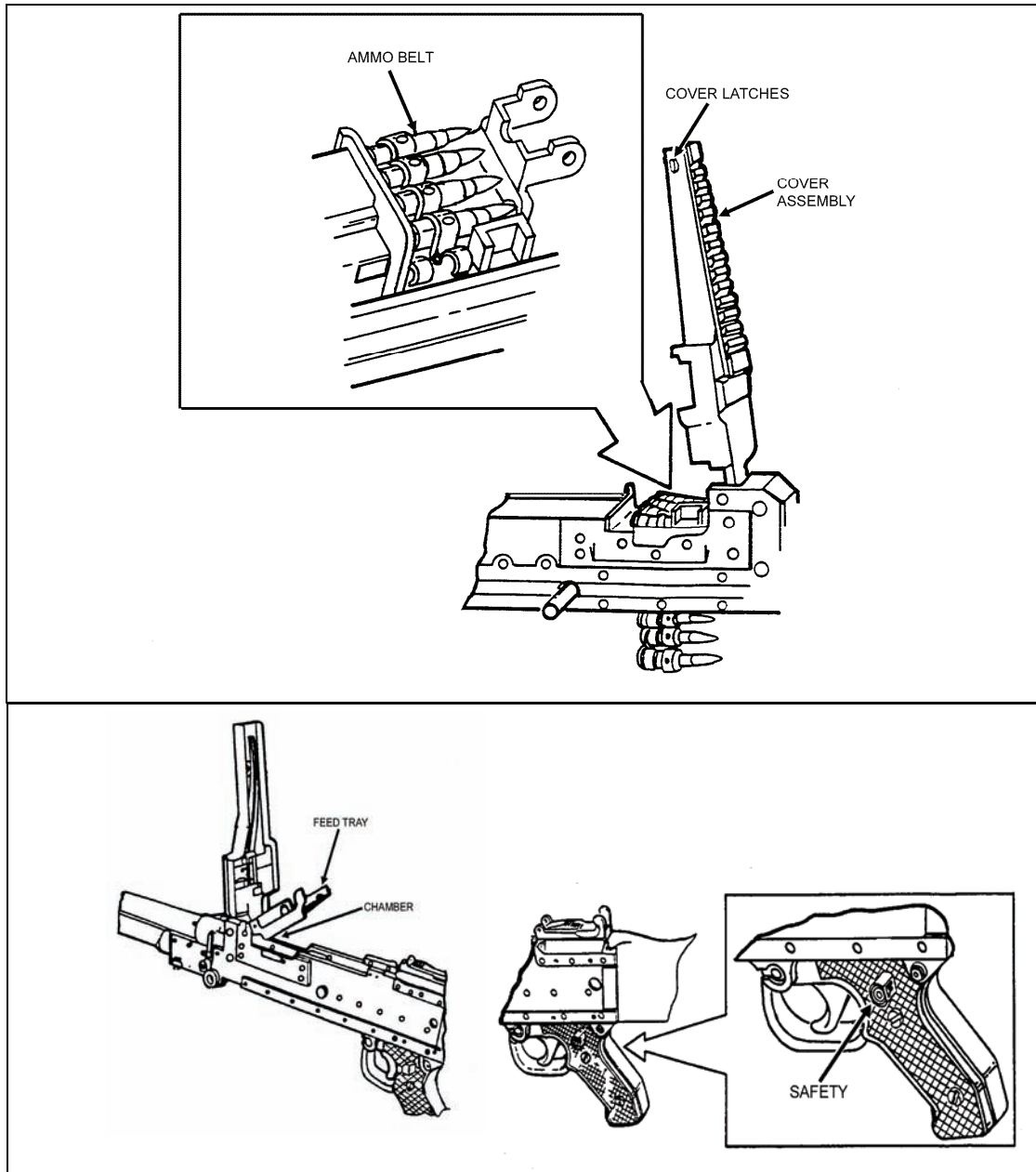


Figure 3-8. Clearing procedures (continued).

## GENERAL DISASSEMBLY

3-19. The gunner performs general disassembly by removing the eight major groups (Figure 3-9). The unit armorer performs detailed disassembly. In fact, *only* ordnance personnel may disassemble the M240B beyond the procedures explained in this manual. During general disassembly, the gunner first clears the weapon, and then he ensures that the bolt is forward. He places each part on a clean, flat surface such as a table or mat, ideally in the order in which he removes them. This simplifies assembly and helps prevent the loss of parts.

**DANGER**

Ensure that the bolt is in the forward position before disassembly. If you retract the operating rod spring with the bolt pulled to the rear, the spring guide can cause you to suffer death or injury.

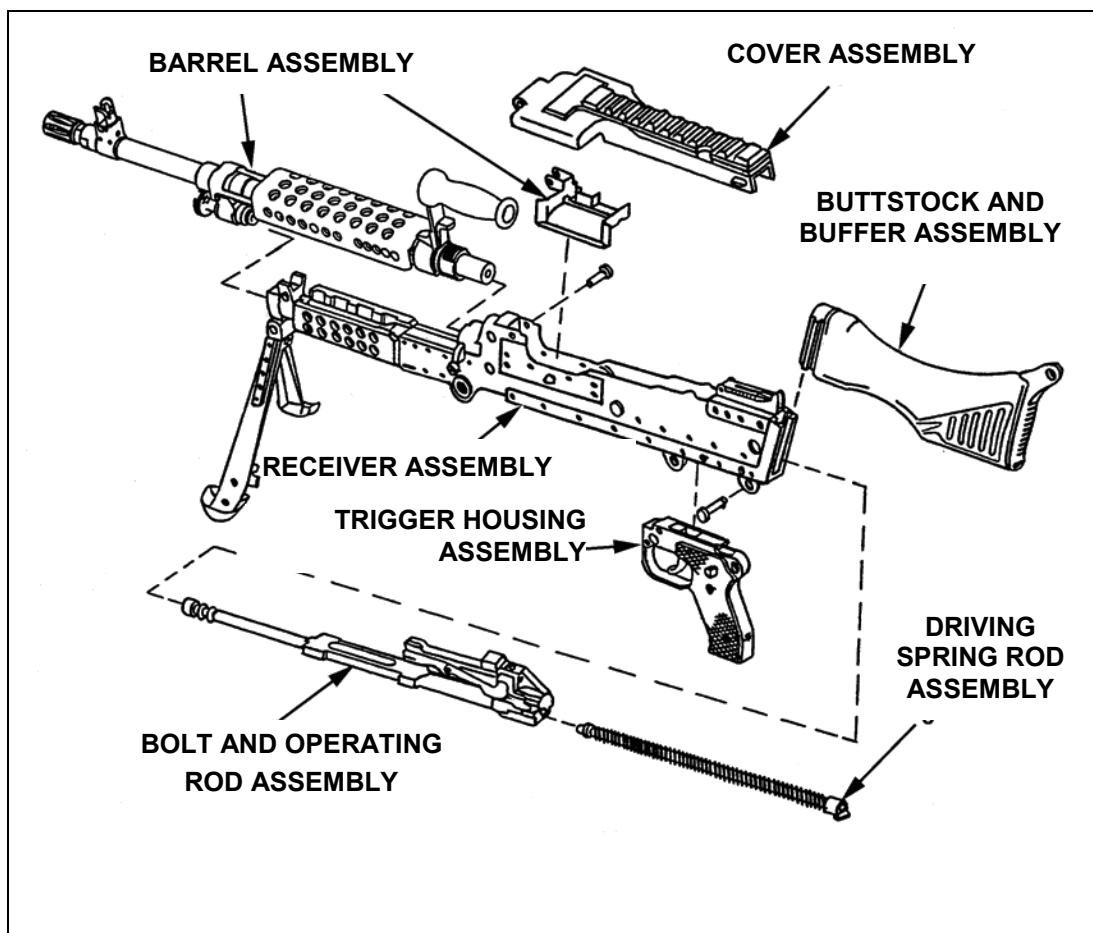


Figure 3-9. Eight major assemblies.

### REMOVAL OF THE BUTTSTOCK AND BUFFER ASSEMBLY

3-20. Find the backplate latch under the buttstock where it joins the receiver. Slide the buttstock straight upward, and remove it from the receiver (Figure 3-10).

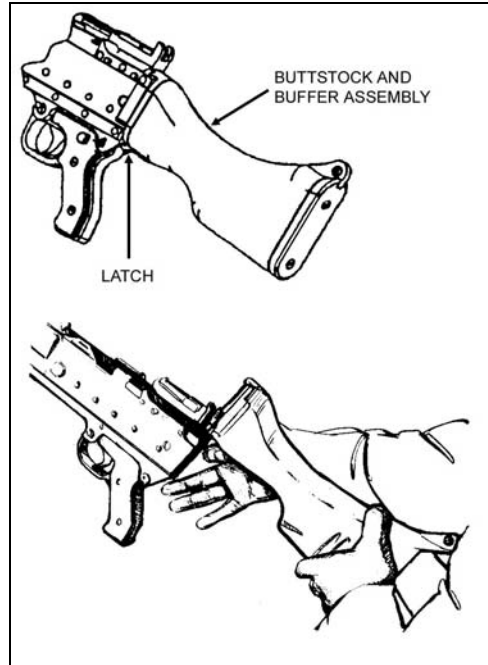


Figure 3-10. Removal of the buttstock.

### REMOVAL OF THE DRIVE-SPRING ROD ASSEMBLY

3-21. Push the drive-spring rod assembly forward and up to disengage its retaining stud from inside the receiver (Figure 3-11). Pull rearward on the drive spring rod assembly, removing it from the receiver (Figure 3-12).

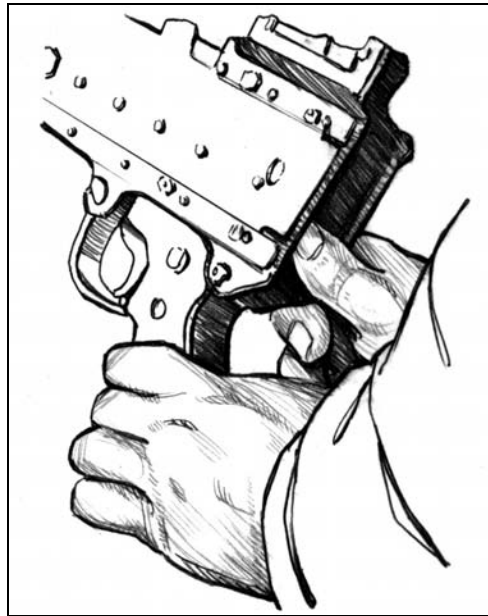


Figure 3-11. Removal of drive-spring rod assembly.

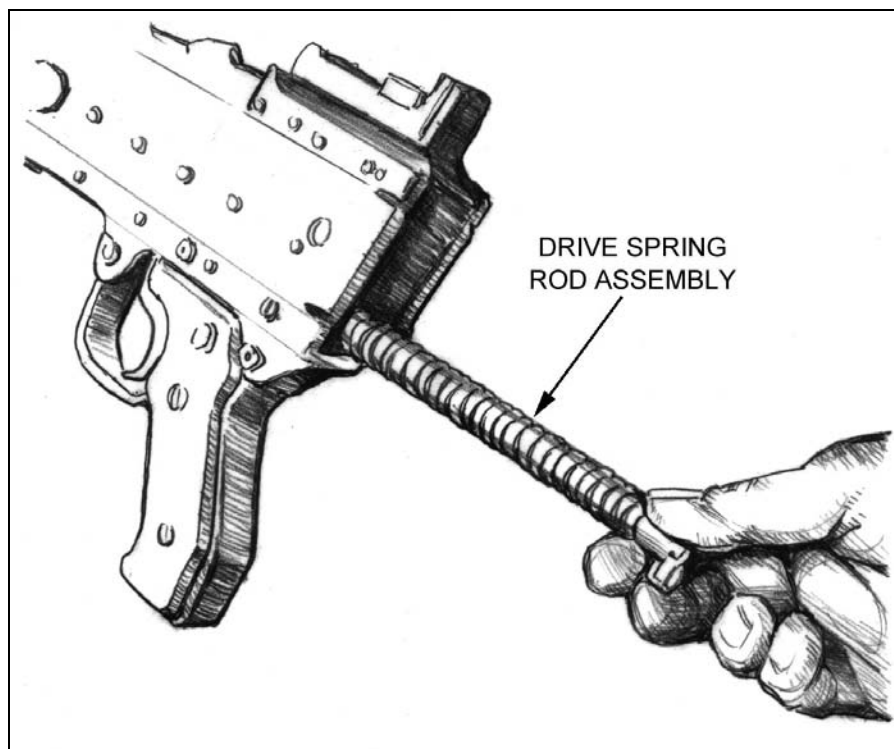


Figure 3-12. Drive-spring rod assembly.

**WARNING**

To avoid injury, keep your face away from the rear of the receiver.

Hold the rod assembly securely, because it is under tension.

**Removal of the Bolt and Operating Rod Assembly**

3-22. Pull the cocking handle to the rear to start the rearward movement of the bolt and operating rod assembly inside of the receiver. With the index finger, reach inside the top of the receiver and push rearward on the face of the bolt until the bolt and operating rod assembly are exposed at the rear of the receiver.

3-23. Grasp the bolt and operating rod and remove them from the rear of the receiver. Return the cocking handle to the forward position (Figure 3-13).

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*Note:* To lower the sear and release the bolt, you might have to pull the trigger.

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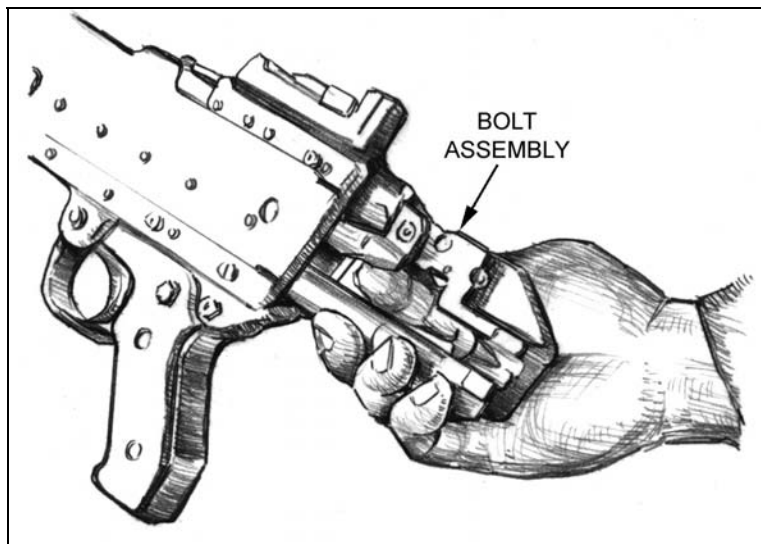


Figure 3-13. Bolt assembly.

### WARNING

Before pulling the cocking handle to the rear with the buttstock off, remove the drive spring assembly.

### Removal of the Trigger Housing Assembly

3-24. Depress spring pin and remove. You may need to use the back of the back plate of the buttstock to tap on the spring pin, then remove pin with fingers. All pins go from right to left (Figure 3-14).

3-25. Rotate the rear of the trigger-housing group assembly down, disengage the holding notch at the front of the assembly from its recess on the bottom of the receiver, and remove the assembly from the receiver (Figure 3-15).

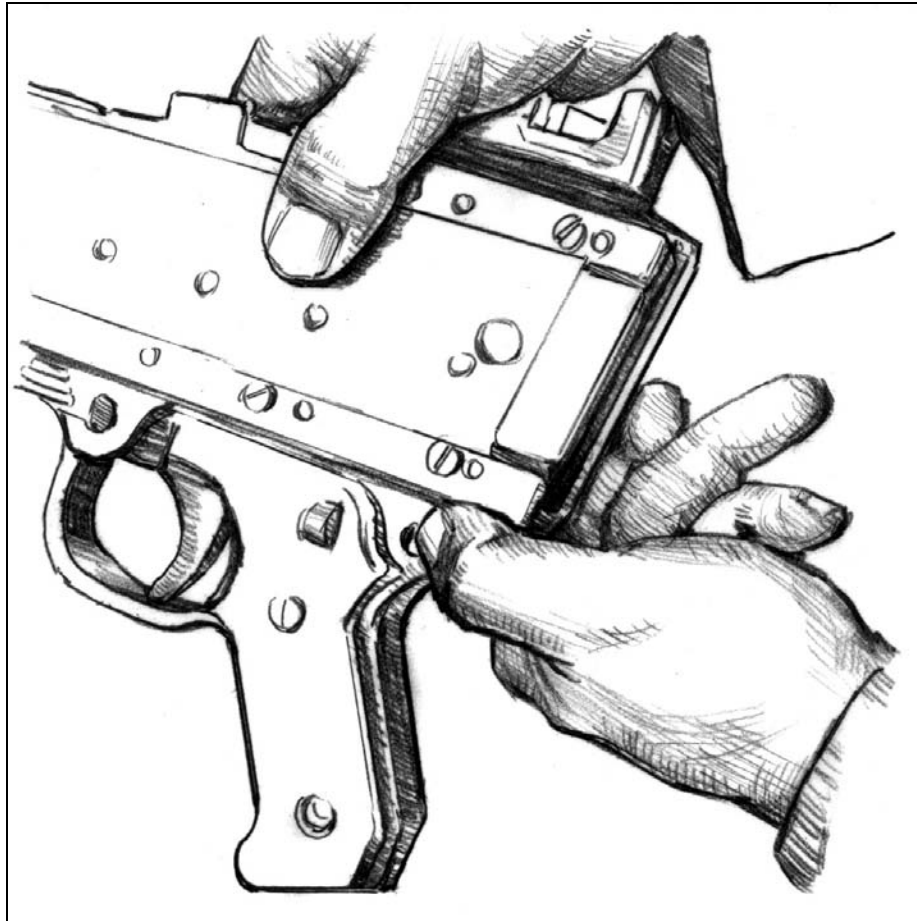


Figure 3-14. Trigger spring pin.

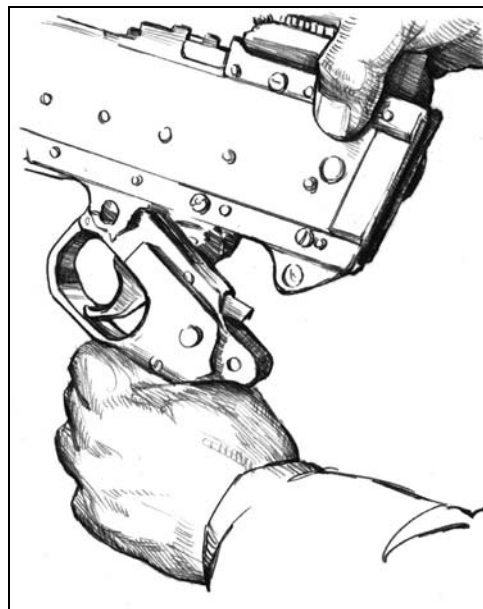


Figure 3-15. Removal of trigger housing.

### Removal of the Cover Assembly

- 3-26. Close the cover.
- 3-27. Depress and remove the spring pin (A, Figure 3-16). If needed, use the back of the back plate of the buttstock to tap on the spring pin. Then remove it with your fingers (B, Figure 3-16). (All pins go from right to left.)
- 3-28. Depress the cover latches, then lift up and remove the cover assembly (C, Figure 3-16).
- 3-29. Remove the feed tray (D, Figure 3-16).

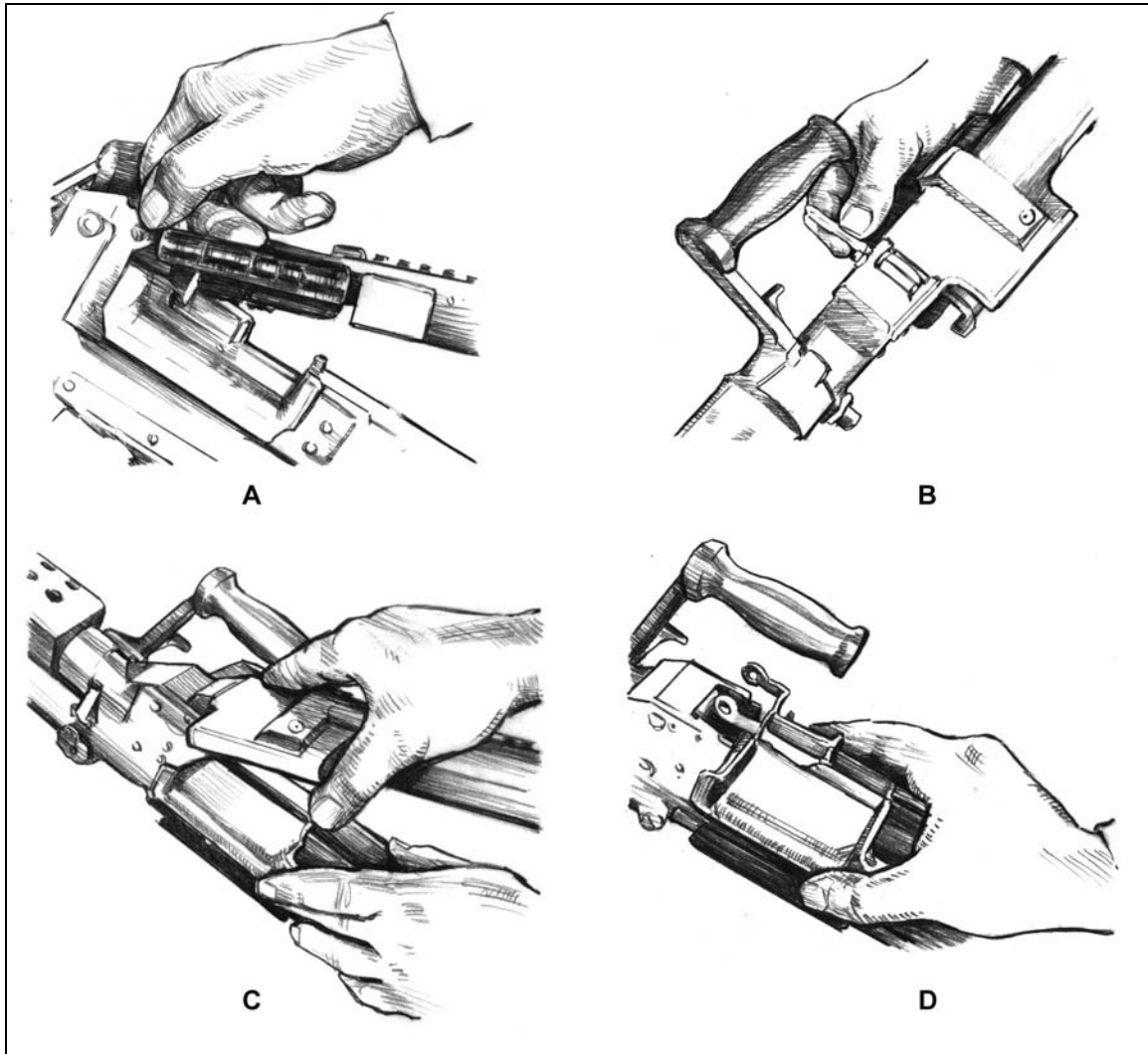


Figure 3-16. Removal of cover, feed tray, and spring pin.

### Removal of the Barrel Assembly

- 3-30. Make sure that the barrel-carrying handle is to the right side (A).
- 3-31. Depress the barrel-locking latch located on the left side of the receiver where the barrel joins the receiver and hold.

- 3-32. Grasp the barrel carrying handle and rotate the carrying handle to the upright position (without pulling up on the barrel release) (B).
- 3-33. Push forward and pull up, separating the barrel from the receiver (C) (Figure 3-17).

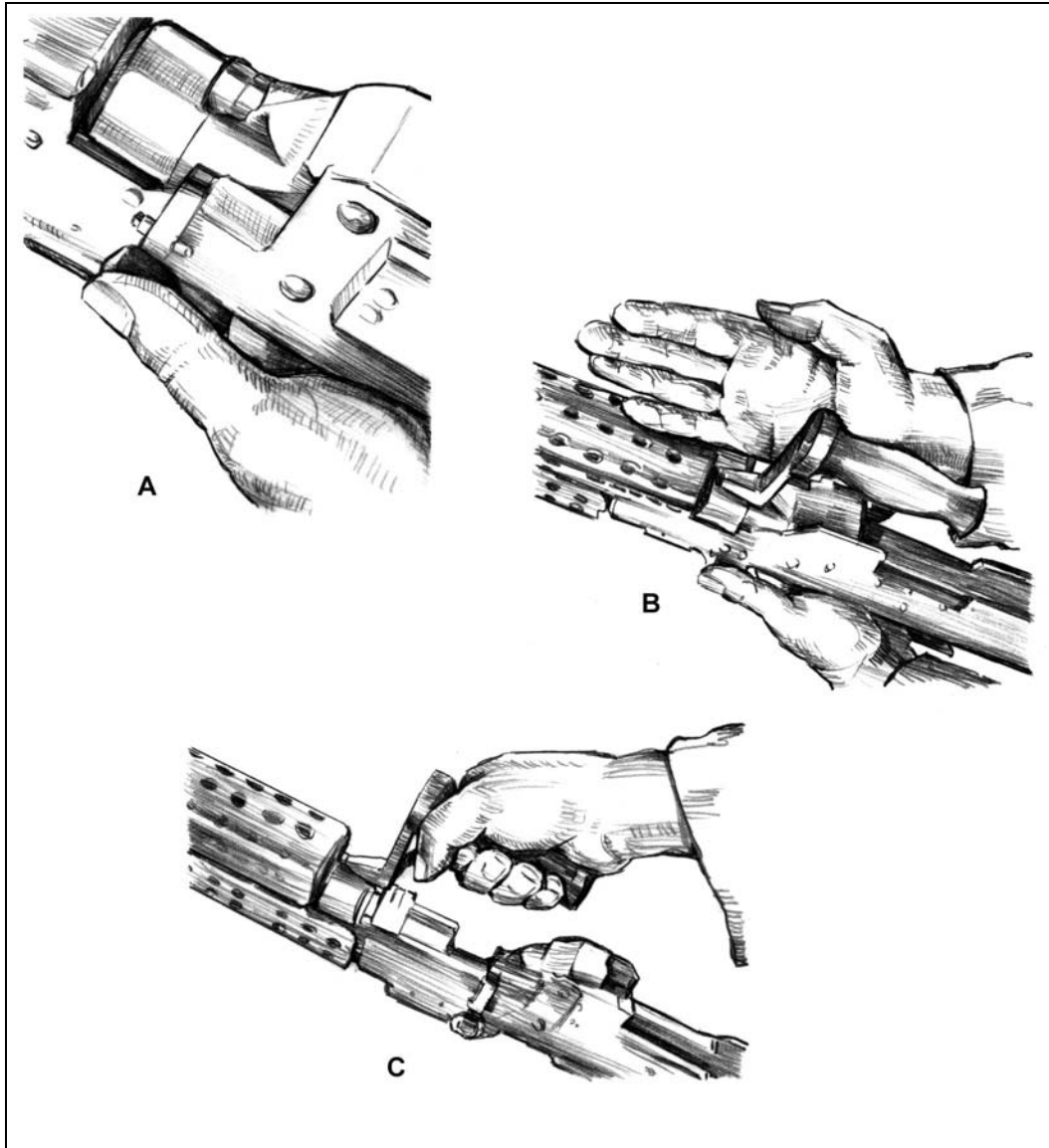


Figure 3-17. Removal of barrel.

### Disassemble the Barrel Assembly

- 3-34. Hold the barrel at the point where the gas system attaches to it (A).
- 3-35. Grasp and rotate the gas collar clockwise until it releases from the gas plug (B).
- 3-36. Remove the collar from the gas plug.
- 3-37. Slide the gas regulator plug from front to rear, removing it from the gas hole bushing (C).
- 3-38. Remove heat shield (D).

3-39. Lift the rear of heat shield assembly off the barrel, and then pry one of the front metal tabs out of hole on gas hole bushing.

3-40. Rotate the heat shield towards the other metal tab, and remove heat shield from the barrel (Figure 3-18).

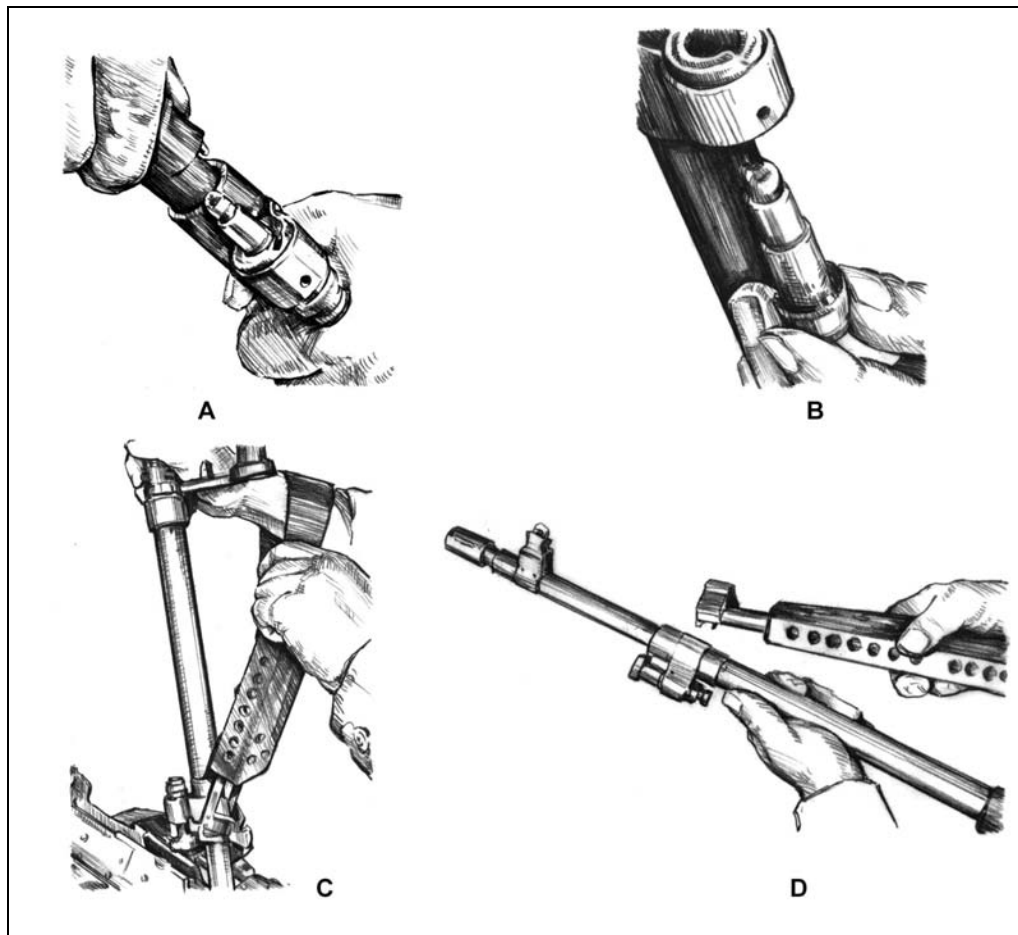


Figure 3-18. Gas regulator and collar.

## INSPECTION

3-41. Inspection begins with the weapon disassembled into its eight major assemblies. Shiny surfaces do not indicate unserviceability. The gunner inspects each area of the weapon and related equipment for the conditions indicated. Any broken or missing parts should be repaired or replaced IAW TM 9-1005-313-10. The gunner should perform PMCS every 90 days. If the gunner has not used the weapon for 90 days, he should perform the PMCS in the operator's manual regardless. If he sees rust on a weapon, he should perform PMCS immediately. He inspects all of the components for broken or missing parts; all parts for cracks, dents, burrs excessive wear, rust, or corrosion; and external surfaces for adequate finish.

### Barrel Assembly

3-42. Check the barrel for bulges, bends, burrs, obstructions and obstructions or pits in the chamber or bore.

- 3-43. Disassemble, inspect, and clean the gas collar and plug.
- 3-44. Ensure the flash suppressor is fastened securely. Inspect the front sight for damage or looseness.
- 3-45. Inspect carrying handle assembly for bent, broken, or missing parts.
- 3-46. Ensure that the heat shield is present and on the barrel assembly, that it is neither bent nor broken, and that it has all of its parts.

---

**Note:** You might see some heat distortion or charring on the outer nonmetallic portion of the heat shield. This is not cause for replacement. Never apply lubricants to composite or rubber components.

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### Buttstock and Buffer Assembly

- 3-47. Check for burrs and rough edges on mating grooves and flanges.
- 3-48. Check to ensure the back plate latch locks the buffer assembly securely to the receiver assembly when installed.
- 3-49. Ensure the buffer plug sticks out through the back plate and is flush or higher than the protrusion below it.
- 3-50. Ensure nothing rattles when he shakes the buffer, and that he cannot rotate the plug by finger pressure.
- 3-51. Inspect the butt stock for cracks.
- 3-52. Ensure the back plate locks the butt stock securely to the receiver assembly when installed.

### Drive-Spring Rod Assembly

- 3-53. Check the spring for broken strands. Ensure the rod assembly is not bent.

### BOLT AND OPERATING ROD ASSEMBLY

- 3-54. Inspect the entire area of the bolt and operating rod assembly for missing parts, broken or cracked areas, burrs, bends, or pits on the surface. Looking at the bolt, you can see if the firing pin is broken. The extractor should not move. The operating rod piston should have a slight movement from left to right (about 1/8-inch turn). When you pull the bolt and operating rod to the rear, the piston should move freely without binding.

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**Note:** If you find any damage on the bolt assembly, always turn in both barrels with the weapon.

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### Trigger Mechanism and Housing Assembly

- 3-55. Inspect the tripping lever and sear for burrs on edges. Push the tripping lever back to raise the sear, put the safety on "S," and pull the trigger. The sear should not drop down far enough to lock in the downward position. Place the safety on "F," and pull the trigger. The sear should drop down and lock in the downward position. Check the sear spring, ensuring the leg of the spring is behind the trigger pin and not between the trigger and the pin. Check grip assembly for loose or missing grip screws. Check trigger guard for bends or cracks. Check trigger spring pin for bends, and or broken or missing spring.

**Cover Assembly**

3-56. Pivot the feed lever back and forth to ensure it operates smoothly without binding. Push in on the cover latches to make sure the retaining clip is not weak or missing and that they do not bind in the housing. Push down on the cartridge guides and feed pawls to make sure the springs are not weak or missing. Inspect accessory mounting rail for nicks or burrs.

**Feed Tray**

3-57. Check for cracks, deformation, broken welds, or loose rivets.

**Handguard**

3-58. Check handguard for cracks, broken or missing parts.

**Receiver Assembly**

3-59. Check that the rear sight assembly is securely mounted to the receiver and operates properly. Check that the cocking handle operates the slide properly. Pull the cocking handle to the rear and allow it to slowly return forward, making sure that the slide does not bind in the receiver. Check for damaged or missing ejection port cover, spring, and pin. Lower and raise the bipod legs, ensuring they move freely without binding. Check bipod legs for cracks, or twisted or incomplete assembly. Check the exterior surface of the M240B for the exterior protective finish.

**Machine Gun**

3-60. Assemble the weapon. Be sure parts are installed correctly and are in good working condition. When installing the barrel, move the barrel release slowly to the right and count the number of clicks. Fewer than two and more than seven clicks indicate defective parts. Check both barrels. Check weapon functioning with belted dummy ammunition by performing a function check. If weapon does not function properly and the cause cannot be determined using troubleshooting shooting procedures, notify direct-support maintenance.

**M122A1 MOUNT**

3-61. Ensure that the traversing and elevating mechanism does not bind. The numbers on the scales and dials must be legible.

- You should hear distinct clicks when you turn the handwheels. Calibrate the index lines with the indicator-pointer.
- Ensure that the pintle fits snugly in the pintle bushing, and that the pintle lock holds the pintle securely.
- Ensure that the sleeve latch functions properly, and that the traversing bar is tight when you extend and latch the tripod legs.

**CARRYING CASE**

3-62. Ensure that all maintenance tools and equipment are complete and serviceable. Ensure the case is serviceable as well, but avoid washing it too often. Doing so could destroy the waterproofing and shrink the case.

## CLEANING AND LUBRICATING PROCEDURES AND PREVENTIVE MAINTENANCE

3-63. The gunner should clean the M240B machine gun immediately after firing. At a minimum, he should clean it after firing a basic load of 900 to 1,200 rounds. He disassembles the M240B into its major groups for cleaning. He should clean all metal components and surfaces that have been exposed to powder fouling using CLP on a bore-cleaning patch. He uses CLP on the bristles of the receiver brush to clean the receiver. After he cleans and wipes dry the M240B, he rubs a thin coat of CLP on it with a cloth. This lubricates and preserves the exposed metal parts during all normal temperature ranges.

### CAUTION

#### CLEANER, LUBRICANT, PRESERVATIVE

Use CLP alone; it mixes poorly with other cleaners.

When cleaning the barrel, keep cleaning fluid *out* of the ulator, because cleaning fluid will damage the regulator.

3-64. When cleaning the weapon, the gunner can use any of the previously mentioned cleaning and lubricating agents. As soon as possible after firing the M240B, the gunner disassembles the weapon into its eight major assemblies and cleans them as follows. Before the weapon is disassembled, ensure it is clear:

- Clean the bore using CLP or RBC and a bore brush with a cleaning rod. Do not reverse direction of the bore brush while it is in the bore.
  - Run the brush through the bore several times until most of the powder fouling and other foreign matter has been removed.
  - Swab out the bore several times using a cleaning rod and a swab wet with CLP.
  - Swab out the bore several times using a cleaning rod and a dry swab.
- Clean the chamber using CLP and a chamber brush attached to a cleaning rod.
  - Run the brush through the chamber several times until most of the powder fouling and other foreign matter has been removed.
  - Swab out the chamber several times using a cleaning rod and a swab wet with CLP.
  - Swab out the chamber several times using a cleaning rod and a dry swab.
- Clean the receiver using a receiver brush and CLP.
  - Brush the receiver until most of the powder fouling and other foreign matter is removed.
  - Swab out the receiver several times using a cleaning rod section and a swab wet with CLP.
  - Swab out the receiver several times using a cleaning rod section and a dry swab.
- Clean the gas regulator plug with special tools (cleaning reamers and combination regulator scraper). Remove all carbon dust. Do not use CLP on the collar, gas block, or body.
- Clean each gas inlet hole of the gas regulator plug. Insert the small reamer into each hole and twist back and forth to remove the carbon (apply hand pressure only) (Figure 3-19).
- Clean the central hole of the gas plug by inserting the scraper tool down to the bottom of the hole and twisting firmly (Figure 3-20).
- Clean the two grooves by inserting the scraper tool into the grooves and applying pressure as firmly as possible (Figure 3-20).



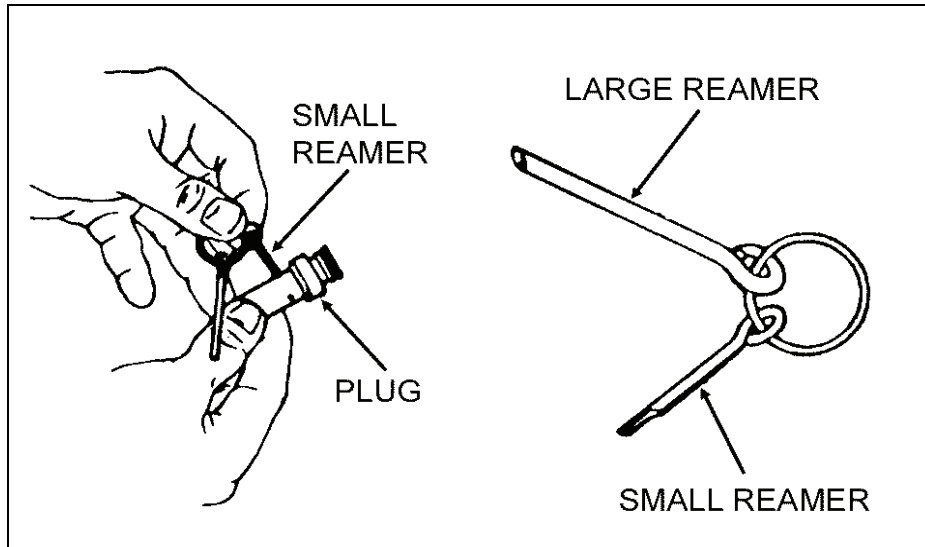


Figure 3-19. Tools for cleaning the gas regulator plug inlet holes.

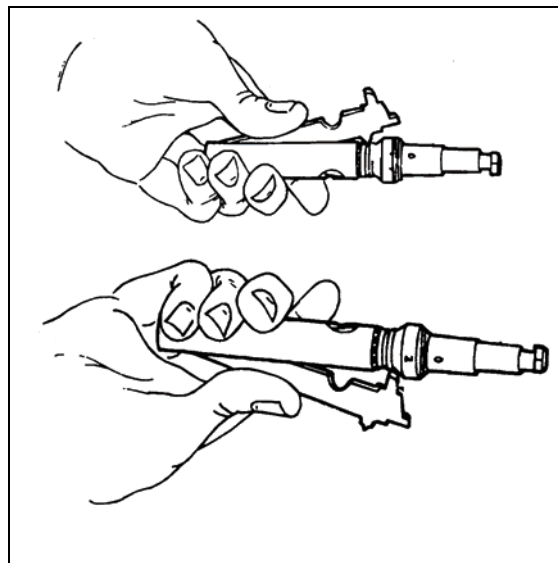
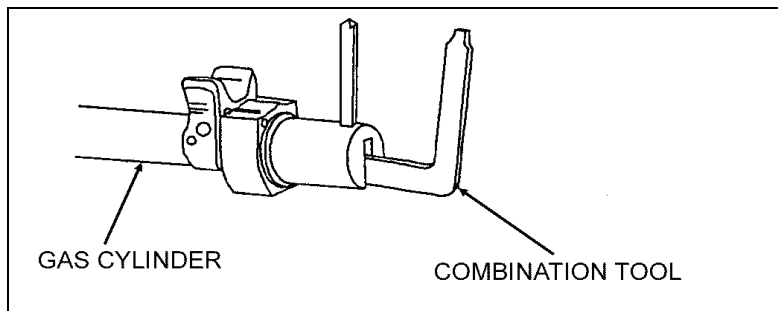


Figure 3-20. Procedure for cleaning the gas regulator plug grooves.

- 3-65. Clean the gas cylinder with the special tool scraper-extraction combination too
- 3-66. Clean the front interior of the gas cylinder by carefully inserting the combination tool, with the handle upward. Be sure the tool is fully inserted and seated against the gas cylinder. Apply slight pressure to the handles and turn clockwise to remove carbon (Figure 3-21).
- 3-67. Clean gas cylinder bore with gas cylinder cleaning brush dampened with CLP.
- 3-68. Brush the gas cylinder until you remove most of the powder fouling and other foreign matter.

**CAUTION****SCRAPER-EXTRACTOR TOOL**

Before using the scraper-extractor combination tool to clean out the gas cylinder, seat the tool fully against the fore-end of the cylinder. Scraping the cylinder without placing the tool precisely can damage the cylinder, causing gas leaks and stopping the weapon.

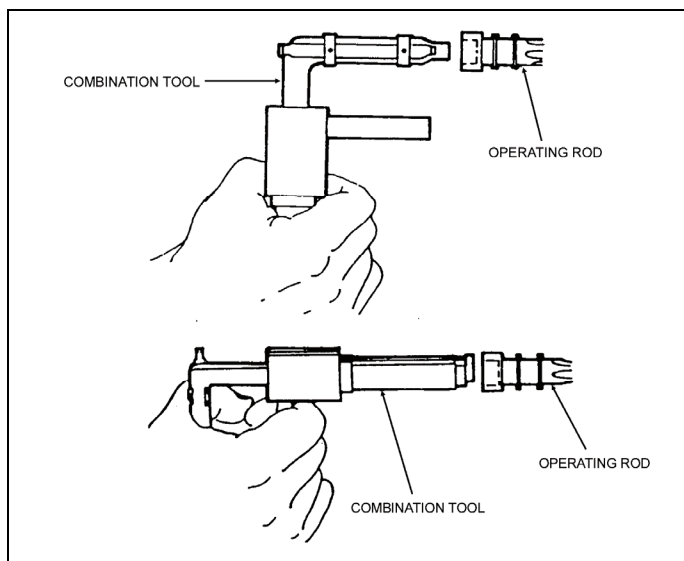


**Figure 3-21. Tool for cleaning the gas cylinder.**

3-69. Clean the bolt and operating rod with the scraper-extractor

3-70. Clean the piston head cavity by inserting the combination tool into the piston bottom of the operating rod. Squeeze handles firmly and twist the tool to remove carbon (Figure 3-22).

- Insert the screwdriver end of the tool into the piston to remove carbon residue on the bottom.
- Clean the bolt and operating rod with rag and CLP.



**Figure 3-22. Tool for cleaning the piston head cavity.**

3-71. Remember the following important points during cleaning:

- Avoid using gasoline, kerosene, benzene, shaving cream, high-pressure water, steam, or air for cleaning.

- Keep the gas hole bushing free of CLP or RBC. It must remain dry.
- During sustained fire, especially with blank ammunition, you must periodically strip and clean the extractor assembly.
- An improperly cleaned gas cylinder and gas regulator plug can stick together during firing.
- Lubricate the following parts with CLP as instructed:
  - Drive-spring rod assembly.
  - Bolt.
  - Receiver inner walls.
  - Cover assembly (springs, and feed pawls).
  - Trigger housing (inside only). After you lubricate the weapon, cycle the components by hand to spread the CLP. If you fire a weapon infrequently or store it for prolonged periods, keep a light film of CLP on it. Apply it to the inside of the gas cylinder and to the gas piston right after you clean or inspect the weapon. Do preventive maintenance every 90 days, unless your inspection reveals a need for more frequent servicing. Even when you keep a weapon lubricated, you must still clean and inspect it for corrosion. Before you use the weapon, clean the gas system and components, and ensure they are free of oil and lubricants. Clean all exposed surfaces of the M122A1 tripod, flex-mount assembly, and complete pintle and T&E mechanism. Wipe them down with a clean rag. Loosen dirt in stubborn areas (except the flex mount) with a steel or bore brush. Use a clean rag to wipe them down. Finish by lubricating them with CLP.
- In unusual conditions, clean and lubricate the M240B as follows:
  - Below 0 degrees Fahrenheit—use lubricating oil, arctic weather (LAW). Oil lightly to avoid freeze-up.
  - Extreme heat—use light coat of CLP.
  - Damp or salty air—use CLP. Clean and apply frequently.
  - Sandy or dusty areas—use CLP. Clean and apply frequently, and wipe with a clean rag after each application to remove excess.

## **GENERAL ASSEMBLY**

3-72. After cleaning, lubricating, and inspecting the weapon, the gunner assembles it and performs a function check.

### **Replacement of the Barrel Assembly**

3-73. Insert the gas-regulator plug into the gas hole bushing so that it is on the number 1 setting. At this setting, the number 1 on the regulator faces the barrel. Place the gas collar over the front end of the gas regulator plug. Push the collar against the spring and rotate the collar counterclockwise until it stops. Insert one of the metal tabs of the heat shield into the hole on the side of the gas hole bushing. Rotate the bushing so that the other tab locks into place as well. Push down on the heat shield so that it snaps onto the barrel. With the gas regulator downward and the carrying handle in the vertical position, place the barrel on the barrel support (located on the gas cylinder). Keeping the gun upright, pull the barrel to the rear, guiding the gas regulator into the gas cylinder. Pull the barrel fully into the receiver. Rotate the carrying handle completely to the right, counting the number of clicks. If the number is between 2 to 7, the headspace is set correctly. If the number falls outside 2 to 7, turn in the weapon to the unit armor. Before you do this, ensure that the threads on the barrel are located on top and bottom. On the inside of the receiver, however, they should be on the left and right (Figure 3-23).

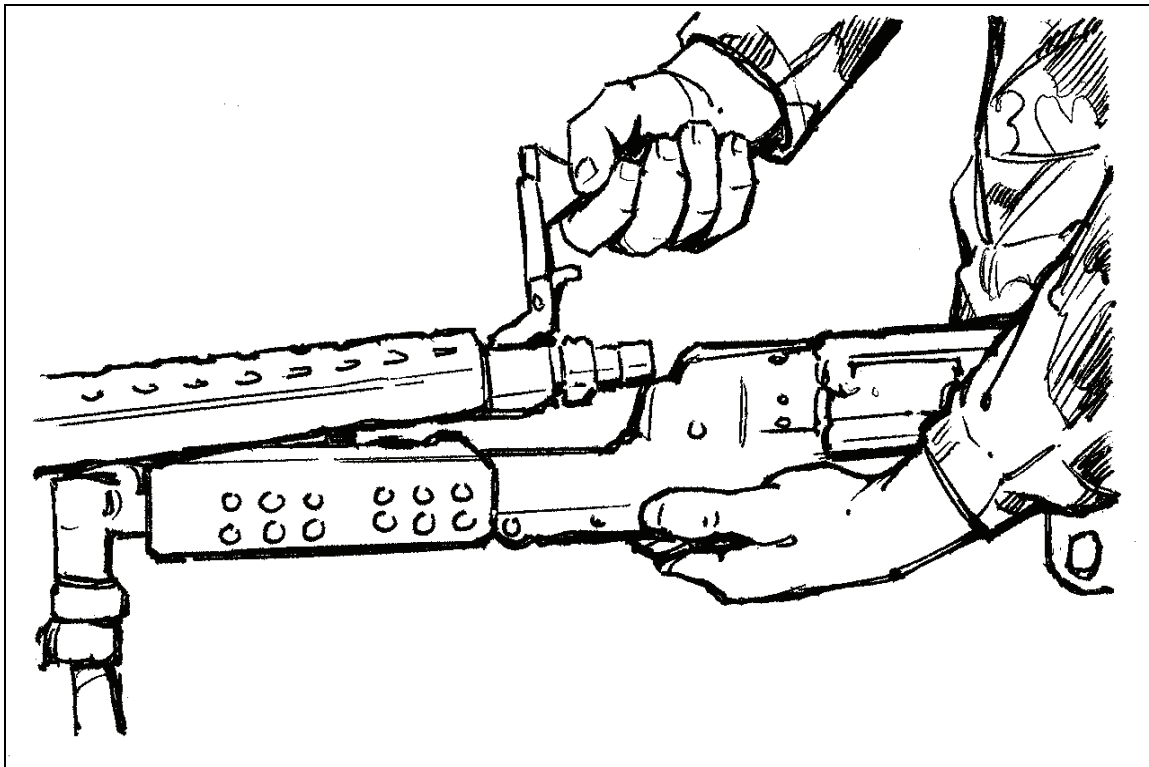


Figure 3-23. Replacement of the barrel assembly.

### Replacement of the Cover Assembly and Feed Tray

3-74. Position the feed tray on the receiver to align the feed tray guides with the receiver brackets. Place the cover assembly onto the receiver, aligning its mounting holes with the mounting brackets on the receiver, and then close the cover assembly. Then, insert the spring pin into the holes to affix the cover and feed tray to the receiver (insert the spring of the spring pin into the hole than push in from right to left).

### Replacement of the Trigger Housing Assembly

3-75. Insert the holding notch on the front of the trigger housing into the forward recess on the bottom of the receiver. Rotate the rear of the trigger housing upwards and align the holes of the trigger housing with the mounting bracket on the receiver. Hold the trigger housing assembly and insert the spring pin into the hole, securing the assembly to the receiver. Insert the spring of the spring pin into the hole than push in from right to left (Figure 3-24).

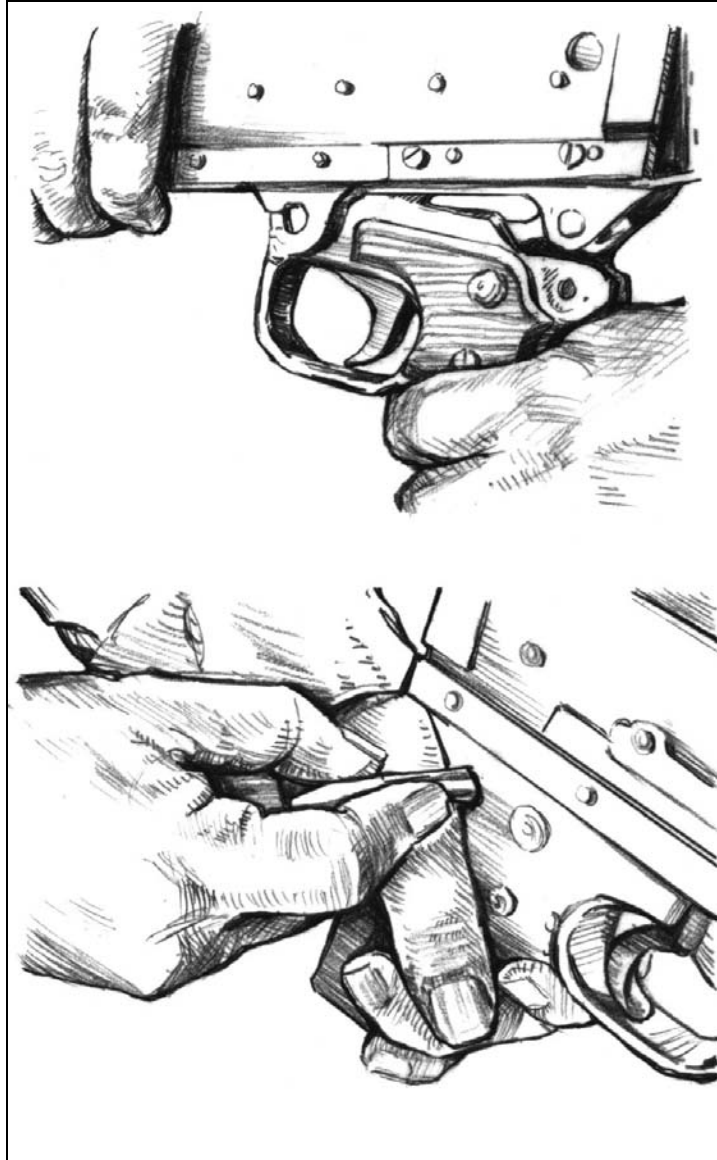


Figure 3-24. Replacement of the trigger housing assembly.

### Replacement of the Bolt and Operating Rod Assembly

3-76. Ensure that the bolt and operating rod are fully extended (unlocked position). Insert the bolt and operating rod into the rear of the receiver (bolt upward, operating rod beneath bolt) ensuring the bolt is on top of the rails located on the left and right inner walls of the receiver. Push the entire bolt and operating rod assembly into the receiver as far forward as possible. Pull the trigger to allow the sear to drop and the group to slide all the way into the receiver (Figure 3-25).

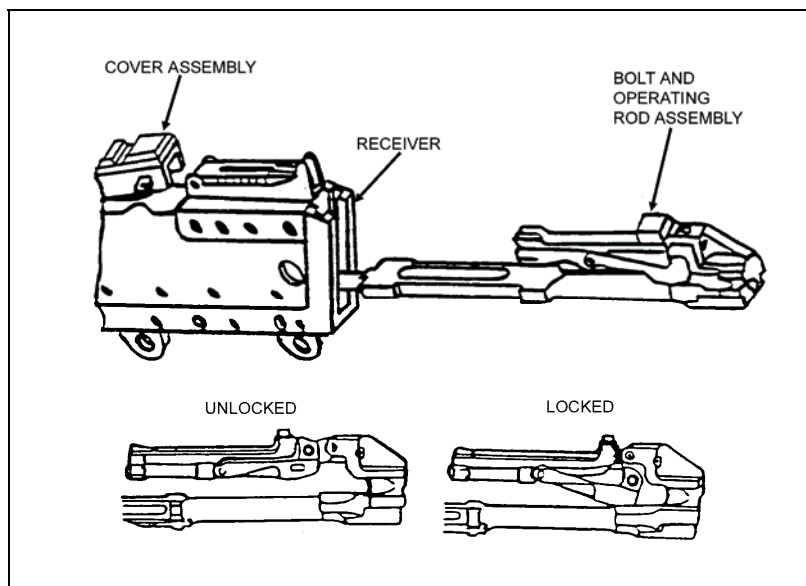


Figure 3-25. Replacement of the bolt and operating rod assembly.

### Replacement of the Drive-Spring Rod Assembly

3-77. Insert the drive-spring rod assembly into the receiver, sliding it all the way forward against the recess in the rear of the operating rod. Push in and lower the drive-spring rod assembly to engage the retaining stud into the hole located on the bottom of the receiver (Figure 3-26).

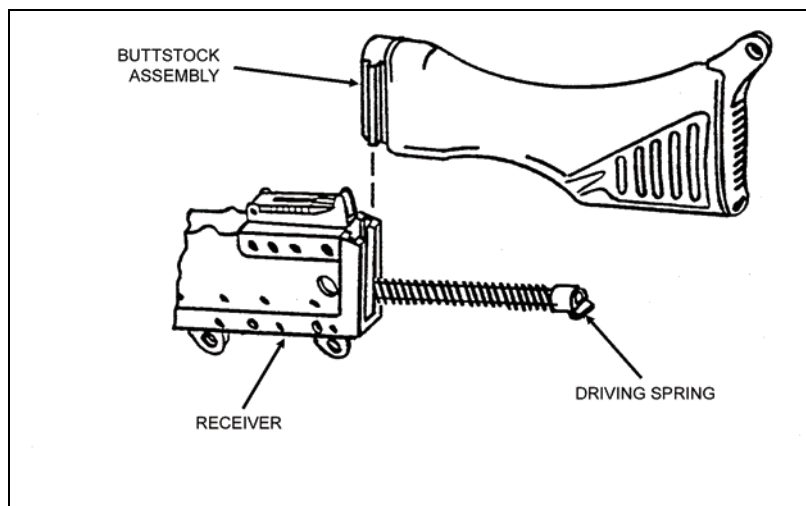


Figure 3-26. Replacement of the drive-spring rod assembly.

### Replacement of the Butt stock and Buffer Assembly

3-78. Position the bottom recess grooves of the butt stock onto the top of the receiver recess grooves. Slide the butt stock down until it locks in place on the receiver. Ensure the butt stock is secure.

### **Replacement of the Handguard**

3-79. Line the handguard on the bottom of the gas cylinder and push upwards. The handguard snaps in place.

### **FUNCTION CHECK**

3-80. The gunner must perform a function check to ensure that the M240B is correctly assembled by performing the following steps in order:

- Place the safety on “F.”
- Pull the cocking handle to the rear, locking the bolt to the rear of the receiver.
- Return the cocking handle to the forward position.
- Place the safety on “S” and close the cover.
- Pull the trigger. (Bolt should not go forward).
- Place the safety on “F.”
- Pull the cocking handle to the rear, pull the trigger, and ride the bolt forward.
- Close the ejection port cover.

### **MAINTENANCE PROCEDURES**

3-81. Maintenance of the M240B requires the gunner to take certain actions before, during, and after firing.

- Before firing—
  - Wipe the bore dry.
  - Inspect the weapon as outlined in operator’s TM.
  - Inspect the spare barrel.
  - Lubricate the weapon.
- During firing—
  - Change the barrels. Changing the barrel prolongs the life of both barrels.
  - Periodically inspect the weapon to ensure that it is properly lubricated.
  - When malfunctions or stoppages occur, follow the procedures in Section IV.
- After firing—
  - Clear and clean the weapon immediately.
  - Every 90 days during inactivity, clean and lubricate the weapon unless inspection reveals more frequent servicing is necessary (TM 9-1005-313-10).

### **MAINTENANCE IN CHEMICAL, BIOLOGICAL, RADIOLOGICAL, OR NUCLEAR CONDITIONS**

3-82. If the M240B is contaminated by chemical, biological, or radiological (nuclear) agents, the gunner takes appropriate action to reduce exposure and minimize penetration.

#### **CHEMICAL**

3-83. Use towelettes from the M258A1 kit to wipe off the weapon. If these are unavailable, wash the weapon with soap and water.

## BIOLOGICAL

3-84. Use towelettes or soap and water as previously described.

## RADIOLOGICAL OR NUCLEAR

3-85. Wipe the weapon with warm soapy water if it is available. If not, use towelettes or rags. (For more details, see FM 3-5.)

# SECTION III. OPERATION AND FUNCTION

This section discusses the operation of the M240B machine gun. This includes loading, unloading, cycle of functioning, adjustment of the sights, and use of both the bipod and tripod.

## OPERATION

3-86. The gunner loads the M240B machine gun from the closed bolt position. He fires, unloads, and clears it from the open bolt position. Before he can pull the bolt to the rear, he must first place the safety on "F." Before he can fire belted ammunition, he must first link it with the double link at the open end of the bandoleer. He must ensure that it is free of dirt and corrosion. The M240B machine gun usually works best when fired from a tripod, which makes the most of this gun's continuous, accurate fire and control manipulation. However, if needed, the gunner may use the bipod mount.

## LOADING PROCEDURES

3-87. The gunner makes sure the weapon is clear. He places the safety on "F." With his palm facing up, he pulls the cocking handle to the rear. This puts the bolt assembly in the rear position. While the sear holds the bolt to the rear, the gunner manually returns the cocking handle to the forward position and places the safety on "S." He raises the cover assembly and ensures the feed tray, receiver assembly, and chamber are clear. He lowers the feed tray, places the safety on "F," and pulls the cocking handle to the rear. While maintaining rearward pressure on the cocking handle, he pulls the trigger and eases the bolt assembly forward. He places the first round of the belt in the feed tray groove with the double link leading, and with the open side of links face down. While closing the cover assembly, he holds the belt about six rounds from the loading end. *Ensure that the round remains in the feed tray groove, and close the cover assembly* (Figure 3-27).



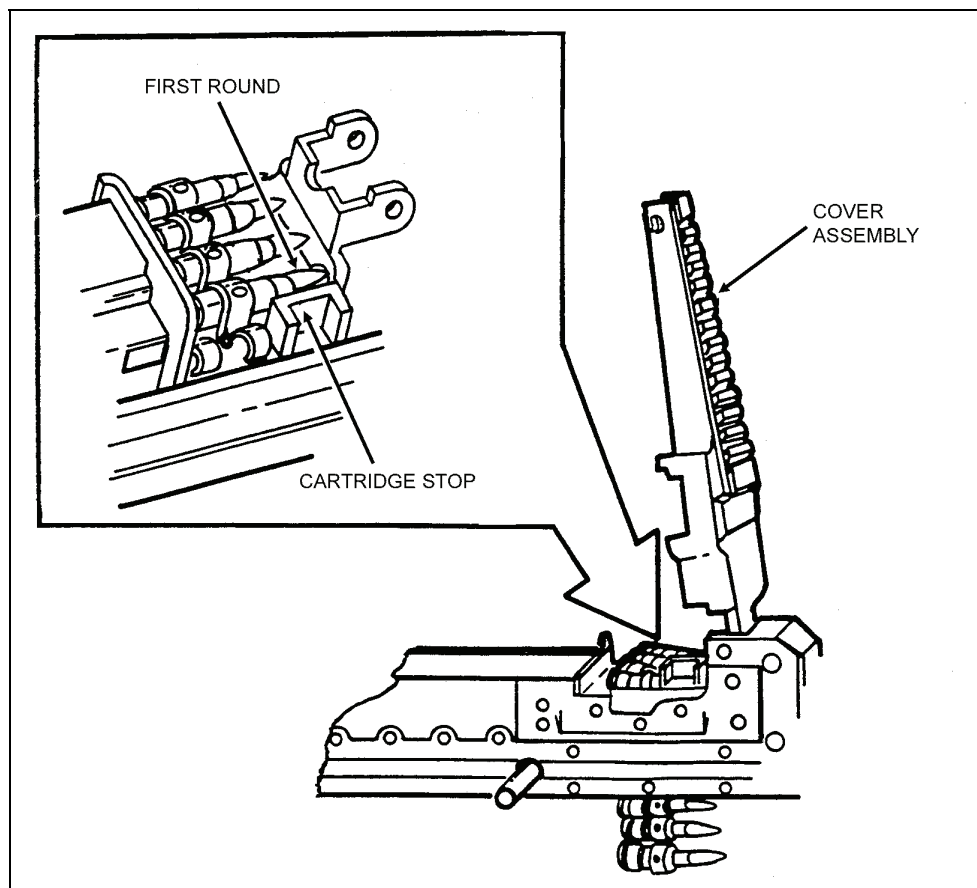


Figure 3-27. Loading procedures.

## UNLOADING PROCEDURES

3-88. The gunner unloads the M240B by pulling and locking the bolt to the rear position, if it is not already there. He manually returns the cocking handle to its forward position. He places the safety on "S." He raises the cover assembly and removes any ammunition or links from the feed tray. He performs the four-point safety check (Section III).

## CYCLE OF FUNCTIONING

3-89. Crewmembers can recognize and correct stoppages when they know how the weapon functions. The weapon functions automatically as long as ammunition is fed into it and the trigger is held to the rear. Each time the gunner fires a round, the parts of the weapon function in a cycle or sequence. Many of the actions occur at the same time. (This paragraph discusses these actions separately only for teaching purposes.) This sequence is called the "cycle of functioning," which starts when the gunner places the first round of the belt in the tray groove. Then he pulls the trigger, releasing the sear from the sear notch. When he pulls the trigger, the back of the sear lowers and disengages from the sear notch. This allows the expansion of the drive-spring rod assembly to drive the bolt and operating rod assembly forward. The cycle stops when the gunner releases the trigger and the sear again engages the sear notch on the bolt and operating rod assembly:

**Feeding**

3-90. The actuating roller moves the feed lever side to side, which in turn moves the feed pawls. The forward movement of the bolt forces the outer pawls to the right, fully feeding the round. The inner pawl rides over the round and settles behind it. The rearward movement forces the inner pawl to the right, fully feeding the round. The action of fully feeding a round pushes the link of a fired round out of the side of the gun. The gunner cannot push out the last link in a belt, so he must clear it while unloading.

**CHAMBERING**

3-91. The gunner positions the first round in line with the chamber. The cartridge stop and cartridge guide pawl hold it in position. When the gunner squeezes the trigger, the nose of the sear depresses, which frees the piston rod extension. The drive-spring rod assembly pushes the working parts forward. The feed horn strikes the base of the round. The bolt strips the round from the belt link. The chambering ramp angles downward and, along with the spring tension of the cartridge guide pawl, forces the round toward the chamber. The cartridge guide pawl also holds back the belt link. When the round seats fully in the chamber, the extractor snaps over the extractor rim of the cartridge, and the ejector depresses.

**LOCKING**

3-92. During chambering, as soon as the piston begins to move, the firing pin is withdrawn into the bolt block. The breech remains locked during the primary movement. The bolt enters the barrel breech as the drive spring drives the operating rod forward, and as the locking lever, which the bolt is riding on, swings forward, pushing the bolt forward and locking it to the barrel breech. Although the term “locking” is used here, in the M240B, the bolt and barrel do not physically interlock. This way, the barrel can be removed when the bolt is forward.

**FIRING**

3-93. As the working parts come forward and the round feeds into the chamber, the locking cams force the locking lever down. This slows the forward movement of the bolt assembly. The piston rod extension, still moving forward, causes the locking lever link to rotate downward and back. This forces the arms down to their fullest extent in front of the locking shoulder. The extractor rises over the base of the round and the ejector is compressed. The round is now fully home with the breech locked. The final forward movement of the piston extension drives the firing pin through the bolt assembly onto the cartridge primer and fires the round. The working parts are now fully forward.

**UNLOCKING**

3-94. When the gunner fires a round, some of the gasses pass through the gas plug regulator into the gas cylinder. The rapidly expanding gases enter the hollow end cap of the gas piston and force the operating assembly to the rear. This powers the last four steps in the cycle of functioning. During the primary movement of the operating rod assembly, it moves independently of the bolt for a short distance. At this point, the locking lever begins to swing toward the rear, carrying the bolt with it into its unlocked position, and clearing the barrel breech. When the bolt assembly has been jerked back, slightly enough to unlock the breech, the primary effort is extraction of the empty case.

**EXTRACTING**

3-95. When the breech is fully unlocked and the bolt assembly starts its rearward movement, the extractor withdraws the empty case from the chamber.

## EJECTING

3-96. As the cartridge case is withdrawn from the chamber, the ejector pushes from the top, and the extractor pulls from the bottom. The casing falls down from the face of the bolt as soon as it reaches the cartridge-ejection port. The empty belt links are forced out the link ejection port as the rearward movement of the bolt causes the next round to be positioned in the tray groove.

## COCKING

3-97. As the working parts continue toward the rear, the return spring compresses and the gunner maintains his trigger squeeze. The gas regulator adjustment makes sufficient gas available, which causes the working parts to rebound off the buffer; continuing the cycle of feeding and firing continues. When the gunner releases the trigger, the sear remains down, but the tripping lever rises. As the working parts come to the rear, the end of the piston rod extension hits the tripping lever, which, in turn, allows the sear to rise and engage the sear notch, which holds the working parts to the rear.

## SIGHTS

3-98. This paragraph provides information on how to make corrections if the initial setting is not accurate. At a 10-meter target, each paster is 1 cm. Therefore, ten clicks on the adjusting screw (windage) of the front sight assembly in either direction moves the strike of the round left or right 1 cm. One complete turn on the front sight blade moves the strike of the round up or down 1 centimeter. (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

## ELEVATION CORRECTION

3-99. If the shot group is above or below the point of aim, the gunner must use the front sight-adjusting tool to adjust the front sight posts. Unlock the front-sight retaining strap and rotate it up. If the shot group is above the point of aim, rotate the sight post counterclockwise. If the shot group is below the point of aim, rotate the sight post clockwise. Rotating the front sight post counterclockwise brings the point of impact *down* on the target. Rotating the front sight post clockwise brings the point of impact *up* on the target. At a range of 10 meters, one-half turn of the front sight post blade will move the point of impact by 5 mm or .5 cm. One full turn of the front sight post blade moves the point of impact by 1 cm. After rotating the front sight post blade the desired amount, lower the retaining strap, but *do not* lock it down until you confirm the elevation. If you have to rotate the front sight post blade must be rotated counterclockwise to a point where its base is past flush (Number 2 blade), it should be replaced with a Number 1 front sight blade, which is smaller than a Number 2 blade. If the front sight post blade must be rotated counterclockwise to a point where its base is more than one full turn past flush (Number 1 blade), it should be replaced with a Number 2 front sight blade, which is taller than a Number 1 blade (Table 3-4).

## WINDAGE CORRECTION

3-100. If the shot group is to the left of the point aim, move the front sight assembly to the right to shift the point of impact to the left (towards the point of aim). Using the front sight-adjusting tool, loosen (turn counterclockwise) the adjusting screw on the front sight assembly the desired amount. Then tighten (turn clockwise) the opposite side screw on the left *exactly* the same number of clicks. At a range of 10 meters, one complete rotation of the adjusting screws will move the point of impact 8 mm or .8 cm. As you turn the adjusting screws, you should detect eight clicks per revolution. Each click should be 1 mm or .1 cm. If not, have your armorer repair it. The front sight windage adjusting procedure is the combination of creating slack on one side, and then taking up that slack from the opposite side. You should always clamp the front sight protector assembly between the heads of the two opposing screws. *Remember, each time you loosen or back off one screw, you must turn the opposite screw must be turned exactly the same amount.* Check for play in the front sight assembly by lightly clamping it between finger and thumb and attempting to

move the sight assembly laterally. If you feel no play, the windage adjustment is completed. If evident, *carefully* check both screws for looseness (Table 3-5).

### 10-METER ZEROING (MECHANICAL ZERO)

3-101. Ten-meter zero (mechanical zero) is the standardized starting point for all weapons in the United States Army. The gunner places the range scale on a range of 500 meters on the rear sight. He gets the front sight post blade approximately centered for both elevation and windage. The gunner identifies what number blade is on the weapon for elevation.

#### *Number 1 blade (low 9.8mm)*

3-102. Unlock the retaining strap and unscrew (counterclockwise) until the base of the blade is flush with the front sight protector surface, then make one full turn (counterclockwise). This should put the base of the blade past the base of the protector. Screw in (clockwise), counting the number of turns it takes until it stops, making sure the blade is on line with the barrel. If needed, back off until the blade is on line. Unscrew (counterclockwise) half the number of turns. This brings the blade to about the center.

#### *Number 2 blade (high 11.8mm)*

3-103. Unlock the retaining strap and unscrew (counterclockwise) until the base of the blade is flush with the front sight protector surface. Screw in (clockwise), counting the number of turns it takes until it stops, making sure the blade is on line with the barrel. If needed, back off until the blade is on line. Unscrew (counterclockwise) half the number of turns. This brings the blade to about the center. Assume the prone position and sight on the target. Adjust windage by ensuring that the front sight protector is centered left and right on its base.

<b>At This Range</b>	<b>One Full Turn Moves Strike Up Or Down...</b>	
	<b>Centimeters</b>	<b>or Inches</b>
100 meters	10.8	4.25
200 meters	21.6	8.50
300 meters	32.4	12.75
400 meters	43.2	17.00
500 meters	54.0	21.25
600 meters	64.8	25.50
700 meters	75.6	29.75
800 meters	86.4	34.00
900 meters	97.2	38.25

**Table 3-4. Elevation correction chart.**

<i>At This Range</i>	<i>One Full Turn Moves Strike Up Or Down...</i>	
	<i>Centimeters</i>	<i>or Inches</i>
100 meters	8.0	3.15
200 meters	16.0	6.30
300 meters	24.0	9.45
400 meters	32.0	12.60
500 meters	40.0	15.75
600 meters	48.0	18.90
700 meters	56.0	22.00
800 meters	64.0	25.20
900 meters	72.0	28.35

Table 3-5. Windage correction chart.

## M122A1 TRIPOD

3-104. The M122A1 tripod provides a stable mount for the M240B, and it permits accuracy and control. This tripod is recommended for marksmanship training and defensive employment. The M122A1 tripod consists of the tripod, and flex-mount with T&E mechanism. When available, the gunner can use the M192 lightweight ground mount (tripod; Appendix C.) (Appendix A provides more detailed information about employment.)

## MOUNTING THE M240B ON THE TRIPOD

3-105. The tripod assembly provides a stable and relatively lightweight base that is far superior to the bipod. The tripod may be extended and collapsed without difficulty. It consists of a tripod head, one front leg and two rear legs, and traversing bar. The traversing bar connects the two rear legs. It is hinged on one side, and has a sleeve and sleeve latch on the other that allows the tripod to collapse to a closed position for carrying or storage, or to lock in an open, extended position for use. The traversing bar also supports the T&E mechanism. The increments are numbered every 100 mils to 425 mils right of center. On the bar, there is a scale that measures direction in mils. It is graduated in 5-mil increments and numbered every 100 mils to 450 mils left of the center.

- The T&E mechanism provides controlled manipulation and the ability to engage predetermined targets.
  - The traversing portion of the mechanism consists of the traversing handwheel and traversing slide-lock-lever. As the traversing handwheel is turned, the muzzle of the weapon turns to the left or right depending on the direction it is turned. Each click of the traversing handwheel indicates a 1-mil change in direction of the muzzle: one click equals 1 mil. There is a total of 100-mils traverse (50 mils right and 50 mils left of center).
  - The elevating portion of the mechanism consists of the elevating handwheel. The elevating handwheel has a mil-click device built into it (1 click equals 1 mil). Engraved into the handwheel is a scale divided into 5-mil divisions and 1-mil subdivisions for a total of 50-mil increments. There are 200 mils above and 200 mils below the zero mark for a total of 400 mils in elevation change. Elevation readings are taken in two parts. Take the major reading from the elevation screw plate and the minor reading from the handwheel. When you record them, record these two readings separately.

- The traversing slide-lock-lever allows rapid lateral adjustments along the traversing bar. Direction readings are taken from the scale on the traversing bar, using the left side of the traversing slide as an index. The direction of the reading comes from the position of the muzzle, not the position of the slide.
- The flex-mount consists of the mount itself and the traversing and elevating mechanism. It joins the weapon and the T&E mechanism to the tripod. The flex-mount enhances the stability of the tripod platform and dampens the recoil of the weapon.
- To setup the tripod, the gunner unfolds the front leg and spreads the rear legs until the leg lock engages (Figure 3-28).

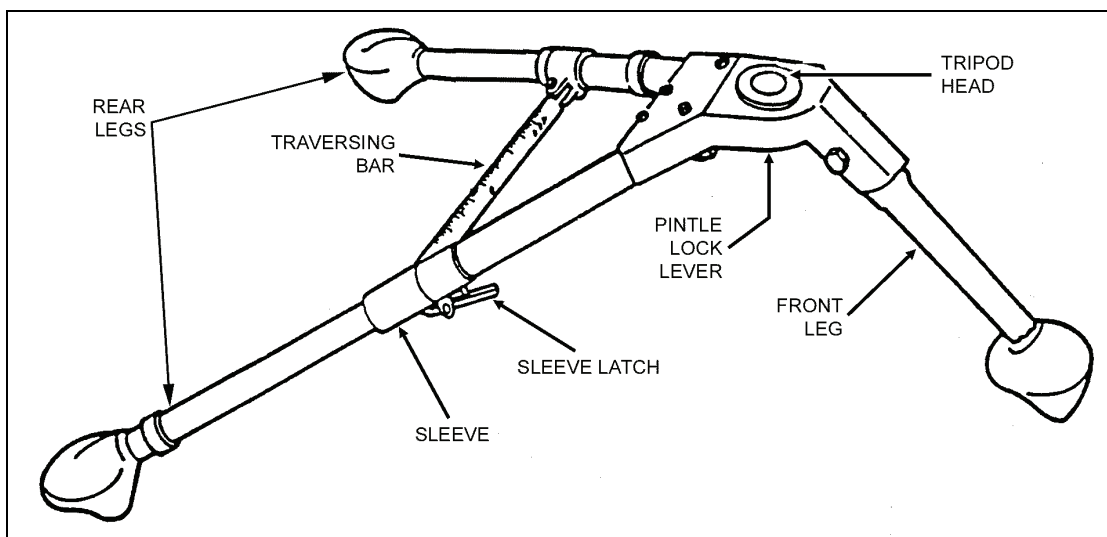


Figure 3-28. M122A1 tripod extended.

- Prepare the T&E mechanism for mounting. Center the elevating and traversing handwheel. To do this, rotate the elevation handwheel until about 1 1/2 inches (two fingers) are visible on the upper elevating screw; rotating the traversing slide until approximately two fingers are visible on the lower elevating screw. The gunner rotates the traversing handwheel towards his body as far as it will go, then turns it away two complete revolutions. Check the traversing handwheel scale to ensure the "0" on the scale is aligned with the "0" index line before and after the two revolutions. The T&E should be centered now (Figure 3-29).
- Mount the T&E mechanism, pintle assembly, and fork assembly to the M122A1 tripod. With the T&E roughly centered, place the pintle assembly (1, Figure 3-29) into the sleeve bushing on the tripod leg assembly (2, Figure 3-29). Release the pintle lock (3, Figure 3-29) on the tripod leg assembly to secure the pintle assembly to the tripod.

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**Note:** The deflector on the fork assembly should deflect to the right.

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- Align the holes in the fork assembly (4, Figure 3-29) with the holes in the T&E (5, Figure 3-29). Insert the pin (6, Figure 3-29) through the fork assembly and the T&E and secure with "C" clamps (7, Figure 3-29).
- Mount the weapon on the M122A1 tripod assembly (Figure 3-29). Tilt the muzzle down slightly and insert the weapon's front receiver bushing (1, Figure 3-29) into the slots in the pintle assembly (2, Figure 3-29). Insert the quick-release pin (3, Figure 3-29) through the

pintle (2, Figure 3-29) and front receiver bushing (1, Figure 3-29). Place the T&E assembly (5, Figure 3-29, with fork assembly attached) onto the traverse bar (8, Figure 3-29) of the tripod leg assembly (2, Figure 3-29). Lock the T&E mechanism into place by turning the lock lever (9, Figure 3-29) clockwise. Lower the rear of the weapon into the fork assembly (4, Figure 3-29). Align the mounting holes (5, Figure 3-29) in the trigger housing with the hole in the fork assembly (4, Figure 3-29). Insert the spring pin (6, Figure 3-29) through the holes in the trigger assembly and fork but make sure the weapon is securely attached.

### **DISMOUNTING THE M240B FROM THE M122A1 TRIPOD**

3-106. The gunner dismounts the M240B from the M122A1 tripod by first removing the spring pin from the fork assembly, and then he disengages the quick-release pin from the pintle and the front receiver bushing. Now, he raises the weapon up and off the tripod assembly.

### **BIPOD OPERATION**

3-107. The bipod assembly is used to fire from the prone position. The buttstock in conjunction with the gunner's nonfiring hand provides support for the weapon when firing in the bipod mode. The gas cylinder holds the bipod in place.

- To lower the bipod legs, the gunner depresses the bipod-retaining latch, while holding the bipod legs together to disengage from slots in the receiver. Then rotate the bipod legs down and release them so they lock in the vertical position. The bipod legs of the M240B do not extend (Figure 3-30).
- To return the bipod to the locked upright position, the gunner holds the bipod legs together to disengage them from the locked vertical position. Then he rotates the bipod legs rearward, depressing the bipod-retaining latch, and engage the bipod leg hooks into the slots of the receiver. The bipod-retaining latch will return to its original position, locking the bipod legs into position.

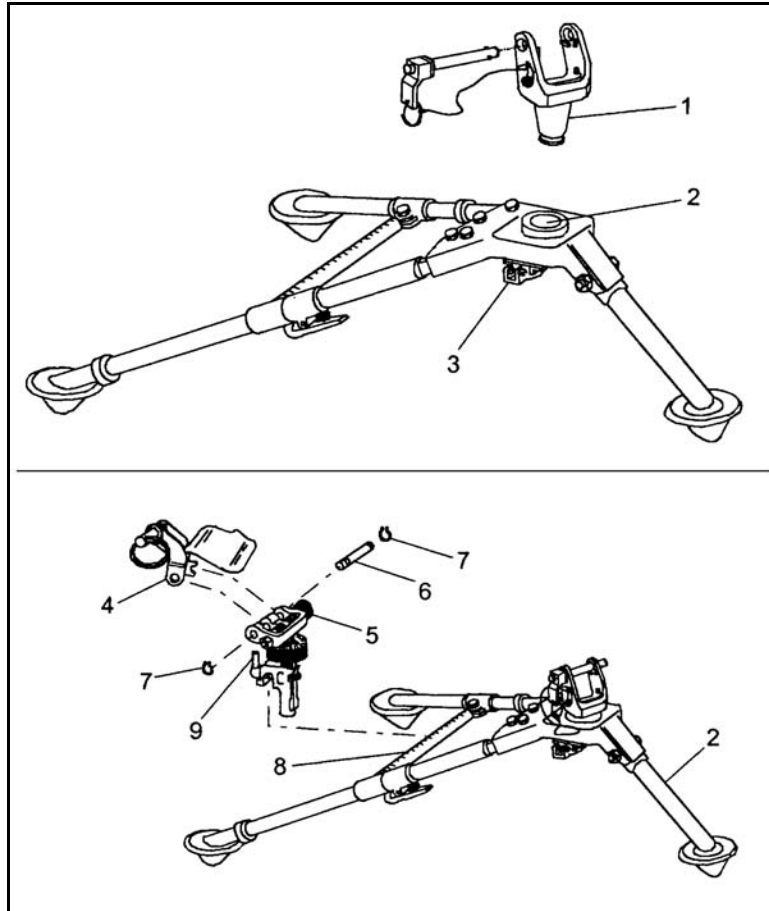


Figure 3-29. Mounting of the M240B on the M122A1.

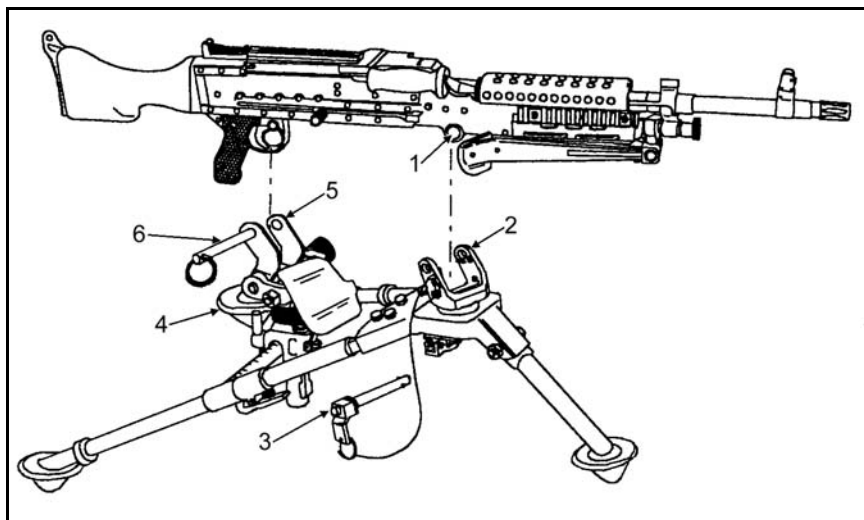


Figure 3-30. Lowering of the bipod.



## VEHICULAR MOUNT

3-108. The M7 HMMWV pedestal and platform mount (Figure 3-31) replaces the M4 and M6 mounts. It gives the gunner more control while firing. It mounts easily on the M998, M1038, and M1097 HMMWVs. It is used with three weapons: the M240B machine gun, the MK 19 grenade machine gun, and the M249 SAW in the machine gun role.

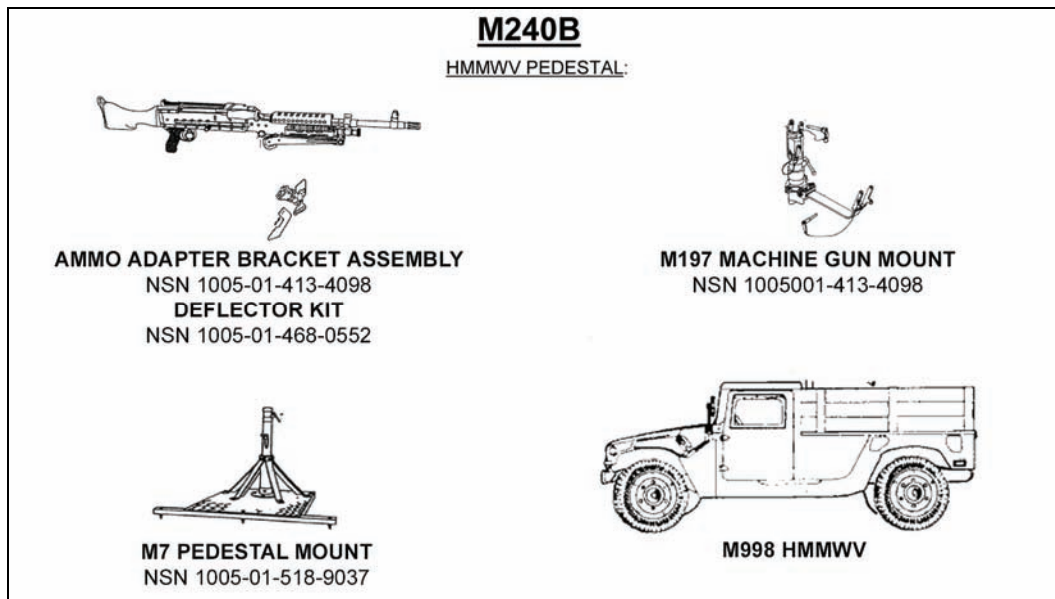


Figure 3-31. M7 HMMWV pedestal and platform mount.

## COMPONENTS

3-109. The M7 HMMWV pedestal and platform mount consists of--

- The pedestal and column assembly (NSN 1005-01-518-9037),
- The ammunition adapter (NSN 1005-01-431-8324),
- A deflector kit (NSN 1005-01-468-0552),
- The platform mount, floor plate assembly, securing pins, and depression stop (NSN 1005-01-413-4098).

## MOUNTING PROCEDURES

3-110. To mount the weapon on the M7 pedestal, the gunner--

- Places the weapon's bipod legs down in the locked position.
- Pulls out and holds the spring pin on the cam follower.
- Slides the cam follower under the forward rail assembly.
- Aligns the forward mounting holes of the weapon with the cam follower.
- Releases the spring pin to lock the weapon to the mount.
- Positions the weapon with the cam follower attached over the pintle.
- Aligns the rear mounting holes of the cam follower and weapon with the pintle.
- Inserts the quick release pin.

## DISMOUNTING PROCEDURES

- 3-111. To dismount the weapon, the gunner--
- Takes out the quick release pin.
  - Grasps the carrying handle with one hand.
  - Raises the rear of the weapon slightly.
  - Lifts the weapon from the mount.

## TRIPOD OPERATION

3-112. The M122A1 tripod provides a stable mount for the M240B, and it permits a high degree of accuracy and control. The gunner unfolds the front leg and positions it toward the target and spreads the rear legs until the leg lock engages. When available, the gunner can use the M192 lightweight ground mount (tripod; Appendix C.) (Appendix A provides more detailed information about employment.)

## SECTION IV. PERFORMANCE PROBLEMS AND DESTRUCTION

This section identifies some of the problems that cause the weapon to perform improperly. It also explains how to identify unserviceable parts, and how to destroy the M240B when authorized to do so.

## MALFUNCTIONS

3-113. A malfunction occurs when a *mechanical failure* causes the *weapon to fire improperly*. Defective ammunition or improper operation by the gunner is not considered a malfunction. Sluggish operation and uncontrolled fire are the most common malfunction. If cleaning and lubricating the weapon fails to fix the problem, then the gunner turns it in to the unit armorer. Table 3-6 shows malfunctions, their probable causes, and the corrective actions.

<i>Malfunctions</i>	<i>Probable Causes</i>	<i>Corrective Actions</i>
Sluggish operation on gas regulator.	Carbon build-up.	Clean gas regulator.
Uncontrolled fire (runaway gun).	Broken or stuck trigger.	Replace trigger.
	Stuck sear.	Replace sear.
	Broken or damaged sear spring	Replace sear spring.

**Table 3-6. Malfunctions.**

## UNCONTROLLED FIRE (RUNAWAY GUN)

3-114. Uncontrolled fire (the weapon continues to fire after the gunner releases the trigger). This is usually caused by the gunner's failure to pull and hold the trigger all the way to the rear. The following are immediate actions for uncontrolled fire:

- The gunner holds the weapon on target and fires the remaining ammunition.
- The assistant gunner stops the weapon from firing by breaking the belt of ammunition.
- The gunner as a last resort pulls the cocking handle to the rear thus, locking the bolt to the rear of the receiver.

## SLUGGISH OPERATION

3-115. Sluggish operation is due to excessive friction caused by carbon build-up, improper lubrication, or burred parts. Corrective action includes cleaning, lubricating inspecting, and replacing worn parts. The gunner may adjust the gas regulator to maintain the rate of fire until he has a chance to clean the machine gun.

## STOPPAGES

3-116. A stoppage is any *interruption* in the cycle of functioning caused by *faulty action* of the weapon or *faulty ammunition*. Stoppages are classified by their relationship to the cycle of functioning. Table 3-7 shows types of interruptions or stoppages, their probable causes, and the corrective actions.

<i>Stoppage</i>	<i>Probable Cause</i>	<i>Corrective Action</i>
Failure to feed.	Insufficient gas pressure	Clean gas port, inserts, and gas plug.
	Improper lubrication	
	Defective links or ammunition	
	Ammunition belt installed wrong	
	Damaged or weak feed pawls and springs or feed lever.	
	Obstruction in receiver	
	Damaged or weak feed pawls	
	Defective links or ammunition	
Failure to chamber.	Ruptured cartridge case	Remove IAW TM 9-1005-313-10.
	Damaged drive-spring rod assembly.	Replace drive-spring rod assembly.
	Damaged gas plug or collar (cracks or burrs).	Replace gas plug/collar.
	Built-up carbon on gas plug or collar, gas cylinder, or piston; or dirty chamber.	Remove carbon and clean IAW TM 9-1005-313-10.
Failure to extract.	Broken extractor or spring	Replace.
	Chipped or broken extractor	Replace.
	Defective extractor plunger	Replace.
	Insufficient gas pressure	Clean and lubricate as required.
Failure to lock.	Dirty chamber	Clean IAW TM 9-1005-313-10.
	Dirty receiver or lack of lubrication	Clean and lubricate IAW TM 9-1005-313-10.
	Insufficient gas pressure	Clean gas regulator.
Failure to fire.	Faulty ammunition	Replace.
	Broken or damaged firing pin or defective trigger.	Replace or send to DS maintenance.
	Insufficient gas pressure	Clean gas port, inserts, and gas plug.
Failure to cock.	Broken sear	Send to DS maintenance.
	Worn operating rod sear notch	Send to DS maintenance.
	Broken, defective, or missing sear plunger and or spring.	Send to DS maintenance.
Short to recoil.	NA	Clean gas port and operating rod tube. Lubricate as required. Replace operating rod spring. See runaway gun (Malfunctions).

Table 3-7. Stoppages.

**DANGER****HOT WEAPON**

A "hot" weapon, that is, one through which 200 or more successive rounds have just been fired, can "cook off" a round without any action by the firer.

If a "hot" weapon fails to fire, and you must clear it while the barrel is still hot--

1. Keep the cover closed, get the weapon off your shoulder, and point it downrange.
2. Place the weapon on safe (no red showing).
3. Place the weapon on the ground, still pointed downrange.
4. Before clearing and applying immediate or remedial action, you must first wait--
  - Training situations: 15 minutes.
  - Tactical situations: 5 seconds.

---

*Note:* When applying immediate or remedial action on a cold or hot gun, check to see if any part of the round (ranging from the tip of the bullet to the rim) is in the chamber. Remove the ammunition from the feed tray only, then close the cover and try to fire. If the weapon fires, reload and continue firing. If it does not fire, then clear the weapon and inspect the weapon and ammunition.

---

## IMMEDIATE ACTION

3-117. The gunner takes immediate action to reduce a stoppage without seeking the cause. For example, the gunner conducts immediate action when a misfire or cook off occurs. The gunner keeps the weapon on his shoulder while performing immediate action procedures. If the weapon stops firing, he takes the following immediate actions.

### DEFINITIONS

- A *misfire* is the failure of a chambered round to fire. Such failure can be due to an ammunition defect or faulty firing mechanism.
- A *cook off* is the firing of a round due to the heat of a hot barrel and not to the firing mechanism. Cook offs can be avoided by applying immediate action within 10 seconds of a failure to fire.
- An effective memory aid is POPP, which stands for pull, observe, push, and press:
  - *Pull* and lock the cocking handle to the rear while you
  - *Observe* the ejection port to see if a cartridge case, belt link, or round ejects. Ensure that the bolt remains to the rear to prevent double feeding if a round or cartridge case is not ejected. If a cartridge case, belt link, or round ejects
  - *Push* the cocking handle to its forward position, take aim on the target, and
  - *Press* the trigger. If the weapon does not fire, take remedial action. If a cartridge case, belt link, or round fails to eject, take remedial action.

## REMEDIAL ACTION

3-118. Remedial action is any action taken to determine the cause of a stoppage and to restore the weapon to an operational condition. Do this only if immediate action fails to fix the problem.

## COLD WEAPON PROCEDURES

3-119. When a stoppage occurs with a cold weapon and immediate action has failed, the gunner must--

- Pull the cocking handle to the rear, locking the bolt. Return the cocking handle and place the safety to SAFE.
- Place the weapon on the ground or away from his face and open the cover, perform the four-point safety check. Reload and continue to fire.
- If the weapon fails to fire, clear the weapon and inspect it and the ammunition.

## HOT WEAPON PROCEDURES

3-120. If the stoppage occurs with a hot weapon (200 rounds or more in 2 minutes or as noted above for training), the gunner moves the safety to SAFE, waits 5 seconds (during training, lets the weapon cool for 15 minutes), uses the same procedures as outlined for cold weapon procedures.

## JAMMED COCKING HANDLE

3-121. If a stoppage occurs and the gunner cannot pull the cocking handle to the rear by hand (the bolt might be fully forward and locked, or only partially forward), the gunner must--

- Try again to pull the cocking handle *by hand*.

### WARNING

**Avoid forcing the cocking handle to the rear, because this could seriously damage the weapon.**

- If the weapon is hot enough to cause a cook off, move all Soldiers a safe distance from the weapon and keep them away for 15 minutes.
- After the gun has cooled, pull the cocking handle to the rear. Keep rearward pressure on the cocking handle until you remove the drive-spring rod assembly. Open the cover and disassemble the gun. (The assistant gunner will help you.)
- Removes the round or fired cartridge. Uses cleaning rod or ruptured cartridge extractor if necessary.

3-122. In a training situation, after completing the remedial action procedures, do not fire the gun until an ordnance specialist has inspected it.

3-123. In a combat situation, after you have corrected the stoppage, change the barrel and try to fire. If the weapon fails to function properly, send it to the unit armorer.

## STUCK BARREL

3-124. Stuck barrel is the result of the machine gun crew not properly cleaning the gas cylinder and gas regulator plug. During training or range firing, clear, disassemble, and clean the M240B immediately. In

combat, clean it as soon as possible. If they cannot properly clean the weapon in these situations, then the gun crew must--

- Pull the cocking handle to the rear, locking the bolt. Return the cocking handle and place the safety on "S."
- Place the weapon on the ground or away from his face and open the cover, and then perform the four-point safety check.
- (Gunner only) ensure that the barrel is still locked to the receiver with the carrying handle to the right.
- (Assistant gunner only) place the heat protective mitten on your right hand and remove the gas regulator collar from the barrel, which is secured to the receiver.
- With the gas regulator collar removed, remove the barrel (Section II).
- (Assistant gunner only) After removing the barrel, remove the gas regulator collar and gas regulator plug from the spare barrel.
- Insert the barrel into the socket of the receiver. Ensure that the gas regulator plug is going into the gas hole bushing.
- (Assistant gunner only) Once the barrel is secured to the receiver, secure the gas regulator collar on the gas regulator plug.
- (Gunner only) After ensuring the barrel is secured to the receiver (2 to 7 clicks) and the collar is secure, reload and continue firing.

## **DESTRUCTION PROCEDURES**

3-125. Destruction of any military weapon is only authorized as a last resort, to prevent enemy capture or use. This paragraph discusses the field-expedient means of this destruction; it does not replace published policies. In combat situations, the commander has the authority to destroy weapons, but he must report this destruction through channels.

- Disassemble the weapon as completely as time permits. Use the barrel or tripod mount to destroy the bolt and operating rod assembly, barrels, rear and front sights, and mounts.
- Bury the disassembled weapon or dump the parts into a stream, a sump, or a latrine.
- Burn the weapon by placing an incendiary grenade on the receiver group over the bolt (with the cover resting on the grenade) and detonating the grenade.
- Smash the traversing and elevating mechanism and pintle assembly. Bend the tripod legs.

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## Chapter 4

# Machine Gun Marksmanship Training

This chapter helps trainers prepare and conduct machine gun marksmanship training. Chapters 1 through 3 discuss zeroing:

- Chapter 1--M249
- Chapter 2--M60
- Chapter 3--M240B.

For the trainers' convenience, Appendix D provides all of the firing tables from this chapter in one place for quick reference.

- General intro to marksmanship training (Section I),
- Preliminary gunnery (Section II),
- Crew drills (Section III, apply to all MGs plus preliminary and basic gunnery).
- Basic gunnery (Sections IV and V), that is, gunnery and marksmanship in the machine gun and automatic roles.

### SECTION I. INTRODUCTION

Marksmanship begins with the achievement of proficiency in nonfiring individual skills and ends with the achievement of collective proficiency in firing under demanding conditions.

### OBJECTIVES

- 4-1. The objective of machine gun marksmanship training is to produce gunners who can--

#### FIRE AN ACCURATE INITIAL BURST

- 4-2. Obtaining an accurate initial burst of fire on the target is essential to good marksmanship. This requires the gunner to estimate range to the target, set the sights, and apply the fundamentals of marksmanship while engaging targets.

#### ADJUST FIRE

- 4-3. The assistant gunner must observe the strike of the rounds when the initial burst is fired. If the gunner misses the target, then he manipulates the T&E mechanism until he hits it. The assistant gunner must be proficient in observing the strike of rounds and in observing and using tracers. This helps the gunner re-lay the machine gun back on target.

#### DEVELOP SPEED

- 4-4. Speed is also essential to good marksmanship; it is attained by practice in both dry-fire and live-fire exercises. Speed develops through extensive training that combines other skills when delivering fire. However, *speed is less important than accuracy.*

## PHASES

4-5. Marksmanship training for the machine gun is progressive in nature. It begins with nonfiring individual skill proficiency and concludes with collective proficiency firing under demanding conditions. Gunners and leaders must master the fundamentals before trying individual and collective firings. Marksmanship is most effective and efficient when preceded by effective preliminary marksmanship training (Appendix E). Likewise, the greater the proficiency of Soldiers firing individually, the greater their proficiency when firing collectively.

### PRELIMINARY GUNNERY

4-6. In this phase, the gunner learns and demonstrates proficiency on individual skills that prepare him to fire live ammunition. This phase includes mastering mechanical training, the four fundamentals of marksmanship, T&E manipulation, sight adjustments, crew drill, and fire commands.

### BASIC GUNNERY

4-7. In this phase, the gunner applies the fundamentals in live-fire exercises during day and night conditions. This phase includes zeroing, 10-meter firing with crew drill, field zeroing, and transition firing with crew drill.

### ADVANCED GUNNERY

4-8. In this phase, gunners are trained on combat techniques of fire, techniques of employment (*see also* Appendix A), and live-fire exercise during CBRN conditions.

## STRATEGY

4-9. Training strategy involves the overall concept for integrating resources into a program that trains individual and collective skills needed to perform a wartime mission. The goal of a marksmanship program is to produce well-trained gunners who can win and survive on the battlefield.

- Leaders implement training strategies for machine gun marksmanship in TRADOC institutions (IET, NCOES, IOBC, IOAC, and so forth) and in units. The overall training strategy is multifaceted and is inclusive of the specific strategies used in institution and unit programs. Also included are the supporting strategies that use resources such as publications, ranges, ammunition, training aids, devices, simulators, and simulations (*see also* Appendix F and Appendix J). These strategies focus on developing critical Soldier skills and leader skills that are required for the intended outcome.
- The training strategies contain two components: initial training and sustainment training. Both may include individual and collective skills. Initial training is critical because a task that is taught correctly and learned well is retained longer. Well-trained skills are more quickly regained and sustained. The more difficult and complex the task, however, the harder to sustain the skill. Personnel turnover plays a major factor in the decay of collective skills, since the loss of critical team members requires retraining to regain proficiency. Retraining becomes necessary when a long period elapses between initial and sustainment training sessions or when the training doctrine is altered.
- The training strategy for machine gun marksmanship begins in the institutions and continues in the unit. Figure 4-1 shows an example of this overall process, which provides a concept of the flow of unit sustainment training. Combat arms IET provides field units with Soldiers who are familiar with the standards in basic marksmanship tasks. Those who graduate from these courses know how to maintain their machine guns and hit a variety of targets. They have

learned range determination, target detection, application of marksmanship fundamentals, and other skills needed to engage a target. However, they remain unqualified gunners.

- Additional skills trained in the institution include techniques for employment (*see also* Appendix A), classes of fire, and fire commands. These skills must then be reinforced in the unit. Related Soldier skills of camouflage, cover and concealment, maneuver, and preparation and selection of a fighting position are addressed in STP 21-24-SMCT, which must be integrated into tactical training.
- In the units, sustainment training is conducted for the basic skills taught in combat arms IET. Additional skills, such as suppressive and supporting fire, are also trained, and then are integrated into collective training exercises. This includes squad and platoon live-fire exercises. (Appendix G explains the unit machine gun marksmanship training program.) The strategy for Vsustaining and expanding the basic marksmanship skills from combat arms IET involves periodic preliminary gunnery. This is followed by 10-meter, transition, and qualification range fire. However, a unit must establish a year-round program to sustain skills. Key elements include training the trainers and refresher training of nonfiring skills.
- In the unit, leaders integrate individual and leader proficiency of marksmanship tasks into collective training that includes squad, section, and platoon drills and STXs. ARTEPs 7-8-MTP and -Drill allow leaders to evaluate collective task performance to standard. The collective tasks in these exercises show how leaders plan and conduct collective training exercises. Leaders evaluate the performance of collective tasks to standard and discuss them during leader and trainer AARs. Objective evaluations of both individual and unit proficiency indicate readiness and help leaders identify future training requirements.
- A critical step in the Army's overall marksmanship training strategy is to train the trainers and leaders first. Leader courses include limited machine gun training, but unit publications will help develop officer and NCO proficiency necessary to plan and conduct gunnery training and to evaluate the effectiveness of their programs. Proponent schools provide training support materials to include field manuals, training aids, devices, simulators, and programs that are doctrinal foundations and guidance for training the force (*see also* Appendix F).
- Once the Soldier understands the weapon, knows how to zero, and has demonstrated proficiency at 10-meter and transition ranges, he is exposed to more difficult ranges and scenarios.
- IET culminates in the Soldier's proficiency assessment, which is conducted on the 10-meter and transition fire ranges. Unit training culminates in a collective, live-fire, tactical exercise that provides an overview of unit proficiency and training effectiveness.

## **COMBAT CONDITIONS**

4-10. The trainer must realize that qualification is just a step toward reaching combat requirements. To reach this goal, the gunner considers his position, the use of his weapon, and some of the following combat conditions as well:

- Most engagements are within 300 meters. However, the gunner must still engage targets out to the maximum range of the machine gun.
- Enemy personnel are seldom visible except when assaulting.
- The gunner directs most combat fire where he has detected the enemy or where he suspects the enemy of being, but where the gunner cannot see him. Area targets consist of objects or outlines of men irregularly spaced along covered and concealed areas (ground folds, hedges, borders of woods).
- Most combat targets can be detected by smoke, flash, dust, noise, or movement, but the targets remain visible only for a moment.
- Some combat targets can be engaged using reference points, predetermined fire, or range card data.

- The nature of the target and irregularities of terrain and vegetation might require a gunner to move from one position to another to place effective fire on the target. The most stable position for the gunner is the prone tripod-supported position.
- Most combat targets have low-contrast outlines and are obscure. Therefore, choosing an aiming point in elevation is difficult.
- Time-stressed fire in combat includes fire at a single, fleeting target that must be engaged quickly; at distributed targets that must be engaged while they are available; and a surprise target that they must engage at once, with instinctive, accurate fire.

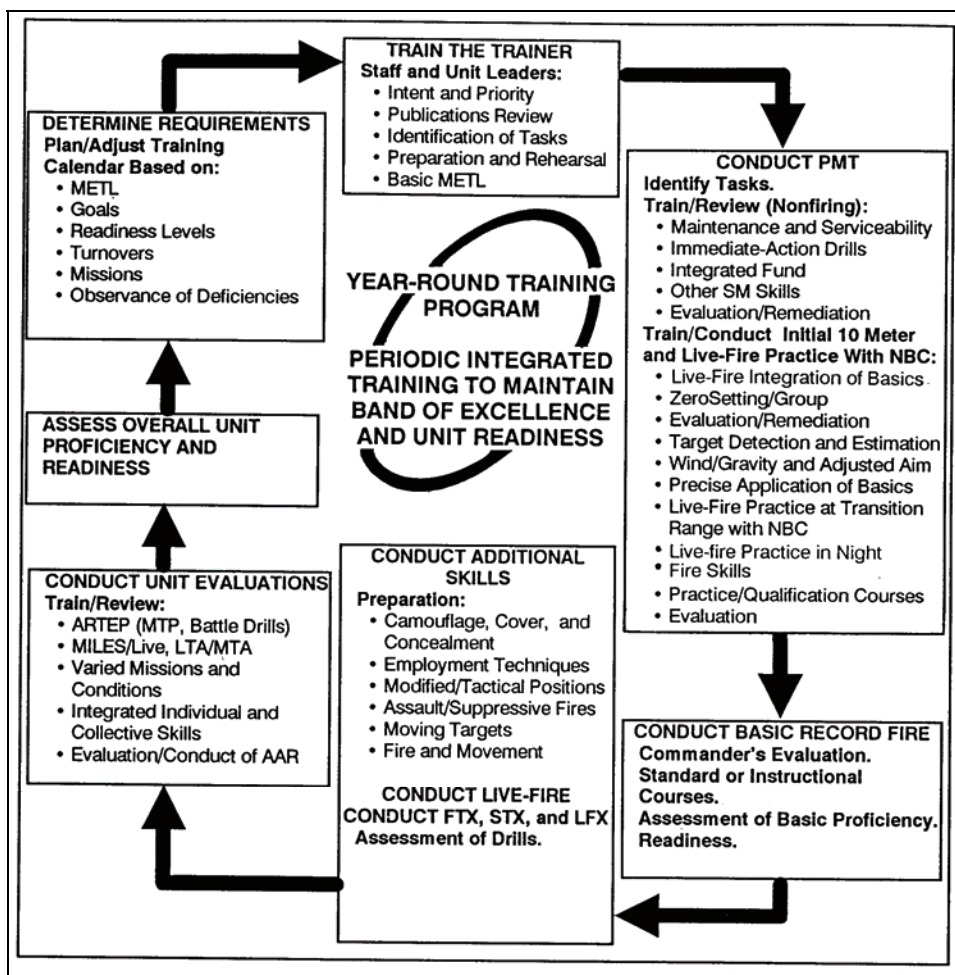


Figure 4-1. Unit marksmanship sustainment strategy.

## SECTION II. PRELIMINARY GUNNERY

Once a Soldier is proficient in the characteristics and mechanical training of the machine gun, he is ready to receive training on the four fundamentals of marksmanship. As the gunner learns the fundamentals, he is required to manipulate the sights, use his body to shift and lay the sights on the target, use the T&E mechanism to lay on the target, conduct crew drill, and respond to fire commands. Dry-fire exercises are an excellent method for training to proficiency.

### MARKSMANSHIP FUNDAMENTALS

4-11. The four fundamentals for firing are the same for all machine guns, they are *steady position, aim, breath control, and trigger control*.

#### STEADY POSITION

4-12. In automatic fire, position is the most important aspect of marksmanship. If the gunner has a good zero, correctly aims his weapon, and properly applies a steady hold in firing a burst of automatic fire, the first round of that burst hits the target at the point of aim. However, this procedure might apply only to the first round fired. The first round hits the aiming point the same as when a single round is fired. The recoil from the first and subsequent rounds progressively disturb the lay of the weapon with each round of the burst. The relationship between the point of impact of the first and subsequent rounds of the burst depends on the stability of the gunner's position. His body, directly behind the weapon, serves as the foundation, and his grip serves as a lock to hold the weapon against the foundation. The better the body alignment and the steadier the grip, the less dispersed the rounds of a burst of automatic fire will be.

#### AIM

4-13. To aim the machine gun, the gunner must align the sights, focus his eye, obtain a correct sight picture, control his breathing, and maintain trigger control.

#### Sight Alignment

4-14. To obtain correct alignment, the gunner centers the front sight post in the aperture of the rear sight. For a correct sight picture, the gunner centers the target over the front sight post so that it appears to rest lightly on top of the sight. The aspects of obtaining an accurate initial burst through sight alignment and sight picture, trigger manipulation, and zeroing are the same for tripod training as for bipod training.

#### Focus of the Eye

4-15. A good firing position places the eye directly on line with the center of the rear sight. The gunner must focus on the tip of the front sight post. The natural ability of the eye to center objects in the rear sight, and to seek the point of greatest light, helps the gunner align the sights correctly.

#### Sight Picture

4-16. A correct sight picture has the target, front sight post, and rear sight aligned. The sight picture has sight alignment and placement of the aiming point on the target. The gunner aligns the front sight post in the center of the rear sight and then aligns the sights with the target. The top of the front sight post aligns on the center base of the target (Figure 4-2).

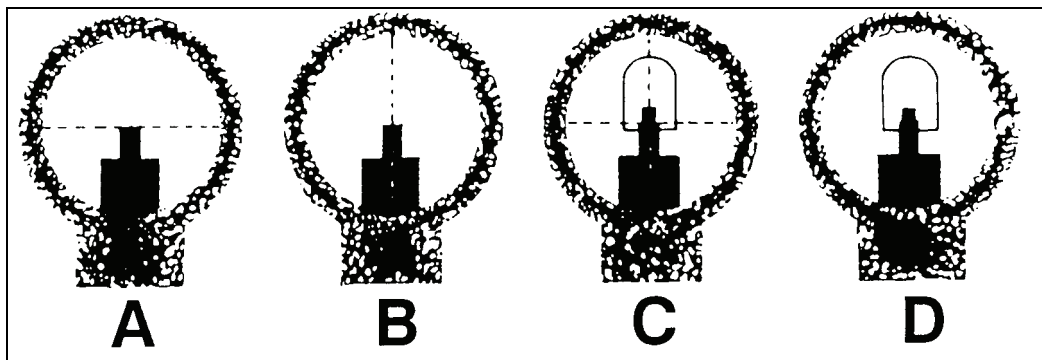


Figure 4-2. Sight picture.

### BREATH CONTROL

4-17. When firing in bipod-mounted mode, two types of breath control are used. When firing single shots, as in zeroing, the gunner stops breathing after most of the air has been exhaled during the normal breathing cycle. He fires before he feels any discomfort. During automatic fire, ideally, the gunner exhales and stops his breath when pressing the trigger. He lacks the time to take deep breaths between bursts. He must either hold his breath before each burst, or he must adapt his breathing. He can do this by taking quick shallow breaths or by taking deeper breaths between several bursts.

### TRIGGER CONTROL

4-18. Pressing the trigger straight to the rear and releasing it helps control the number of rounds in each burst and prevents disturbing the lay of the weapon. To do this, the gunner must learn how to manipulate the trigger in order to get the desired burst that he wishes to obtain.

### FIRING POSITIONS

4-19. The bipod-supported prone and fighting positions and the tripod-supported prone and fighting positions are covered in preliminary gunnery.

### PRONE POSITION, BIPOD-SUPPORTED

4-20. Assume a prone position to the rear of the weapon (place the shoulder rest on your firing shoulder for the M249 and M60 only). An imaginary line drawn through the weapon should bisect the firing shoulder and buttock, and continue through the heel of your foot.

- Spread your legs a comfortable distance apart with your heels as close to the ground as possible.
- Grasp the pistol grip with your firing hand. Rest the fleshy end of your index finger lightly on the trigger. Place your nonfiring hand on the small of the stock, with your thumb curled underneath. Then, slide your nonfiring hand forward until your little finger touches the receiver, so that the aiming point remains the same.
- Place your cheek against the forefinger of your nonfiring hand to form a stock weld. Try to position your nonfiring hand and cheek at the same spot on the stock each time you fire the weapon. The stock weld should provide for a natural line of sight through the center of the rear sight aperture to the front sight post and to the target. Relax your neck so that your cheek rests on your forefinger naturally.

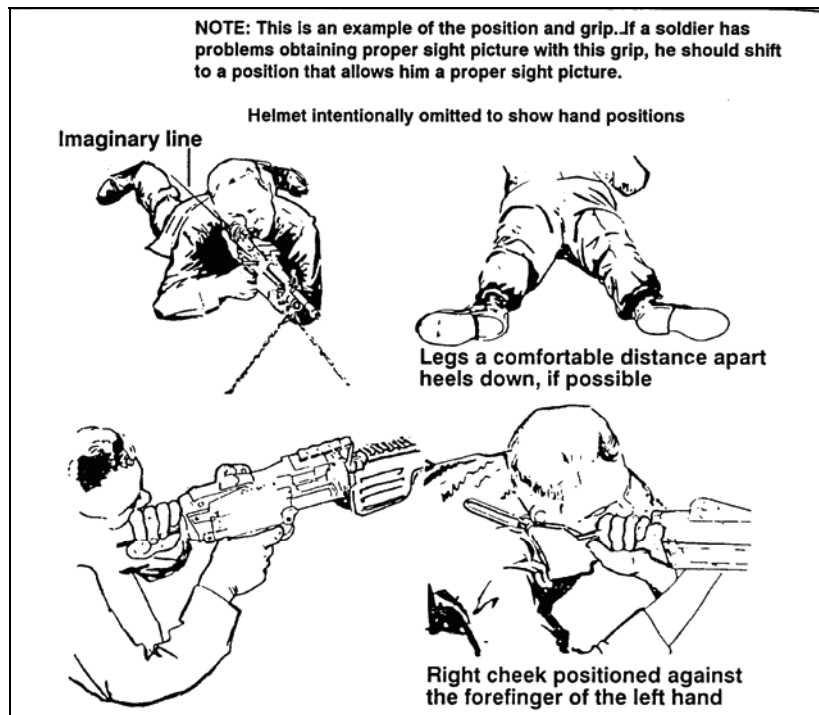
- Apply a firm, steady pressure rearward and down, holding the weapon tightly into the hollow of your shoulder while aiming and firing.
- Keep your shoulders level and elbows about an equal distance from the receiver of the weapon (Figure 4-3).

- 
- Notes:**
1. *Assistant Gunner:* Assume a prone position along the left side of the gunner to load ammunition and observe.
  2. *Gunner:* Avoid firing the M249 and M60 with the left hand, because some weapons eject almost directly to the rear. Also, when using a tripod, you manipulate the T&E mechanism with your left hand, which makes firing with the same hand difficult at best.
  3. *Gunner:* If you have trouble obtaining a proper sight picture, shift to a position where you can do so.
- 

### **FIGHTING POSITION, BIPOD-SUPPORTED**

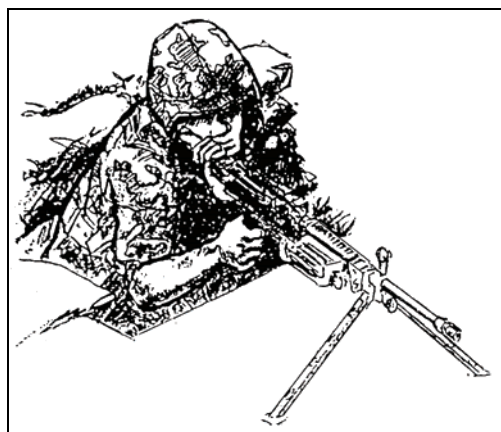
4-21. This is an excellent position that provides a stable firing platform. The gunner adjusts the depth of the fighting position and the support for his height and arm length. This allows for a steadier position.

- Extend the bipod legs and place the machine gun in front of the position.
- Place your right (firing side foot) foot sideways against the rear of the fighting position and lean forward until your chest is squarely against the forward wall.
- Raise the folding shoulder rest and place it on your firing shoulder (M249 and M60 only). Keep your shoulders level or parallel to the ground.
- Grasp the pistol grip with your firing hand. place the fleshy end of the index finger resting lightly on the trigger. Place your nonfiring hand on the small of the stock and ensure that your thumb curls underneath.



**Figure 4-3. Prone position, bipod-supported.**

- Place your cheek against the forefinger of your nonfiring hand to form a stock weld. Try to position your nonfiring hand and cheek at the same spot on the stock each time you fire the weapon. The stock weld should provide for a natural line of sight through the center of the rear sight aperture to the front sight post and to the target. Relax your neck so that your cheek rests on your forefinger naturally.
- Apply a firm, steady pressure rearward and down, holding the weapon tight into the hollow of your shoulder while aiming and firing.
- Keep your shoulders level and elbows about an equal distance from the receiver of the weapon (Figure 4-4).



**Figure 4-4. Fighting position, bipod-supported.**



## PRONE POSITION, TRIPOD-SUPPORTED

4-22. The gunner assumes a prone position to the rear of the weapon. For the M249 and M60 only, he places the shoulder rest on his firing shoulder. An imaginary line drawn through the weapon should bisect the right shoulder and buttock and continue through the heel of the foot. When using the tripod, the assistant gunner assumes a prone position along the left side of the gunner to load ammunition and observe. Then, the gunner must--

- Spread his legs a comfortable distance apart with his heels as close to the ground as possible and still be comfortable.
- Grasp the pistol grip with his right hand with the fleshy end of his index finger resting lightly on the trigger. When he uses the tripod, he must fire the machine gun right-handed, because turning the traverse handwheel with the right hand is difficult.
- Grasp the elevating handwheel with his left hand, palm down. Exert a firm downward pressure with both hands while aiming and firing.
- Place both elbows on the ground between the tripod legs and his body. The position of his elbows raises or lowers his body relative to the machine gun.
- Lean forward and to the right, into the buttstock, eliminating play in the weapon (from the T&E mechanism), and push forward with his toes to obtain a stable firing platform.
- Place his shoulder lightly against the stock, without applying pressure.
- Rest his cheek lightly (if at all) against the stock (Figure 4-5).

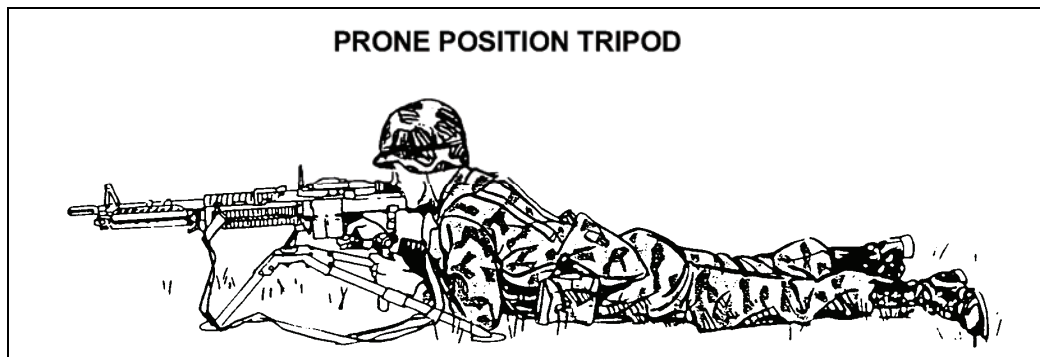


Figure 4-5. Prone position, tripod-supported.

## FIGHTING POSITION, TRIPOD-SUPPORTED

4-23. As shown in Figure 4-6, the gunner places his right (firing side) foot sideways against the rear of the fighting position and leans forward until his chest is squarely against the wall. Then he must--

- Grasp the pistol grip with his firing hand, with the fleshy end of his index finger resting lightly on the trigger.
- Place his left hand on the elevating handwheel, palm down, exerting a firm downward pressure to make either minor or major adjustments in deflection or elevation. (The tripod stabilizes the weapon.)
- Place his elbows on the inside and avoids touching the tripod.
- Lean forward and to the right, into the buttstock, eliminating play in the weapon (from the T&E mechanism). This gives him a stable firing platform.
- Place his shoulder lightly against the stock, without applying pressure.
- Rest his cheek lightly, if at all, against the stock.



Figure 4-6. Fighting position, tripod-supported.

## NIGHT FIRE

4-24. Although the gunner follows the same four fundamentals of marksmanship for night firing, he must make adjustments for night vision devices.

### BIPOD

#### Steady Position

4-25. When firing unaided, changes in head position and stock weld are necessary especially when using weapon-target alignment techniques. Normally, the gunner positions his head so that he can align the weapon on the target and look over the sights. In some cases, the lower part of his jaw makes firm contact with his nonfiring hand on the stock, with his eyes an inch or so above the sights. The key is to use the natural pointing ability to align the machine gun on the target. When using NVDs, the gunner must alter his head position and stock weld. Sometimes, the height of the NVD can make this impossible. NVDs also alter the machine gun's weight and center of gravity. The gunner must compensate by exerting greater pressure and control with his firing hand on the pistol grip and his nonfiring hand on the stock.

#### Aim

4-26. Various modifications are necessary when aiming the machine gun at night. When firing unaided the gunner uses off-center vision instead of pinpoint focus. Both eyes are open and focused downrange on the target, rather than on the sights. Rather than aim using the sights, the gunner looks over the sights and points the machine gun where he is looking. The normal tendency is to fire high so the gunner must improve weapon-target alignment by pointing slightly low to compensate. When using NVDs, the gunner uses the necessary aiming process to use the device.

#### Breath Control

4-27. This fundamental remains the same during night firing; however, because NVDs magnify the field of view, wobble is more pronounced.

### **Trigger Control**

4-28. This remains the same during night firing. The objective is to keep the weapon aligned with the target.

### **TRIPOD**

#### **Steady Position**

4-29. Firing at predetermined targets at night, with the weapon laid on each target, is the same as in the daytime. However, firing at night at targets of opportunity is different. The gunner must align the weapon on the target and look over the sights. His head is higher and his lower jaw only lightly rests on the stock, if at all. When using NVDs, the gunner positions his head so that his firing eye aligns with the device.

#### **Aim**

4-30. For nighttime targets of opportunity, the gunner uses the same techniques as with a bipod, except he aligns the weapon using the T&E mechanism.

#### **Breath Control**

4-31. This is the same.

#### **Trigger Control**

4-32. This is the same.

## **CHEMICAL, BIOLOGICAL, RADIOLOGICAL, OR NUCLEAR FIRE**

4-33. The fundamentals apply in a CBRN environment, too, with minor changes to accommodate equipment.

### **BIPOD**

#### **Steady Position**

4-34. Bulky overgarments might require the gunner to adjust his position for stability and comfort. A consistent stock-weld is difficult to maintain, due to the shape of the protective mask. Looking through the sight requires the gunner to hold his head in an awkward position. If needed, he can cant the weapon instead. This is easier on the neck and aligns the eye with the center of the rear sight.

#### **Aim**

4-35. The gunner might have to rotate (cant) the machine gun to see through the rear sight aperture. He should cant it just enough to align the sights, and only if he must. At long ranges, the cant will cause rounds to impact low in the direction of the cant. If he must cant when firing at targets beyond 175 meters, he must also adjust his point of aim. The best technique is to aim at center base of the target, then to adjust based on the strike of the rounds. Right-handed firers adjust the point of aim to the right and high, whereas left-handed firers adjust it to the left and high.

### **Breath Control**

4-36. Although the masks restrict breathing, the main impact is that the gunner might tend to overcompensate by hyperventilating during burst fire. He must try to avoid doing this, because it reduces the amount of oxygen he inhales.

### **Trigger Control**

4-37. Wearing gloves reduces trigger control, unless the gunner practices and trains while wearing gloves.

## **TRIPOD**

### **Steady Position**

4-38. Modifications are similar to those in bipod firing. Wearing gloves makes the handwheel feel different, so control is more difficult to achieve. Also, hearing is impaired. The impairment of these two senses makes manipulating the T&E especially difficult, and therefore slower.

### **Aim**

4-39. Unlike the bipod, the tripod prevents the gunner from canting the machine gun. Therefore, to use the sight, the gunner must position his head behind the stock. Skilled gunners who can adjust the T&E quickly can confirm their sight picture. While firing, they can look over the sights to observe the strike of the round. This provides relief for the neck muscles, and also aids in making adjustments.

### **Breath Control**

4-40. The tripod's stable platform offsets movement caused by breathing.

### **Trigger Control**

4-41. As with the bipod, trigger control differs because the trigger feels different. Training familiarizes the gunner with the changes he must make while wearing gloves.

## **ENGAGEMENT OF MOVING TARGETS**

4-42. The fundamentals of hitting a moving target are the same as those for hitting a stationary target. However, the procedures to engage moving targets vary as the angle, speed, and range of the target varies. (Appendix H discusses aerial targets engagements.)

## **LEADS**

4-43. To hit a moving target, the machine gun must be aimed ahead of the target far enough to cause the bullet and target to arrive at the same time at the same point. This distance is measured in target lengths. One target length as seen by the gunner is one lead. Leads are measured from the center of mass. Table 4-1 gives the amount of lead needed to hit a target moving at right angles, to the gunner, and at speeds and ranges indicated. The gunner makes adjustments as conditions change. If target speed is 7 1/2 mph, the amount of lead is half that shown on the table; at 30 mph, double that shown. The angle at which the target moves also changes the lead. If the target is moving on an oblique angle, only half the lead is required. For a target moving directly at the gunner, the aiming point is below the center base of the target depending on range and slope of the ground. For a target moving directly away from a gunner, the aiming point is above

the center base of the target (Figure 4-7). Too much lead is better than too little because the target moves into the beaten zone, and observation of the strike of the rounds is easier relative to the target.

Range (M)	Lead
300	Half the target length
500	Target length
900	Twice the target length

Table 4-1. Lead for vehicles traveling 15 mph.

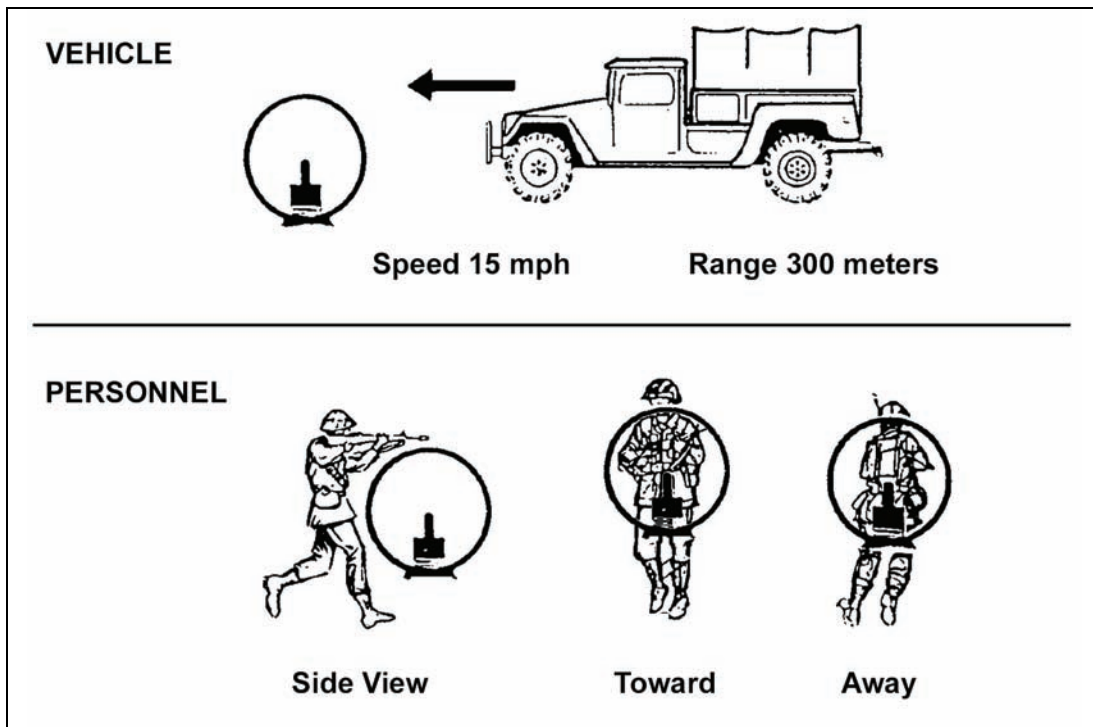


Figure 4-7. Moving target aiming points.

*Note:* A Soldier carrying a full combat load can run as fast as 8 mph for short distances on the battlefield.

### TRACKING TECHNIQUES

4-44. The gunner aims at a point ahead of the target equal to the estimated number of leads, maintains this lead by tracking the target (manipulates the weapon at the same angular speed as that of the target), and then fires. Tracking allows the gunner in position for a second burst if the first one misses.

### TRAPPING TECHNIQUES

4-45. The gunner establishes an aiming point forward of the target and along the target path. He pulls the trigger as the target reaches the appropriate point in regard to lead.

## **POSITION AND AIM**

### **Steady Position**

4-46. In order to obtain a steady firing platform, the gunner leans forward and to the right on the butt stock, and pushes forward with his toes.

### **Aim**

4-47. The gunner uses the T&E mechanism to acquire the appropriate sight picture relative to leading the target. He must quickly determine speed, angle, and range to the target, decide whether to track or trap, acquire lead, and engage the target. He uses the traversing handwheel to maintain lead.

### **Breath Control**

4-48. The gunner makes no change, but he must be quick to hold his breath because of the fleeting nature of moving targets.

### **Trigger Control**

4-49. The gunner makes no change in applying this fundamental.

## **BIPOD TECHNIQUES**

4-50. For targets moving to or from a gunner using a bipod, the same procedures are used. From a prone position, the gunner may be required to adjust his position quickly depending on range, angle, and speed of the target.

### **Steady Position**

4-51. If appropriate lead cannot be achieved by shifting his shoulders right or left (traverse) or by moving his elbows closer or farther a part (search), the gunner redistributes his weight to his elbows and toes and raises his body off the ground. Using his toes, the gunner shifts his body right or left in the opposite direction of the target and pivots on his elbows until the aiming point is well ahead of the target. The gunner rapidly assumes a steady position, obtains the sight picture, leads and engages the target. Trapping is the preferred technique. In order to apply this method, the bipod legs must move freely. When firing from a fighting position, the gunner must be flexible enough to track any target in his sector. If lead cannot be achieved, he slides the bipod legs in the appropriate direction (left or right) ahead of the target and continues as in the prone position. Trapping is still the preferred technique. If the terrain prohibits sliding the weapon left or right, the gunner lifts the bipod legs off the ground and places them where he can aim ahead of the target, reestablishes a steady position, and continues as before.

### **Aim**

4-52. The gunner determines angle, speed, and range quickly; acquires the appropriate lead; and engages the target. He aligns the front sight post in the proper position to lead the target. For targets moving directly away, he places the front sight post above center of mass. For targets moving directly at him, he aligns the front sight post below center of mass. For all other targets, he aligns the front sight with center base of the target applying the appropriate lead.

### **Breath Control**

4-53. The gunner must hold his breath quickly because of the fleeting nature of moving targets.

### **Trigger Control**

4-54. This is the same as for engaging stationary targets.

## **TRAVERSE AND SEARCH**

4-55. The traverse technique moves the muzzle of the weapon to the left or right to distribute fire laterally. Search moves the muzzle up or down to distribute fire in depth.

### **TRIPOD**

#### **Traverse**

4-56. To move the strike of the round to the right, rotate the traversing handle counterclockwise; to move the round to the left, rotate the traversing handle clockwise.

#### **Search**

4-57. To move the strike of the round up (increasing range), rotate the elevation handwheel counterclockwise. To move the strike of the round down (decreasing range), rotate the elevation handwheel clockwise.

### **BIPOD**

#### **Traverse**

4-58. To make minor changes in direction, the gunner shifts his shoulders to the right or left to select successive aiming points in the target area. Major changes require him to redistribute his weight to his elbows and toes and raise his body off the ground. Using his toes, he shifts his body to the right or left to be in the opposite direction of the target, and pivots on his elbows until he aligns with the target. The gunner rapidly assumes a steady position, obtains the proper sight picture, and engages the target.

#### **Search**

4-59. To make changes in elevation, the gunner moves his elbows closer together to lower the muzzle or farther apart to raise the muzzle. He corrects gross errors in range by adjusting the range setting.

## **APPLICATION OF FIRE**

4-60. The gunner must aim, fire, and adjust on a certain point of the target. He always keeps the center of his beaten zone at the center base of the target for maximum effect from each burst of fire. When he uses this procedure, bullets in the upper half of the cone of fire run through the target if it has height, and the bullets in the lower half of the beaten zone ricochet into the target.

## **ADJUSTMENT OF FIRE**

4-61. The gunner initially sets his sights with the range to the target, lays on the target (sight alignment and sight picture on the center base of the target), fires a burst, and observes the strike of the rounds or flight of the tracers. When the initial burst is correct, he continues to fire until the target is covered. He must regain a good sight picture before each burst when using the bipod. When using the tripod, the gunner makes a rapid check of the sight picture after each traverse and search adjustment.

## SIGHT-CORRECTION METHOD

4-62. A gunner must observe and adjust fire rapidly to be effective. He observes bursts of fire by noting the strike of the rounds in the target area and the tracers in flight. The technique to adjust fire depends on time, range, and amount of adjustment. These factors assist the gunner in determining whether to make sight corrections or adjust position and point of aim. When the initial burst is placed incorrectly, the gunner may change the elevation and windage on the sights and fire another burst on the target. This method is time-consuming, even for the well-trained Soldier.

## ADJUSTED-AIMING-POINT METHOD

4-63. In this method of fire adjustment, the gunner uses his sight, but leaves the sight alone. This method is quick. If the gunner misses the target with his initial burst, he must rapidly select a new aiming point the same distance from the target as the center of impact of the initial burst, but in the opposite direction. For example, if the initial burst is 20 meters beyond and 10 meters to the right of the target, the gunner rapidly selects an aiming point about 20 meters short and 10 meters to the left of the target, lays on that aiming point, and fires (Figure 4-8).

- When selecting a new aiming point from bipod mode, he may have to shift his shoulders slightly to the left or right for windage corrections. For elevation changes, he moves his elbows closer together (lowers the impact) or farther apart (raises the impact). For large corrections, he must move his elbows and realign his body to remain directly behind the weapon. He does this by redistributing weight to his elbows and toes and raises his body off the ground. He shifts his body using his toes, to the right or left, pivoting on his elbows until he is on line with the target. Then he assumes a steady position, obtains the sight picture, and engages the target.
- When selecting a new aiming point from tripod mode, the gunner may have to manipulate the T&E mechanism.

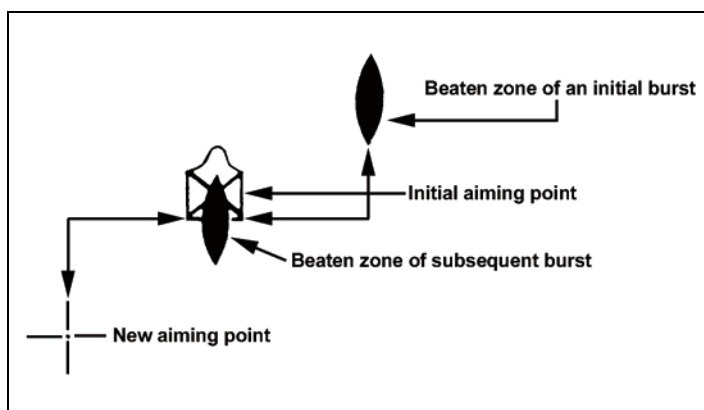


Figure 4-8. Adjusted aiming point method.

## EFFECTS OF WIND

4-64. The effects of wind vary depending on changes in speed and direction. Wind is classified by the direction it is blowing in relationship to the firer and target line. The gunner uses the *clock system* to indicate wind direction and value (Figure 4-9).



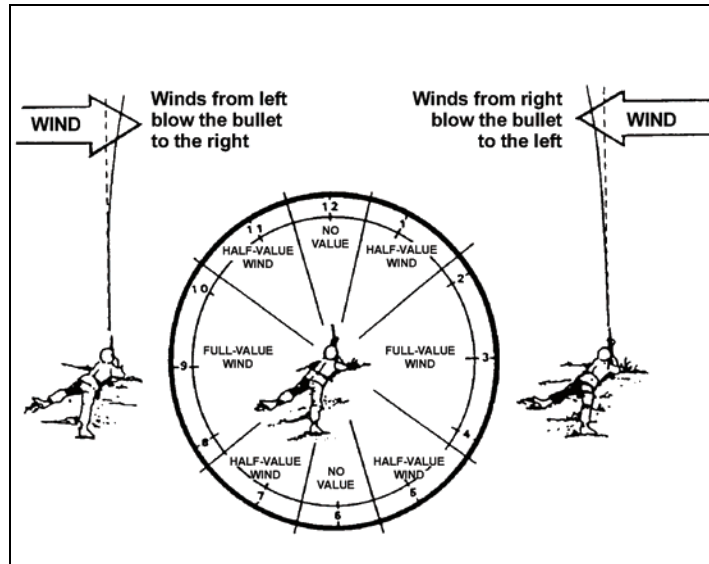


Figure 4-9. Clock method.

## CLOCK SYSTEM

4-65. Winds that blow from the left (9 o'clock) or right (3 o'clock) are called *full-value winds*, because they have the most effect on the round. Winds that blow at an angle from the front or rear area are called *half-value winds*, because they have about one-half the effect on the round as full-value winds. Winds that blow straight into the gunner's face or winds that blow straight into the target are termed *no-value winds*, because their effect on the round is too small to be a concern. Effects of the wind increase as the range increases. Figure 4-10 shows the effects of a 10-mph wind at varying ranges. A 20-mph wind doubles the effect. Winds at other than right angles have less effect. As Table 4-2 shows, the wind has little effect up to 300 meters.

Range (M)	Distance Round Moves	
	Inches	Cm
100	1	2.54
200	5	12.70
300	12	30.48
400	23	53.42
500	39	49.06
600	60	152.04
700	88	223.52
800	121	307.34
900	159	403.86
1,000 +	202	513.08

Table 4-2. Effects of a 10 mph wind drift.

**Note:** When in doubt, the gunner aims the initial burst directly at the center base of the target and, using the techniques of observation and adjustment of fire, adjusts the fire onto the target.

### WIND MEASUREMENT

4-66. Wind can vary greatly between the firing position and the target. Even though the wind blows hard at the firing position, trees, brush, or terrain could protect the path of the round. Also, wind can change several miles per hour between the time the Soldiers measure it and when they fire. However, they should tell Soldiers that, even though wind can affect trajectory, they can overcome its effects by simply adjusting their fire. Also, a wind gauge measures wind velocity precisely, but in the absence of a gauge, they can estimate velocity by using one of two methods.

#### Observation Method

4-67. Knowing the following facts about the wind can help the gunner determine wind velocity.

- A person can barely feel wind under 3 mph, but the presence of a slight wind can be determined by drifting smoke.
- A wind of 5 to 8 mph constantly moves the leaves of trees.
- A wind of 8 to 12 mph raises dust and disturbs loose papers.
- A wind of 12 to 15 mph causes small trees to sway.

#### Pointing Method

4-68. A Soldier can drop a piece of paper or other light material from shoulder height. By pointing directly at the spot where it lands, he can estimate the angle. As shown in Figure 4-10, the angle is also divided by 4 to determine wind speed in miles per hour. However, this only indicates the conditions at the firing position; conditions at the target might differ.

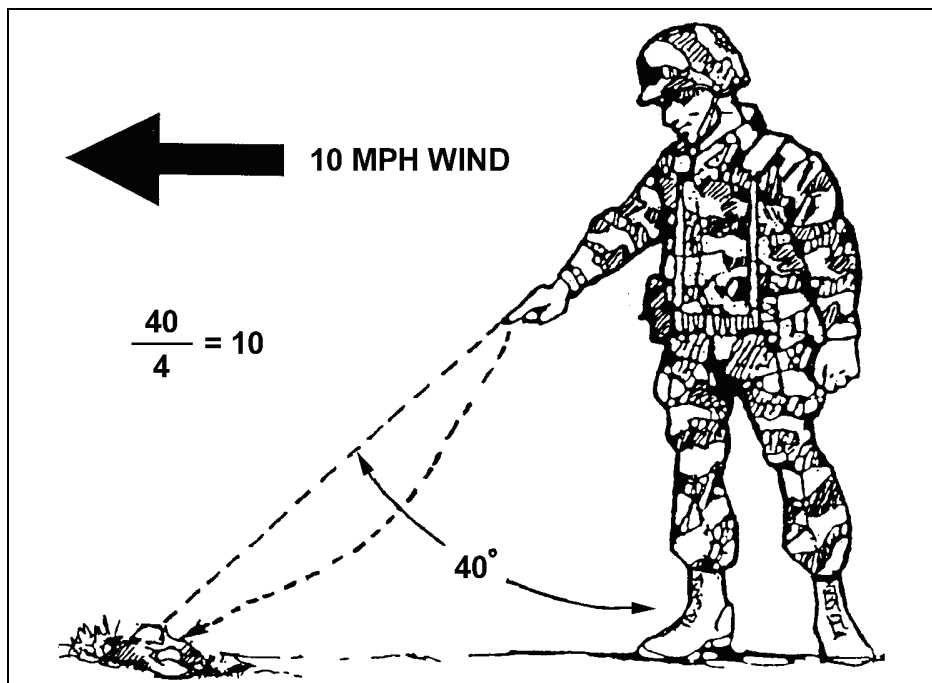


Figure 4-10. Pointing method.

## **FIRE COMMANDS**

4-69. The standard fire commands are used to control fire in preliminary, basic, and advanced gunnery. The trainer explains the fire command to the gunner. He gives the elements (as appropriate) before each dry-fire or live-fire exercise. The gunner acts as directed and repeats each element as announced. (Chapter 5 explains fire commands in detail.) For the basic, 10-meter range target, the elements of the fire command follow:

### **ALERT**

4-70. The trainer gives the alert as--

*GUNNER(S).*

4-71. Upon hearing the alert, the gunner(s) loads his weapon and places the safety on "F."

### **DIRECTION**

4-72. The trainer directs FRONT, since the targets appear to the gunner's front on the basic range.

### **DESCRIPTION**

4-73. The trainer describes the target as PASTER NUMBER (1 through 8, as appropriate), and the gunner lays the weapon on the announced paster.

### **RANGE**

4-74. On the basic range, the trainer always uses the elevation on the rear sight assembly. He announces FIVE HUNDRED or SEVEN HUNDRED, and the gunner ensures that the elevation on the rear sight assembly is set correctly.

### **METHOD OF FIRE**

4-75. Firing on the basic range is at a point target, so the trainer announces method of fire as FIXED.

### **COMMAND TO OPEN FIRE**

4-76. The trainer says AT MY COMMAND. When the gunner is ready, he says "*Up.*" When all gunners are ready to fire, the trainer commands FIRE.

## **DRY-FIRE EXERCISES**

4-77. Dry-fire exercises train the techniques of loading, unloading, immediate action, remedial action, fundamentals of marksmanship, sight settings, and T&E manipulation.

### **AMMUNITION**

4-78. These exercises allow the gunner to use blank or dummy ammunition, and the trainer to use fire commands when appropriate. When the gunner uses the blank firing attachment, the trainer must enforce safety restrictions for its use. While the gunner performs the tasks, the assistant gunner must—

- Check the sight setting and initial lay.
- Check the gunner's position.

- Ensure the gunner simulates firing before adjusting his position.
- Check for proper body adjustment or manipulation of the traversing and elevating mechanism.
- Critique the gunner at the end of the exercise.

### **LOADING AND UNLOADING EXERCISES**

4-79. Chapters 1 through 3 describe how to load and unload the weapons. This training instills confidence and proficiency in the operation of the weapon. It also trains the gunner to clear the weapon.

### **IMMEDIATE AND REMEDIAL ACTION EXERCISE**

4-80. In this exercise, the gunner uses linked dummy rounds and the basic machine gun target. The trainer should use salvage links to join the dummy rounds. The gunner—

- Loads the weapon with dummy ammunition and aims at one of the pasters on the basic machine gun target.
- While remaining aware of his sight picture, pulls the trigger. The bolt moves forward to simulate actual fire. If the sight picture is disturbed, checks his position and grip, and maintains better control of the weapon.
- If he has a stoppage, applies immediate action procedures and continues to fire.
- If immediate action has failed, applies remedial action procedures and continues to fire.

### **OPERATIONAL EXERCISE**

4-81. The gunner aims and simulates firing each dummy round at the aiming paster on the basic machine gun target.

- He observes the sight picture throughout the feeding, locking, and firing cycle. This shows him how well he maintains and holds a sight picture.
- If, at the end of the firing cycle, the sight picture has moved a lot, then the gunner needs to stabilize his position or that of the tripod.
- After each shot, he applies immediate action to extract and eject the dummy cartridge. Then, he returns the bolt to the cocked position and the cocking handle to the forward position.

### **SIGHT SETTING AND SIGHT CHANGING EXERCISES**

4-82. These exercises train the gunner to operate and adjust the rear sight, and to correct elevation and windage on the machine gun.

#### **Elevation**

4-83. The gunner makes large elevation (range) adjustments on the rear sight. He makes fine adjustments by rotating the elevation knob.

#### **Windage**

4-84. The gunner adjusts for windage (direction) by traversing the T&E.

### **PRACTICE EXERCISE**

4-85. Before they take the dry-fire proficiency test, Soldiers should first practice the tasks until they become proficient.

## TRAVERSING AND SEARCHING EXERCISE

4-86. After the gunner knows the principles of sighting and aiming and can assume a satisfactory firing position, he learns to make small and large position changes to obtain an accurate initial lay. He moves his body to shift the direction of his weapon toward successive points. For this exercise, the basic machine gun target is placed 10 meters from the weapon.

- He adjusts for large shifts in direction using his elbows and toes as previously described. To make small changes in direction, he adjusts his shoulders.
- He makes major elevation changes by adjusting the range setting on the rear sight. He makes minor elevation changes by adjusting his elbows.
- He traverses and searches the target by sighting on the initial aiming paster (5 or 6), and then shifting to each of the other pasters in order (5 through 6, or vice versa).
- On receiving a fire command, the gunner repeats the instructions, sets the sights, lays the weapon on the designated paster, assumes the correct position, and reports "Up."
- On the command FIRE, the gunner simulates firing two single shots, then shifts to the next paster and simulates firing until the exercise is complete.

## MANIPULATION EXERCISE

4-87. After the gunner understands the principles of sighting and aiming and can assume a satisfactory firing position, he is instructed in manipulating the tripod-mounted machine gun to obtain an accurate initial lay. He learns to shift the direction of the weapon to successive points with proficiency. Again, for this exercise, the basic machine gun target is placed 10 meters from the weapon.

- The gunner makes large shifts in direction by releasing the traversing slide-lock lever and moving the slide right or left. He makes minor changes in direction with the traversing handwheel. (One click on the handwheel moves the strike of the round 1 centimeter on the target.)
- To adjust for elevation, he uses his left hand to rotate the elevating handwheel.
- To traverse and search the target, he lays on the initial aiming paster (5 or 6), and then shifts to each of the other pasters in order (5 through 6, or vice versa). Before he can make any major shift in direction, he must first loosen the traversing slide-lock lever. When shifting either way between pasters 7 and 8, he uses the traversing handwheel.
- On receiving the command, the gunner repeats the instructions, sets the sights, lays the weapon on the designated paster, assumes the firing position, and reports "Up."
- On the command FIRE, the gunner repeats the command, simulates firing two single shots, shifts to the next paster, and simulates firing until the exercise is completed.

## DRY-FIRE PROFICIENCY (PERFORMANCE) EXAMINATION

4-88. The gunner must demonstrate his skill in all of the tasks in this hands-on test (found in Appendix G) before he can progress to 10-meter live firing. Scoring is pass-fail.

## REMEDIAL TRAINING

4-89. Soldiers who fail to meet the performance objectives in the dry-fire proficiency test must participate in remedial training. Gunners who have passed the proficiency test may help train Soldiers who are having trouble doing so. After re(remedial) training, the Soldiers retest.

## MULTIPURPOSE MACHINE GUN RANGE LAYOUT

4-90. The multipurpose machine gun range is used for 10-meter, transition day, night, and integrated CBRN firing. This range has ten lanes. TC 25-8 shows detailed setup and target configurations, and

Figure 4-11 shows the layout of the range. The same personnel perform the same set of duties for each training period for both 10-meter and transition fire. Local policy might dictate personnel requirements, but the following personnel, at a minimum, must attend all training on this range. All personnel must adhere to safety rules IAW AR 385-63, local regulations, and Appendix I:

- Officer in charge.
- Noncommissioned officer in charge.
- Safety officer or noncommissioned officer.
- Ammunition noncommissioned officer.
- Tower operator.
- Lane noncommissioned officers.
- Trainer.
- Assistant gunners.
- Others as required by TC 25-8.

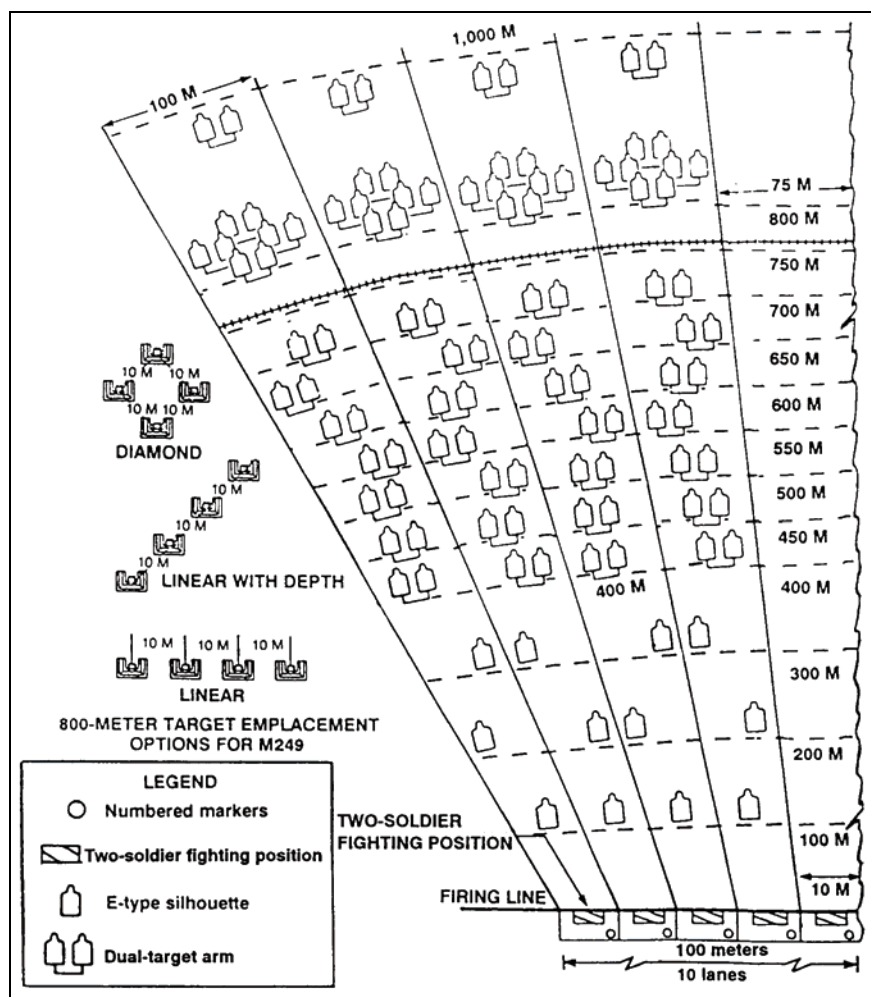


Figure 4-11. Multipurpose machine gun range layout.

*Note:* For targets beyond 800 meters, always use a machine gun optic.

## BASIC MACHINE GUN TARGET

4-91. The basic machine gun target (FSN 6920-078-5128 and NSN 6920-00-078-5123) is used for the 10-meter firing exercise (Figure 4-12). The following explanation of the target, including the size of the aiming pasters and scoring spaces, aids in zeroing the machine guns and facilitates control during the 10-meter firing exercises. The target has four sections lettered A, B, C, and D. Each section has four point targets numbered 1, 2, 3, and 4; and two sets of area targets numbered 5 through 6 and 7 through 8. Each space is 4 cm wide and 5 cm high. The black aiming paster within the numbered scoring spaces is 1 cm square. The target is used to score two gunners. One gunner uses sections A and B and the other C and D.

### POINT TARGETS

4-92. Point targets on the basic machine gun target are pasters 1 through 4 of sections A, B, C, and D. Firing at point targets exposes the gunner to zeroing techniques and controlled-burst fire techniques. Targets 1 through 4 can also be used for qualification.

### AREA TARGETS

4-93. Area targets on the basic machine gun target consist of pasters 5 through 6, and 7 through 8 of sections A, B, C, and D. Target group 5 through 6 provides the gunner with targets in depth and allows him to use a series of aiming points to disburse fire across the target by using the T&E mechanism. Target group 7 through 8 provides the gunner with linear targets with depth. This series of targets uses a series of aiming points to disburse fire across the target and in depth by using the T&E mechanism.

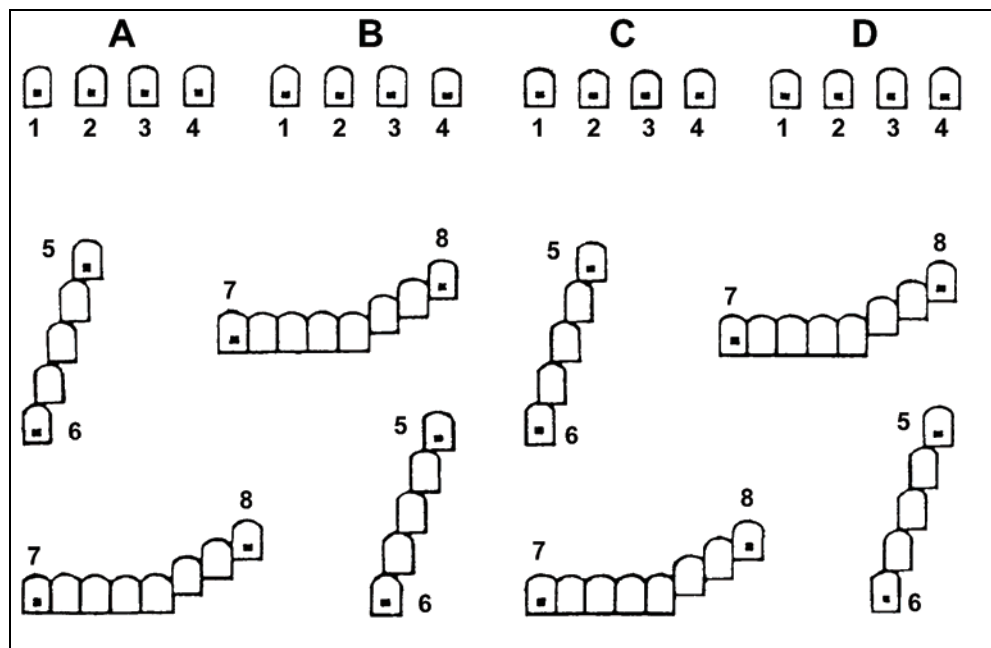


Figure 4-12. Basic machine gun target.

### GRID SQUARE OVERLAY

4-94. This device helps the gunner in zeroing his weapon at 10 meters, while using the basic machine gun target (Figure 4-13). The grid square overlay is used the same as an M16 25-meter zero target, except the material can be made of plastic or view graph transparency. Each square is equal to 1 cm.

1 CLICK = 1 CM in either direction, vertical or horizontal. Therefore--

- Turn the traversing handwheel to move the strike of the round left or right.
- Turn the elevation handwheel to move the strike of the round up or down.

- Sets the sights for 10-meter zeroing, then fires three single rounds to form a three-round shot group. Re-lays on the target using the T&E mechanism.
- After firing the three-round shot group (Figure 4-14), places the grid square overlay over the pasters (1 and 2, Figure 4-15) and counts the number of clicks needed for the rounds to impact on the black aiming paster. To correct, he turns the traverse handwheel to the right one click.

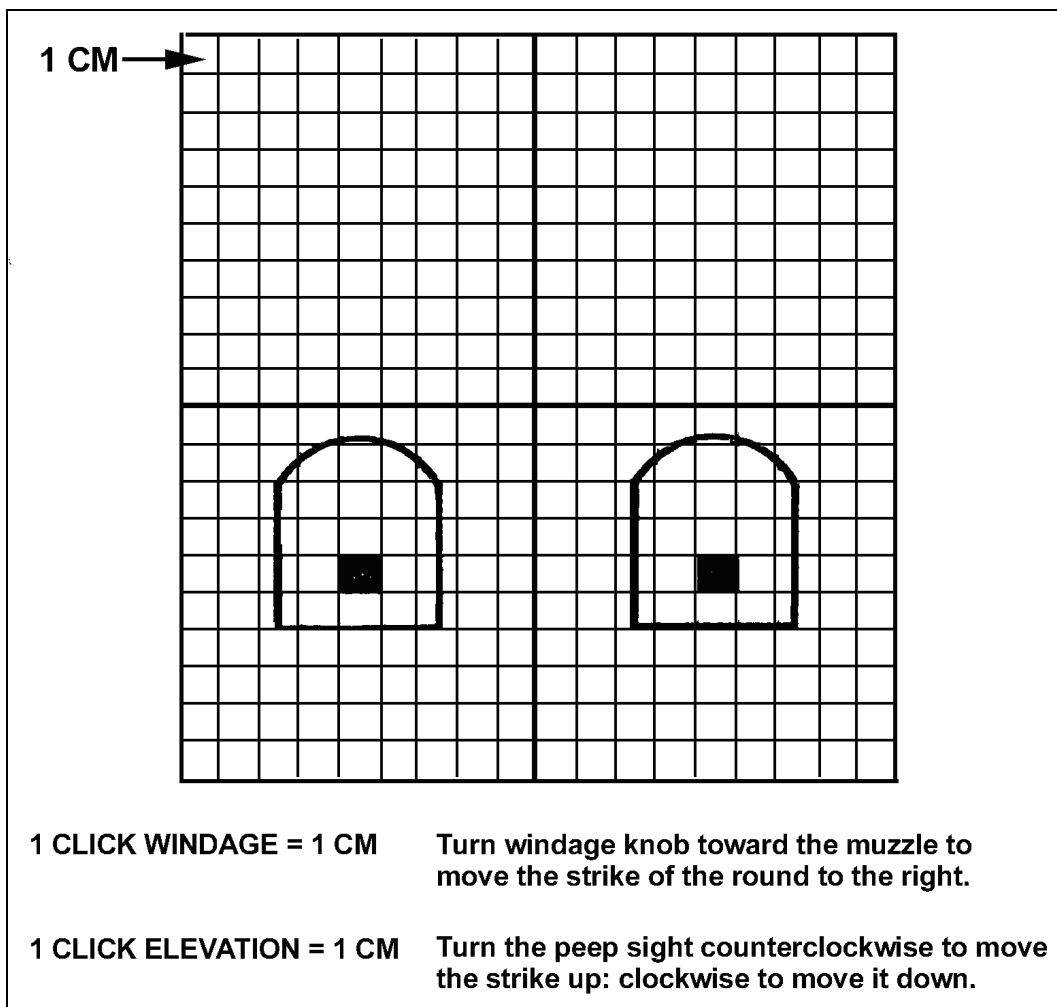


Figure 4-13. Grid square overlay.



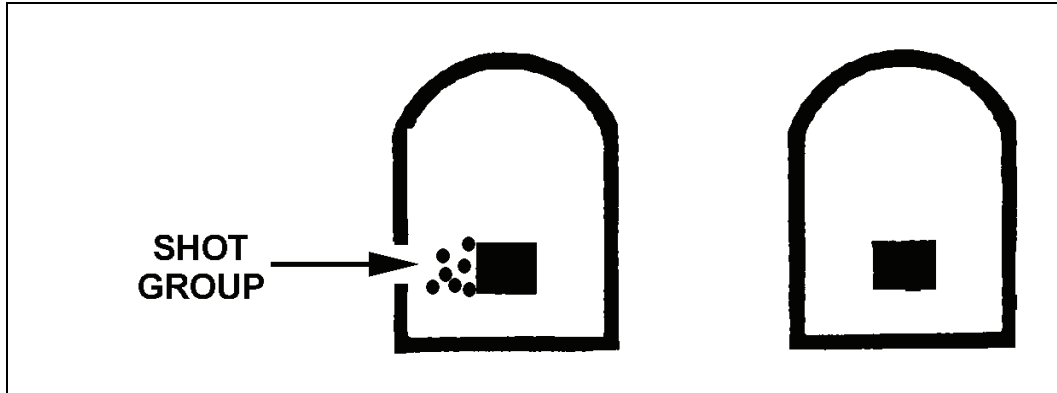


Figure 4-14. Shot group on basic machine gun target.

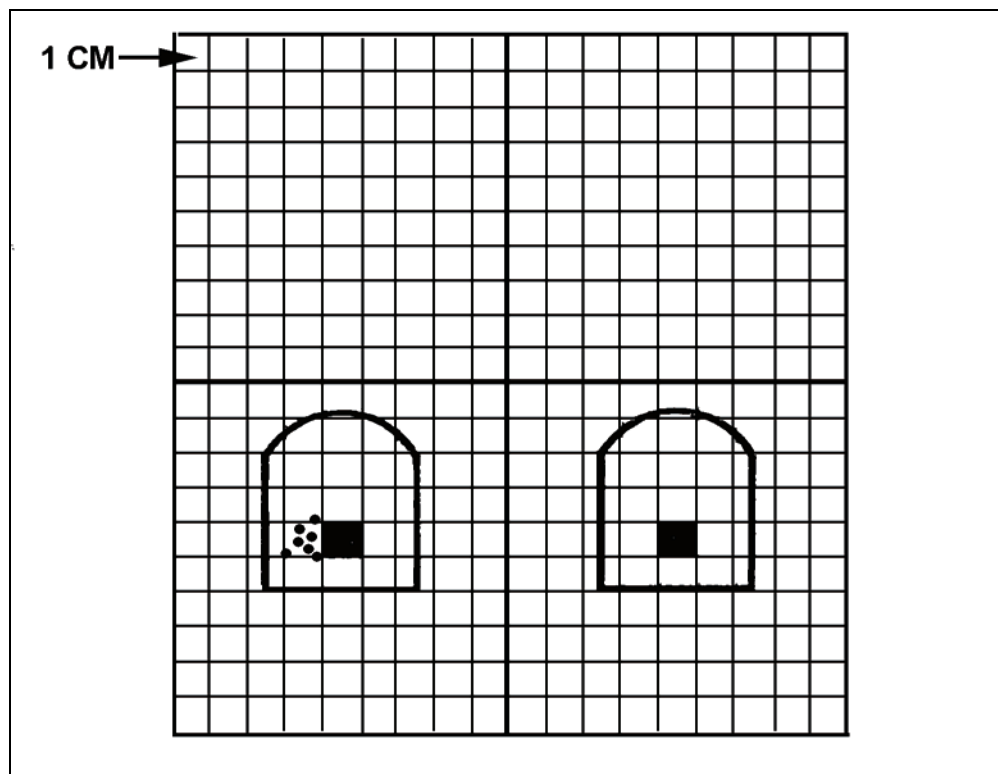


Figure 4-15. Overlay placed over pasters.

## TARGET ANALYSIS

4-95. Targets are analyzed and scored to determine the gunner's proficiency and to reinforce the fundamentals of marksmanship. In a prone or fighting position firing with a zeroed weapon, a target is best analyzed by considering the common errors of machine gun marksmanship (Figure 4-16).

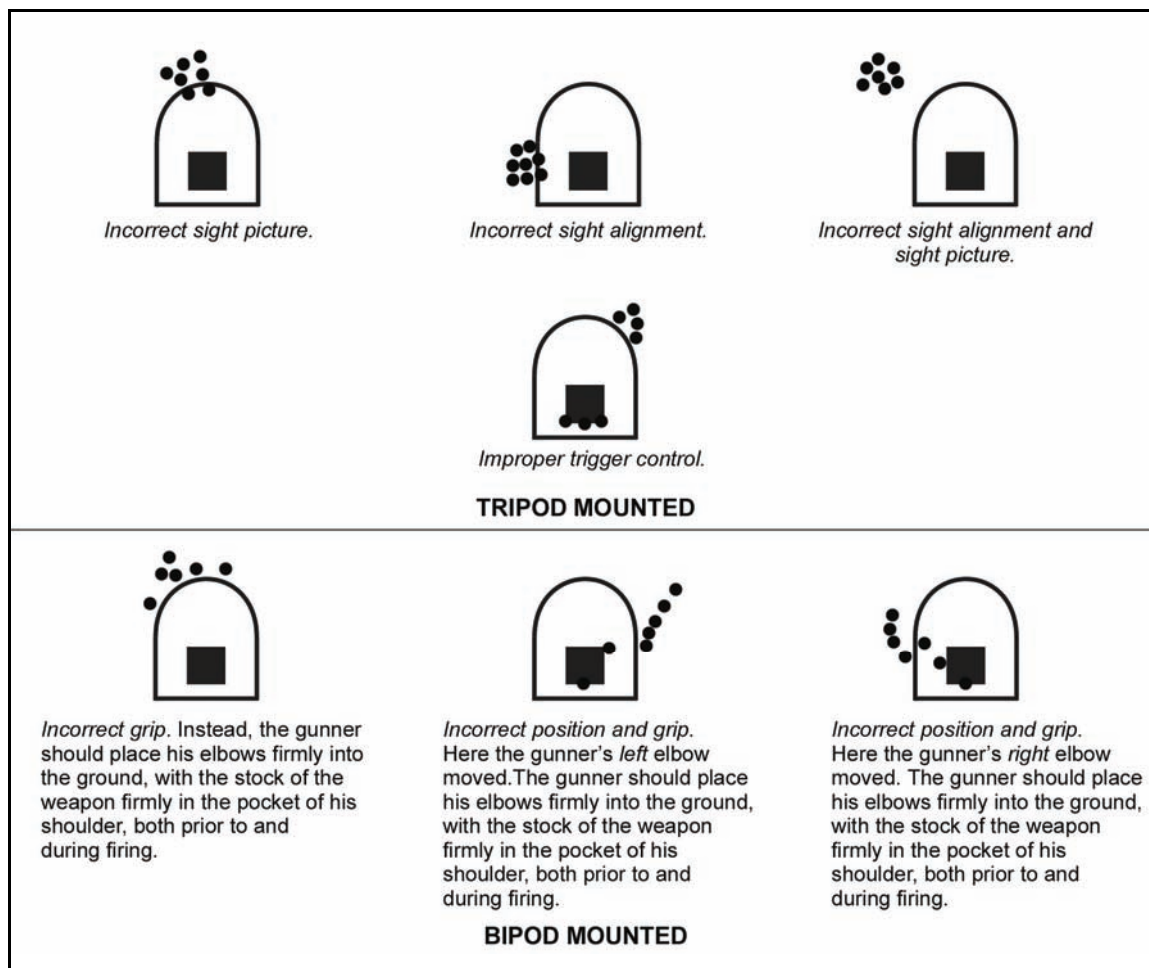


Figure 4-16. Common errors of marksmanship.

### SECTION III. CREW DRILL

This section applies to all three machine guns and is part of both *preliminary gunnery* and *basic gunnery*. The machine gun crew drill trains squad and platoon Soldiers in the fundamentals of machine gun operation. It gives them confidence in their individual and collective abilities to put the machine gun into action with precision and speed. Rotation of duties ensures that each Soldier learns the duties of each crew position. Precision develops from learning and practicing correct procedures correctly. This includes inspecting the machine gun before firing it, and observing all safety procedures. Precision is *more important than* speed. Only after they achieve precision should they work on speed.

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*Note:* Precision is *more important than* speed.

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### PREPARATION

4-96. The crew drill is conducted with preliminary gunnery and is part of the 10-meter and transition firing practice and qualification, concurrently during other courses of fire, or anytime at the discretion of

the unit commander. The organization for crew drill described in this section is for training crews in the fundamentals of machine gun operation. However, some tactical situations require a different organization.

- To instill realism and relate the crew drill to actual situations, the unit leader should vary his method of instruction. Possible approaches to this method of instruction include--
  - Conduct the crew drill from the prone position.
  - Initiate the crew drill from all types of tactical formations.
  - Perform the crew drill in simulated tactical situations.
- The crew drill, as discussed here, involves the leader and one machine gun crew. The machine gun crew has three members (a gunner, assistant gunner, and ammunition bearer).
- All commands are given by a leader. This leader may be a team leader, squad leader, or someone placed in charge of the crew. The gunner and assistant gunner repeat all commands. After the machine gun is mounted, the assistant gunner transmits all signals from the leader to the gunner and from the gunner to the leader.

## CREW EQUIPMENT

4-97. In addition to individual weapons and equipment, crewmembers carry equipment for both bipod and tripod training. The following is a suggested assignment of the equipment to the machine gun crewmembers:

### DAY

#### Leader

4-98. Binoculars, compass.

#### Gunner

4-99. Machine gun, compass, MGO or AN/PAS-13 (Appendix J), two bandoleers (with dummy ammunition).

#### Assistant Gunner

4-100. Binoculars, spare barrel case (spare barrel and accessories), T&E mechanism, pintle assembly, and three bandoleers (with dummy ammunition).

#### Ammunition Bearer

4-101. Compass, tripod and four bandoleers (with dummy ammunition).

### NIGHT

#### Leader (Designated)

4-102. AN/PVS-7B, compass.

#### Gunner

4-103. Machine gun, compass, AN/PVS-4 or AN/PAS-13, two bandoleers (with dummy ammunition).

### Assistant Gunner

4-104. AN/PVS-14, spare barrel case (spare barrel and accessories), T&E mechanism, and three bandoleers (with dummy ammunition).

### Ammunition Bearer

4-105. AN/PVS-7B, compass, tripod, pintle assembly, and four bandoleers (with dummy ammunition).

## FORMATION (BIPOD OR TRIPOD)

4-106. The leader commands--

*FORM FOR CREW DRILL.*

4-107. The crew forms in a file, with five steps between each crewmember, in this order: gunner, assistant gunner, and ammunition bearer. The gunner is five steps from and facing the leader. When the crewmembers reach their positions, each assumes the prone position and is ready for the crew drill (Figure 4-17).

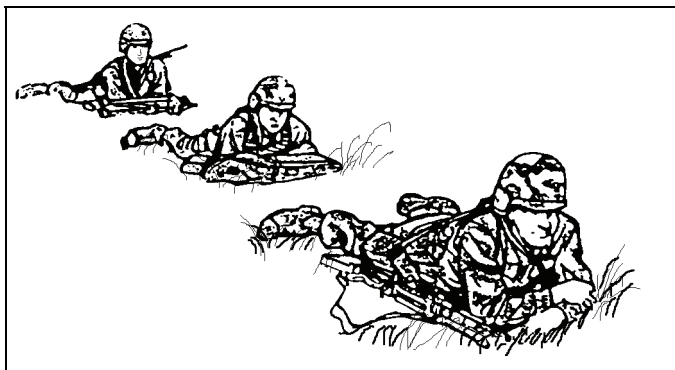


Figure 4-17. Crew in ready position.

## CROSS-TRAINING PROCEDURES

4-108. Duties rotate during the crew drill to train each Soldier in the duties of all crewmembers. The command to rotate duties is

*FALL OUT, GUNNER.*

4-109. At this command, the gunner becomes the ammunition bearer, the assistant gunner becomes the gunner, and the ammunition bearer becomes the assistant gunner. When crewmembers have assumed their new positions, they call out their new duties in order:

*AMMUNITION BEARER.  
ASSISTANT GUNNER.  
GUNNER.*

## INSPECTION FOR BIPOD FIRE

4-110. An inspection of equipment is made at the beginning of each exercise.

## LEADER

4-111. After the crew forms up for crew drill, the leader commands the following. On hearing this command, each crewmember inspects his equipment:

*INSPECT EQUIPMENT BEFORE FIRING, BIPOD.*

## GUNNER

4-112. Every night, the gunner checks the AN/PVS-4 or AN/PAS-13 (Appendix J), but every time he inspects, he must--

- Check the ammunition first, and ensure that the ammunition is properly linked and free of dirt and corrosion, and that the double link is up (ready for loading).
- Place the cloth slings over his shoulder (except for one bandoleer, which he prepares for loading).
- Inspect the machine gun.
- Take his position parallel to the machine gun, with his head on-line with the feed tray.
- Hold the machine gun with his left hand, use his right hand to lower the bipod legs and then rest the machine gun on the bipod.
- Attach the bandoleer to the machine gun.
- Place the safety on "F," pull the cocking handle to the rear, place the safety on "S," returns the cocking handle to the forward position, raise the cover assembly.
- Call for the cleaning rod and receive it from the assistant gunner.
- Crawl forward, and then run the cleaning rod through the barrel to ensure it is clear.
- Check the flash suppressor for cracks.
- Check the front sight for tightness and for damage to the blade.
- Check the carrying handle to ensure that it can be positioned so it will out of the way during aiming and firing.
- Ensure that the barrel is securely locked to the receiver.
- Return the cleaning rod to the assistant gunner.
- Move to the rear of the machine gun and check the moving parts in the feed cover.
  - Ensure that the feed cam is clean and properly lubricated.
  - Push back and forth on the feed cam to check for freedom of movement.
  - Push on the belt feed pawl to ensure that it has spring tension.
  - Push on the cartridge guides to ensure that they have spring tension.
- Push the belt-holding pawl to ensure that it has spring tension.
- Lower and latch the cover (without inserting the belt).
- Pull the trigger to check the functioning of the safety.
- Place the safety on "F," pull the cocking handle to the rear, pull the trigger, ease the bolt forward manually with the cocking handle.
- Check the rear sight.

### ASSISTANT GUNNER

4-113. Remaining in a prone position, the assistant gunner begins by inspecting his ammunition. He takes the cleaning rod from the carrying case and assembles the cleaning rod, and then he must--

- Take the T&E mechanism from the case and prepare it as follows:
  - Rotate the elevating handwheel, exposing 1 1/2 inches or the width of two fingers) of threads above the elevating handwheel.
  - Rotate the traversing slide sleeve, exposing 1 1/2 inches or the width of two fingers) of threads below the elevating handwheel.
  - Center the traversing mechanism.
  - Check to ensure that the locking mechanism that attaches to the machine gun is present and in working order.
  - Replace the T&E mechanism in on the case.
- Remove the spare barrel from the spare barrel case.
  - Check the barrel.
  - Check the flash suppressor for cracks.
  - Check the front sight for tightness and for damage to the blade.
  - Check the pintle assembly for proper functioning.
  - Place the spare barrel its case.

4-114. After the gunner returns the cleaning rod, the assistant gunner disassembles the cleaning rod and returns it to the accessory pocket. Then, he checks the other items in the case including the ruptured cartridge extractor, bore brush, chamber brush, receiver brush, and heat-protective mitten for serviceability. Finally, he checks the AN/PVS-14.

### AMMUNITION BEARER

4-115. Remaining in a prone position, the ammunition bearer inspects his ammunition as described above for gunner and assistant gunner. He then inspects the tripod and the pintle assembly. Night personnel also check the AN/PVS-7.

- Ensure that the front leg will unfold properly and the rear legs unfold and lock securely in place with the sleeve latch.
- Check the sleeve latch to ensure that it has spring tension and will function.
- Check the pintle assembly to ensure that it locks into the pintle bushing and that the pintle rotates freely within the bushing.
- Check to ensure that the T&E mechanism will lock on the traversing bar and move freely when unlocked for major changes in direction.
- Unlock the pintle and T&E mechanism from the tripod and return to the assistant gunner.
- Fold the rear legs by unlocking the sleeve latch and fold the front leg so that the tripod is in the carrying position.

## INSPECTION REPORT

4-116. When crewmembers have finished inspecting the equipment, they call out their reports, without command, starting from the rear.

- "Ammunition bearer correct" (or reports deficiencies).
- "Ammunition bearer and assistant gunner correct" (or reports deficiencies).
- "Gunner all correct" (or reports deficiencies).

## PLACEMENT INTO ACTION (BIPOD)

4-117. To place the machine gun into action, the Soldiers do the following:

- The leader must--
  - Point where he wants the machine gun mounted and command  
*MOUNT MACHINE GUN HERE.*
  - Point in the direction of fire and add, FRONT.
  - Raise his fist to shoulder level, thrusts it several times in the direction of the selected position, and command  
*ACTION.*
- At the command ACTION, the gunner must--
  - Stand and grasp the carrying handle with his left hand
  - Grasp the top of the stock with his right hand
  - Raise the machine gun to a carrying position (muzzle to the front).
  - Move to the selected position.
  - Place the machine gun on the ground and assume a prone position to the rear of it.
  - Position the carrying handle so that it will be out of the way during aiming and firing.
  - Align the machine gun in the direction of fire and set the rear sight.
  - Place the safety on "F," pulls the bolt to the rear, then return the safety to "S."
  - Return the cocking handle to the forward position.
  - Raise the feed cover, place the first round of ammunition in the cartridge feed tray groove, and close the feed cover, ensuring that the round remains in the cartridge feed tray groove.
  - Pull the machine gun into his shoulder and put the safety on "F."

**WARNING**

**BOLT POSITION**

***In tactical situations, where noise discipline is critical to mission success, carry the M240B with the bolt locked to the rear. Only trained gun crews may load the M240B, and then only on command.***

***In training situations, load and carry the M240B with the bolt forward.***

- The assistant gunner times his movements so that he arrives at the position as the gunner is assuming the prone position. Then, the assistant gunner must--
  - Lie prone on his left hip, feet to the rear, and on the left side of the gunner.
  - Place the spare barrel case parallel to the gun with the zippered side towards the machine gun.
  - Open the case and remove the spare barrel. Place the spare barrel on the case, muzzle to the front and even with the muzzle of the machine gun (Figure 4-18).



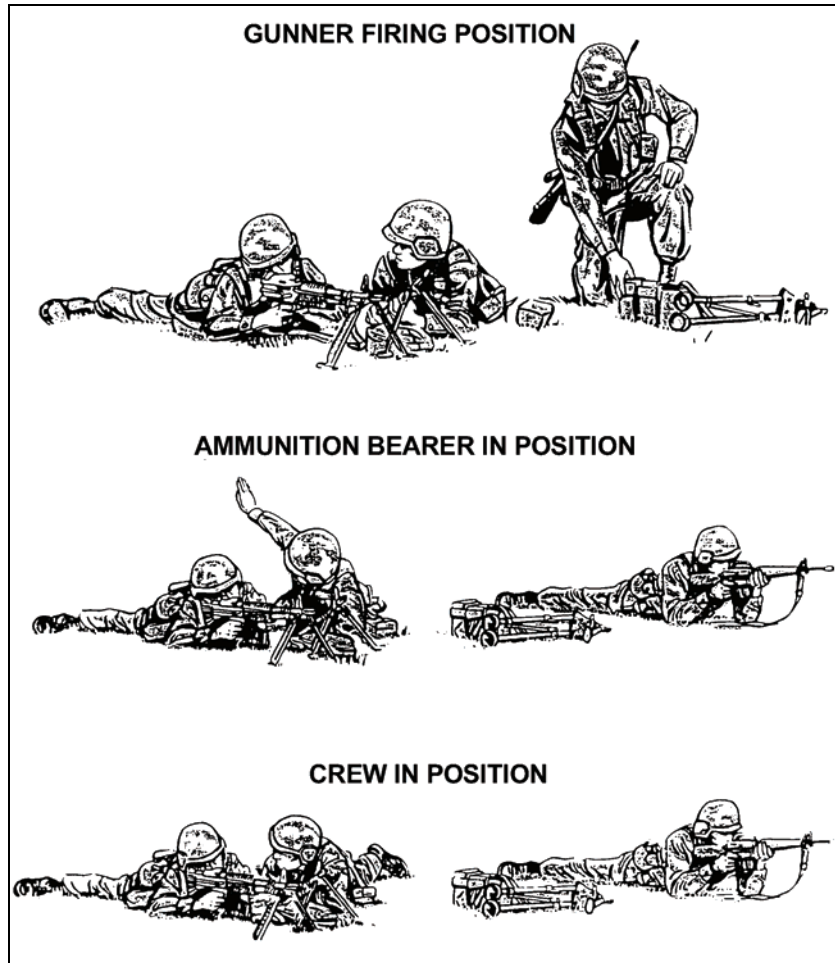


Figure 4-18. Crewmembers in firing position.

- The ammunition bearer times his movements so that he arrives at the position as the assistant gunner is assuming the prone position. The ammunition bearer must--
  - Place the folded tripod one step to the left of the muzzle of the machine gun and on line with the machine gun.
  - Unslung his bandoleers and place them next to the folded tripod legs.
  - Lie prone 10 meters to the left and on line with the position, provide security, and prepare to fire into the target area with his rifle.
- When ready to fire, the gunner must put the safety lever on "F" and report "Up." The assistant gunner must signal "Ready" to the leader.

## BARREL-CHANGING PROCEDURES (BIPOD)

4-118. To ensure proficiency and speed in changing barrels, the barrel changing process is included in crew drill.

- When the gunner has reported "Up" and the assistant gunner has signaled "Ready," the leader commands

### CHANGE BARRELS

- The gunner ensures that the bolt is to the rear, puts the safety on "S," and puts the stock on the ground. Next, he moves his left hand to the top of the stock to ensure the weapon stays parallel to the ground. He puts his right hand under the handguard and forearm assembly. This helps to support the machine gun while the assistant gunner removes the barrel.
- The assistant gunner (wearing the heat-protective mitten) unlocks the barrel locking lever, removes the barrel, and places the barrel on the spare barrel case. He holds the spare barrel inserts it into the machine gun.
- The gunner ensures that the barrel is locked and secured in the receiver of the machine gun. He moves the safety lever to "F," assumes the correct firing position, and reports "Up." The assistant gunner signals "Ready" to the squad leader.

## REMOVAL FROM ACTION (BIPOD)

4-119. To take the machine gun out of action, the leader commands and signals OUT OF ACTION. The gunner and assistant gunner repeat the command.

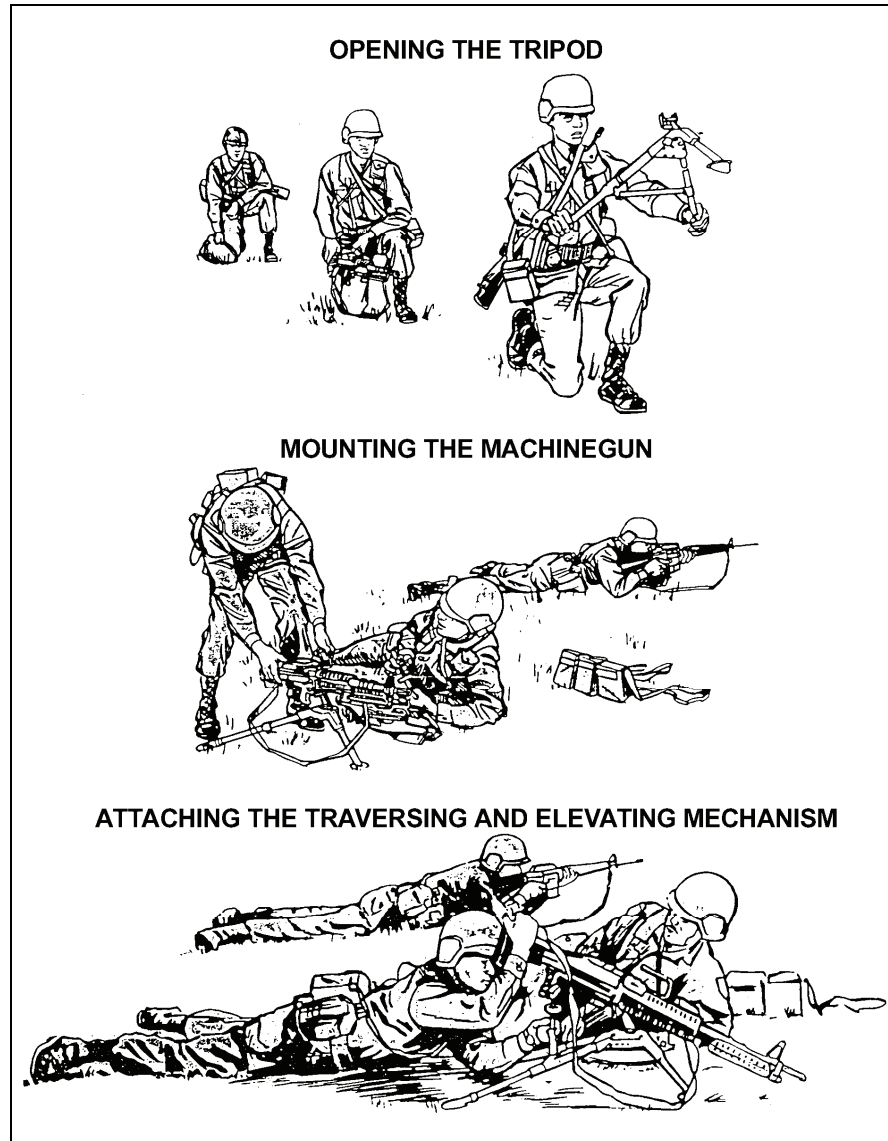
- As soon as he hears the command or sees the signal for OUT OF ACTION, the ammunition bearer slings his rifle and moves to the position. Once there, he finds and slings the bandoleers that he left earlier. He picks up the tripod and moves 15 steps to the rear of the machine gun. There, he lies prone, facing the position with the tripod in front of him.
- The assistant gunner places the spare barrel and the heat-protective mitten in the spare barrel case. Before standing, he closes the spare barrel case just enough to hold the spare barrel and the T&E mechanism. He moves 10 steps to the rear of the position and lies prone, facing the position. At this time, he fully closes the spare barrel case.
- The gunner must--
  - Place the stock on the ground and ensure that the bolt is to the rear
  - Place the safety on "S" and raise the feed cover.
  - Remove the ammunition from the tray, puts it into the bandoleer, and close the bandoleer.
  - Examine the chamber to ensure that it is clear
  - Close the feed cover and pull the cocking handle to the rear.
  - Put the safety on "F" and pull the trigger slowly, while gently easing the bolt forward.
  - Stand and pivots on his right foot
  - Without turning the machine gun, raise it to his left hip and move five steps to the rear.
  - Look to ensure that the ammunition bearer and assistant gunner are in their positions.
  - Lie prone, facing the position with the machine gun on your right.
  - Fold the bipod legs alongside the barrel and report "Up" to the squad leader.

## INSPECTION FOR TRIPOD FIRE

4-120. Inspecting equipment for tripod training is the same as for bipod training, except the command that the leader's command is INSPECT EQUIPMENT BEFORE FIRING TRIPOD. The gunner inspects the tripod legs, and then folds them to their position alongside the barrel.

## PLACEMENT INTO ACTION (TRIPOD)

4-121. The leader commands and signals MACHINE GUN TO BE MOUNTED HERE, FRONT, ACTION (Figure 4-19).



**Figure 4-19. Placement of machine gun into action.**

- Upon the command ACTION, the ammunition bearer stands, holds the tripod with his right hand, and moves forward to the position. He kneels on his right knee and rests the shoes of the rear tripod legs on the ground, with the mount in a vertical position. Steadying the mount with his right hand near the tripod head, he raises the front leg with his left hand. He grasps his right shoe with his right hand and his left shoe with his left hand. Then, he uses his body to raise the tripod chest high. He separates the tripod legs with a quick jerk. Ensuring that the sleeve latch engages the sleeve, he places the tripod on the ground with its front leg pointing in the direction of fire. He rises to his feet and stamps the rear tripod shoes into the ground. He then unslings his bandoleers and places them on line with the front leg of the tripod, one step to the left. He moves 10 meters to the left of the position, unslings his rifle, lies prone, provides security, and prepares to fire into the target area.
- The assistant gunner times his movements so that he arrives at the position just as the ammunition bearer leaves. The assistant gunner places the spare barrel case (with zippered side facing the tripod) parallel to and on line with the spot where the muzzle of the machine gun is when it is mounted. He lies on his left side, with his hip near the left tripod shoe. He

unzips the spare barrel case and removes the spare barrel and the equipment needed to mount the machine gun. He places the spare barrel on the spare barrel case with the muzzle forward.

- The gunner also times his movements, arriving at the position just as the assistant gunner assumes the prone position. The gunner stands, holds the carrying handle in his left hand and the stock in his right, and raises the gun to the carrying position (muzzle to the front). He mounts the machine gun on the tripod. He then positions the carrying handle to the right to keep it from interfering with aim and fire. Then, he raises the rear sight assembly and lies prone.
- The assistant gunner helps the gunner mount the machine gun to the tripod. They secure the pintle and T&E mechanism are securely locked in place and working properly.
- The gunner places the safety on "F," pulls the bolt to the rear, places the safety on "S," and returns the cocking handle to the forward position.

### **WARNING**

#### **BOLT POSITION**

***In tactical situations, where noise discipline is critical to mission success, carry the M240B with the bolt locked to the rear. Only trained gun crews may load the M240B, and then only on command.***

***In training situations, load and carry the M240B with the bolt forward.***

- The assistant gunner places the first round of ammunition in the tray groove and supports the belt.
- The gunner closes the cover, takes the correct position and grip, places the safety on "F," and reports "Up."
- The assistant gunner signals "Ready" to the squad leader.

## **BARREL-CHANGING PROCEDURES (TRIPOD)**

4-122. When the gunner has reported "Up" and the assistant gunner has signaled "Ready," the leader commands CHANGE BARRELS.

- The gunner ensures that the bolt is to the rear and puts the safety on "S." He also helps the assistant gunner change the barrel, if needed.
- The assistant gunner (wearing the heat-protective mitten) unlocks the barrel locking lever, removes the barrel, and places the barrel on the spare barrel case. He secures the spare barrel and inserts it into the machine gun. To ensure that it locks to the receiver, he rotates the carrying handle to the right (M240B).
- The gunner ensures that the barrel is locked and secured in the receiver of the machine gun. He moves the safety lever to "F," assumes the correct firing position, and reports "Up." The assistant gunner signals "Ready" to the squad leader.

## **REMOVAL FROM ACTION (TRIPOD)**

4-123. At the command OUT OF ACTION, the gunner ensures that the bolt is to the rear, places the safety on "S," and raises the cover. The assistant gunner removes the ammunition from the tray, returns it to the bandoleer, and closes the bandoleer. The gunner inspects the chamber to ensure that it is clear; closes

the cover; pulls the cocking handle to the rear; puts the safety on "F"; pulls the trigger, easing the bolt forward. The gunner unlocks the rear of the machine gun from the tripod.

- The assistant gunner helps the gunner in dismantling the rear of the machine gun. He puts the spare barrel and heat-protective mitten into the case and closes it enough to hold the contents. He stands, moves 10 steps to the rear of the position, and lies prone, facing to the front. After receiving all mounting equipment from the ammunition bearer, he puts it in the spare barrel case and fully closes the spare barrel case.
- After the assistant gunner leaves, the gunner stands, lowers the rear sight, and holds the carrying handle with his left hand. With his right hand, he dismantles the front of the machine gun from the tripod. Holding the stock with his right hand, he pivots to his right as he raises the machine gun to the carrying position. He then moves five steps to the rear of the position and lies prone, facing to the front.
- The ammunition bearer rises, slings his rifle, moves to the machine gun, and secures his bandoleers, timing his arrival so that the gunner and assistant gunner is clear of the tripod. He grasps the tripod with his left hand and moves five steps to the rear of the position. He turns, facing the front, and kneels on his right knee. He places the tripod in a vertical position with the rear shoes on the ground and supports it with his right hand near the head of the tripod. At this time, he hands the assistant gunner all mounting equipment. He reaches up with his right hand down the right leg, and releases the sleeve latch. He then grasps the shoes and closes the tripod legs. He lowers the tripod to the ground, head to the left, lies prone behind it, and reports "Up."

## PRONE POSITION

4-124. Machine gun crew drill, as previously described, is an excellent training vehicle. This paragraph discusses the second phase of the crew drill. Train the prone position only to add realism to training.

## INSPECTING EQUIPMENT BEFORE FIRING

4-125. The inspection of equipment for crew drill from the prone position is the same as that for bipod training and tripod training.

## PLACING THE MACHINE GUN INTO ACTION

4-126. The leader commands and signals the following, just as he does for bipod training. With one exception, training with the bipod is the same—crewmembers stay off their feet: they use the low crawl. Once in position, they do everything from the prone position:

*MOUNT THE MACHINE GUN HERE, FRONT, ACTION*

## TRAINING WITH THE TRIPOD

4-127. Upon the command ACTION, the ammunition bearer crawls forward to the designated position and extends the front leg of the tripod. Grasping the rear legs firmly, he emplaces the front leg. Applying downward pressure, he emplaces the rear legs. He then crawls to a position about 10-meters to the left of the machine gun and gets into a good firing position with his rifle.

- The assistant gunner crawls forward, timing his movement to arrive as the ammunition bearer leaves. Positioning himself on the left side and facing the tripod, he places the spare barrel case alongside the tripod, unzips the case, and removes the spare barrel and mounting equipment.

- The procedures for mounting the machine gun on the tripod remain the same except all are performed in a prone position and all movements are in the low crawl.

### TAKING THE MACHINE GUN OUT OF ACTION

4-128. The procedures for taking the machine gun out of action are performed in a prone position and all movements are in the low crawl.

## SECTION IV. BASIC GUNNERY, MACHINE GUN ROLE

In basic marksmanship, the gunner applies the fundamentals in live-fire exercises during day and night. These exercises are conducted with the machine gun mounted on the tripod. Both the gunner and assistant gunner practice and qualify. Basic gunnery includes 10-meter zero, 10-meter fire, field zero, practice and qualification transition fire, and fire in limited visibility. (Chapter 1 discusses zeroing for the M249; Chapter 2 discusses zeroing for the M60; and Chapter 3 discusses zeroing for the M240B.)

### ZERO

4-129. Zeroing aligns the sights with the barrel so that the point of aim equals the point of impact. Ten-meter zeroing is for conducting 10-meter fire only and has no further application. (Zeroing at range or field zeroing is the automatic rifleman's battlesight zero and must be recorded.) Remember to zero both barrels of the machine gun.

#### **WARNING**

##### **BOLT POSITION**

***In tactical situations, where noise discipline is critical to mission success, carry the M240B with the bolt locked to the rear. Only trained gun crews may load the M240B, and then only on command.***

***In training situations, load and carry the M240B with the bolt forward.***

### TEN-METER ZERO, SETTING OF THE SIGHTS (MECHANICAL ZERO)

4-130. The automatic rifleman indexes or places the range scale on a range of 500 meters. He assumes a prone position and sights on the target. (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

### THREE-ROUND GROUP

4-131. The automatic rifleman fires three single rounds loaded individually at the center base of the aiming points on the basic machine gun marksmanship target. He fires the three rounds without making any adjustments to the sights. The shot group must be in a 4-cm circle or smaller to establish the center of the group relative to the center base of the aiming paster.

## GRID SQUARE OVERLAY

4-132. For a more accurate adjustment, the automatic rifleman moves downrange and places the grid square overlay over pasters 1 and 2. He ensures that he aligns the overlay with the pasters and squares.

- Counts the number of squares needed to move the shot group to the aiming paster.
- Upon completion, returns to the firing line to apply corrections to the weapon. (Figure 4-20 shows a zero group size where adjustments may be made, and a group that is too loose to adjust.) If a group is too loose, the automatic rifleman checks his position and group.

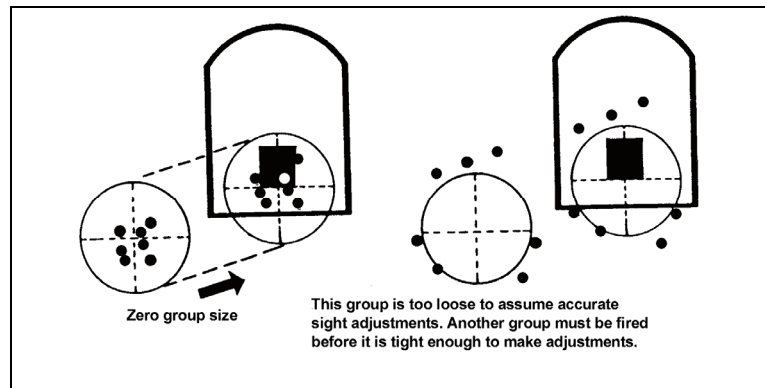


Figure 4-20. Size of zero group.

## WINDAGE CORRECTION

4-133. If the center of the group is to the left or right of the black aiming paster, the automatic rifleman must correct for windage.

## ELEVATION CORRECTION

4-134. If the center of the shot group is above or below the black aiming paster, the automatic rifleman must correct for elevation.

## CONFIRMATION

4-135. The automatic rifleman fires another three-shot group (loaded singly) after making his corrections for windage and elevation. If the center of the group is still off the aiming point, he adjusts further until the group centers on the point of aim.

## RECORDING OF ZERO

4-136. The automatic rifleman can refrain from recording the 10-meter zero, because it applies only to firing at the 10-meter basic machine gun target...

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*Note:* Zero both barrels.

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**WARNING**

**BOLT POSITION**

*In tactical situations, where noise discipline is critical to mission success, carry the M240B with the bolt locked to the rear. Only trained gun crews may load the M240B, and then only on command.*

*In training situations, load and carry the M240B with the bolt forward.*

**FIELD ZERO**

4-137. An automatic rifleman must know how to zero the machine gun at distance. He should select a known distance target between 300 and 700 meters. As the range increases, determining the location of the center of the beaten zone relative to the target becomes more difficult. Therefore, to simplify adjustment of fire, the 500-meter target should be used.

**SETTING OF THE SIGHTS**

4-138. The gunner uses the same procedures as for 10-meter zeroing except that he places the rear sight on the range to the target. The recommended range is 500 meters. (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

**BURST**

4-139. The gunner assumes a stable position and fires a burst (M249, M60 or M240B—5 to 7 rounds at the center base of the target). He observes where each burst strikes.

**CORRECTION FOR WINDAGE**

4-140. If the center of the beaten zone is to the left or right of the target, the gunner corrects for windage.

**CORRECTION FOR ELEVATION**

4-141. If the center of the beaten zone is higher or lower than the target, the gunner corrects for elevation. Because determining this is difficult, he relies on trial and error to gain the experience to make reliable estimates. He corrects for elevation the same as he did for 10-meter zeroing.

**CONFIRMATION**

4-142. After correcting for windage and elevation, the gunner fires a confirming burst. If he misses the target, he repeats the procedures.

**RECORDING OF ZERO**

4-143. On confirming a zero, for both windage and elevation, the gunner records how many clicks (and the direction) that he moved the sight from its original settings.



## TEN-METER FIRE

4-144. Ten-meter fire trains the gunner to apply the fundamentals of machine gun marksmanship in live-fire exercises. It familiarizes the Soldier with the weapon's characteristics, noise, and recoil. It also instills in the Soldier confidence in his weapon. Each gunner learns to zero his machine gun, conduct crew drill, fire controlled-bursts at point targets, and use traverse and search techniques on area targets. Ten-meter fire is conducted on a 10-meter or multipurpose range with the basic machine gun target. The gunner fires with the machine gun on the tripod, from both prone and fighting positions. Ten-meter firing exercises allow practice and part of record qualification. Therefore, all 10-meter firing exercises are recorded and scored. This way, the gunner has an assessment of his performance. Ten-meter fire is conducted IAW Firing Table I (Table 4-3).

FIRING TABLE I -- ALL WEAPONS, BASIC (10-METER) FIRE Prone or Fighting Position, Tripod, Practice and Qualification, Machine Gun Role					
TASK	TIME	ROUNDS		GUNNER TARGETS (PASTERS)	TYPE FIRE
		QTY	TYPE		
1	<i>No limit</i>	12	<i>Ball</i>	A1 and A2	12 single rounds (zero)
2	<i>No limit</i>	28	<i>Ball</i>	A3 and A4	5- to 7-round burst for each paster
3	<i>No limit</i>	35	<i>Ball</i>	A5 and A6	5- to 7-round burst for each paster, traverse and search
4	<i>No limit</i>	56	<i>Ball</i>	A7 and A8	5- to 7-round burst for each paster
*5	45 sec	56	<i>Ball</i>	B7 and B8	5- to 7-round burst for each paster
*6	30 sec	35	<i>Ball</i>	B5 and B6	5- to 7-round burst for each paster
<p><b>NOTES:</b> The gunner fires pasters on sections A and B, and the assistant gunner fires on Sections C and D.</p> <p>* Qualification task.</p>					

**Table 4-3. Firing Table I, all weapons, basic (10-meter) fire.**

## GUNNER--ZERO, PRACTICE, AND QUALIFICATION

### Task 1 (Zero, Tripod)

4-145. The gunner fires single shots to determine his weapon's zero for 10 meters. This task reinforces the dry-fire experience and allows the gunner to practice loading, while providing the tightest, most accurate shot group he can (A1 and A2).

### Task 2 (Controlled-Burst Fire, Tripod)

4-146. This task exposes the gunner to automatic fire and the action of the weapon and at the same time introduces trigger control (A3 through A4). Using a point targets, the gunner fires a burst of 5 to 7 rounds.

### Task 3 (Traverse and Search Fire)

4-147. This task requires the gunner to make position changes or manipulate the T&E mechanism to engage linear targets with depth, to use controlled-burst fire, and to use a series of aiming points to disburse fire across the target (A5 and A6).

**Task 4 (Traverse and Search Fire)**

4-148. This task requires the gunner to make body position changes or manipulate the T&E mechanism to engage area targets in depth, to use controlled-burst fire, and to use a series of aiming points to disburse fire across the target, while wearing a protective mask and gloves (A7 and A8).

**Task 5 (Traverse and Search Fire, Qualification)**

4-149. This task requires the gunner to engage area targets with width and depth while changing position or manipulating the T&E mechanism during timed conditions (B7 and B8).

**Task 6 (Search and Traverse Fire, Qualification)**

4-150. This task requires the gunner to make position changes or manipulate the T&E mechanism to engage area targets in depth during timed conditions (B5 and B6).

**ASSISTANT GUNNER--TEN-METER PRACTICE AND QUALIFICATION**

4-151. After the gunner finishes firing, he and the assistant gunner swap positions. The assistant gunner then fires the same tasks in the 10-meter practice and qualification tables, but he fires at the pasters on Sections C and D.

**TEN-METER CONDUCT OF FIRE**

4-152. The gunners are instructed on the objectives and fundamentals of firing from the tripod-supported prone or fighting positions. They also learn the fire commands used on the basic range. They learn about the basic machine gun marksmanship target, and how the target is analyzed and scored. The assistant helps the gunner during prefire checks and zeroing. The assistant gunner also relays signals to the tower operator, checks the gunner's position, and provides any other assistance allowed. No assistant gunner is available during qualification fire. The six tasks are fired as follows:

**TASK 1—TRIPOD, ZERO**

4-153. The gunner should zero his weapon in 9 rounds. He should use the other 3 rounds to confirm the zero. If he cannot zero in 12 rounds, he leaves the firing line and attends remedial training.

- The tower operator commands MACHINE GUN TO BE MOUNTED HERE (weapon squad leaders indicate the firing points on the 10-meter line), FRONT (weapon squad leader points to the 10-meter targets), ACTION.
- At the command ACTION, the machine gun crew places the machine gun into action (tripod mode).
- The gunner prepares the rear sight for zeroing and checks the front sight.
- The gunner assumes a good tripod position.
- The tower operator instructs the gunner to prepare a single round.
- The gunner and assistant gunner repeat each element of the following fire command:

*FIRE MISSION..... The gunner loads and moves the safety to "F."  
FRONT..... The gunner focuses on the target or target area.  
PASTERS A1 and A2..... The gunner locates the target.  
FIVE HUNDRED ..... The gunner adjusts sights and acquires the sight picture.  
FIXED, ONE ROUND..... The gunner is given the method of fire.  
COMMENCE FIRING..... The gunner fires on command from tower operator, but when ready.*

- The gunner loads one round, obtains the proper sight picture, and signals "thumbs up" to the assistant gunner.
- The assistant gunner relays the ready signal to the tower operator.
- The tower operator commands COMMENCE FIRING.
- When ready, the gunner engages paster A1 with three single shots.
- The gunner moves downrange to observe, mark, and triangulate the shot group. He adjusts as needed.
- He repeats Steps 3 through 10 until he has zeroed or fired 12 rounds. If he has not zeroed after 12 rounds, he is removed from the firing line for retraining. Once he zeroes, he fires the remaining rounds at paster A2 to confirm the zero.

### **TASK 2—TRIPOD, CONTROLLED-BURST FIRE, TRAVERSE**

4-154. The tower operator instructs the gunner to prepare a 28-round belt.

- The gunner and assistant gunner repeat each element of the following fire command:

*FIRE MISSION  
FRONT  
PASTERS A3 AND A4  
FIVE HUNDRED  
FIXED, FIVE TO SEVEN-ROUND BURST  
AT MY COMMAND*

- The gunner acquires the proper sight picture and signals "thumbs up" to the assistant gunner.
- The assistant gunner relays the ready signal to the tower operator.
- The tower operator commands FIRE.
- The gunner engages pasters A3 and A4, firing a 5- to 7-round burst at each paster, using traverse.

### **TASK 3—TRIPOD, CONTROLLED-BURST FIRE, TRAVERSE AND SEARCH**

4-155. The tower operator instructs the assistant gunner to prepare a 35-round belt.

- The gunner and assistant gunner repeat each element of the following fire command:

*FIRE MISSION  
FRONT  
PASTERS A5 AND A6  
FIVE HUNDRED  
TRAVERSE AND SEARCH, FIVE- TO SEVEN-ROUND BURST  
AT MY COMMAND*

- The gunner acquires the proper sight picture and signals "thumbs up" to the assistant gunner.
- The assistant gunner relays the ready signal to the tower operator.
- The tower operator commands FIRE.
- The gunner engages pasters A5 and A6, firing a 5- to 7-round burst at each paster, using traverse and search.

#### **TASK 4—TRIPOD, CONTROLLED-BURST FIRE, SEARCH AND TRAVERSE**

4-156. The tower operator instructs the gunner to prepare a 56-round belt.

- The gunner and assistant gunner repeat each element of the following fire command:

*FIRE MISSION  
FRONT  
PASTERS A7 AND A8  
FIVE HUNDRED  
TRAVERSE AND SEARCH, FIVE TO SEVEN-ROUND BURST  
AT MY COMMAND*

- The gunner acquires the proper sight picture and signals "Thumbs up" to the assistant gunner.
- The assistant gunner relays the ready signal to the tower operator.
- The tower operator commands FIRE.
- The gunner engages pasters A7 and A8, firing a 5- to 7-round burst at each paster, using search and traverse technique.
- The gunner and assistant gunner move downrange to observe and analyze the targets.

#### **TASK 5—TRIPOD, QUALIFICATION, SEARCH AND TRAVERSE FIRE**

4-157. After firing ends, the firing line is cleared and the trainers or safety officers move downrange and score the targets. Someone besides the gunner scores his target.

- The tower operator instructs the gunner to prepare a 56-round belt.
- The gunner and assistant gunner repeat each element of the following fire command:

*FIRE MISSION  
FRONT  
PASTERS B7 AND B8  
FIVE HUNDRED  
TRAVERSE AND SEARCH, FIVE- TO SEVEN-ROUND BURST  
AT MY COMMAND*

- The gunner acquires the proper sight picture and signals "thumbs up" to the assistant gunner.
- The assistant gunner relays the ready signal to the tower operator.
- The tower operator commands FIRE.
- The gunner engages pasters B7 and B8, firing a 5- to 7-round burst at each paster, using search and traverse technique. The gunner has 45 seconds to engage as many pasters as he can during the time allowed.

#### **TASK 6—TRIPOD, QUALIFICATION, TRAVERSE AND SEARCH**

4-158. On completion of all firing, the firing line is cleared and the trainers or safeties move downrange and score the targets. Someone besides the firer scores his target.

- The tower operator instructs the assistant gunner to prepare a 35-round belt.
- The gunner and assistant gunner repeat each element of the following fire command:

*FIRE MISSION  
FRONT  
PASTERS B5 AND B6  
FIVE HUNDRED  
TRAVERSE AND SEARCH, FIVE- TO SEVEN-ROUND BURST  
AT MY COMMAND*

- The gunner acquires the proper sight picture and signals "Thumbs up" to the assistant gunner.
- The assistant gunner relays the ready signal to the tower operator.

- The tower operator commands FIRE.
- The gunner engages pasters B5 and B6, firing a 5- to 7-round burst at each. He uses traverse and search. He has 30 seconds to engage as many pasters as he can.
- When the gunner and assistant gunner return from downrange, the tower operator commands OUT OF ACTION.
- The machine gun crew then takes the machine gun out of action (tripod mode).

- GUNNER NOTES:**
1. Throughout the firing exercises, perform the appropriate tasks during each element of the fire command. Use the number of rounds fired instead of the rate for METHOD OF FIRE. This improves control. However, omitting the rate specifies RAPID fire, which is undesirable for these tasks.
  2. If you zero in 9 rounds, then use the other 3 to confirm the zero. If you cannot zero in 12 rounds, leave the firing line and go through remedial training.

### **WARNING**

#### **BOLT POSITION**

*In tactical situations, where noise discipline is critical to mission success, carry the M240B with the bolt locked to the rear. Only trained gun crews may load the M240B, and then only on command.*

*In training situations, load and carry the M240B with the bolt forward.*

## **TEN-METER QUALIFICATION FIRE**

4-159. The first phase of qualification has the gunner firing tasks 2 through 4 of Firing Table I for practice, and tasks 5 and 6 of Firing Table I for record. Before firing, all Soldiers must be familiar with the tasks, the time allowed, the ammunition allowances, the procedures to follow in the event of a stoppage, and the penalties imposed.

### **TIME AND AMMUNITION**

4-160. Each gunner completes zeroing before record fire. They receive individual fire commands for each task. They must fire Task 5 in 45 seconds, and Task 6 in 30 seconds.

### **STOPPAGES**

4-161. If a stoppage occurs, the gunner must apply immediate action. If the stoppage is reduced, he continues to fire the course.

- If a stoppage occurs that the gunner cannot reduce by immediate action, then he raises his hand and awaits assistance.
- Once he reduces the stoppage, the gunner completes firing, beginning with the next task.
- If gunner error causes a stoppage, additional time is disallowed. He receives whatever score he had earned before the stoppage occurred.
- If the machine gun must be replaced, the gunner must zero it and fire the exercise again.
- Gunners who fail to fire a task or fail to do so in the time allowed due to malfunctions have another option: They can finish the exercise in an *alibi run* after all other gunners complete firing. They need only fire the tasks they failed to hit due to the malfunction.

### PENALTIES

4-162. Five points are deducted from the score of any gunner who fails to stop firing at the command or signal to cease fire. If a gunner fires at the wrong target or exercise, he loses the points for those rounds. A gunner whose target was fired upon by another gunner is permitted to refire the exercise.

### SCORING

4-163. On the 10-meter target, the trainer counts all scoring pasters in Sections B and D (B/D5 to B/D6, and B/D7 to B/D8). He awards 1 point for each round that impacts within the scoring space. The most points he can give the gunner for each paster is 7 points for the M249, M60, or M240B. Rounds that touch the line on the paster are considered hits. Someone besides the gunner scores the gunner's target. During qualification fire, the gunner must earn at least 63 points on Firing Table I on any of the weapons.

#### Sections B/D5 to B/D6

4-164. When firing B/D5 through B/D6, the gunner engages five scoring pasters with 35 rounds (M249, M60, or M240B). He can earn up to 35 points for either the M249, M60, or M240B.

#### Sections B/D7 to B/D8

4-165. When firing pasters B/D7 through B/D8, the gunner engages eight scoring pasters with 56 rounds (M249, M60, or M240B). He can earn up to 56 points for either the M249, M60, or M240B.

### POSITION

4-166. For practice and qualification, the gunner will use either a tripod-supported prone or tripod-supported fighting position.

### FIRERS

4-167. The gunner and the assistant gunner both fire Table I.

### TRANSITION FIRE

4-168. Transition fire provides the gunner with the experience he needs to progress from 10-meter fire to field fire at various types of targets at longer ranges. In a timed scenario, the gunner experiences and learns the characteristics of fire, field zeroing, range determination, and engagement of targets. He uses the adjusted aiming-point method of fire adjustment. Transition fire occurs on a machine gun transition range or the MPRC. Exercises are fired with the tripod prone or fighting position. However, the commander may direct that transition fire be conducted from the bipod prone or fighting position. *Each gunner and assistant gunner fires transition fire twice; once for practice and, once for qualification. They fire the field*

zero (Task 1) only once during the practice phase. Transition fire is scored during both practice and qualification to provide feedback to the gunner. Firing Table II has eight tasks (Table 4-4).

FIRING TABLE II -- ALL WEAPONS						
Tripod Transition Fire, Prone or Fighting Position, Practice and Qualification, Machine Gun Role						
TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No limit	28	4:1 <sup>b</sup>		500	Fixed, 5- to 7-round burst (field zero)
2 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	400	Fixed, 5- to 7-round burst
3 <sup>a</sup>	15 sec	14		Double E	500	Fixed, 5- to 7-round burst
4 <sup>a</sup>	20 sec	14	4:1 <sup>b</sup>	Double E	600	Fixed, 5- to 7-round burst
5 <sup>a</sup>	30 sec	14	4:1 <sup>b</sup>	Double E	800	Fixed <i>and area</i> , 5- to 7-round burst
6 <sup>a</sup>	30 sec	28	4:1 <sup>b</sup>	Single E Double E	400 600	Fixed, 5- to 7-round burst
7 <sup>a</sup>	45 sec	28	4:1 <sup>b</sup>	Double E Double E	700 800	Fixed <i>and area</i> , 5- to 7-round burst
8 <sup>a</sup>	45 sec	42	4:1 <sup>b</sup>	Single E Double E Double E	400 500 600	Fixed, 5- to 7-round burst
<p><b>NOTES:</b> The unit commander determines the firing position.</p> <p><sup>a</sup> Qualification task.</p> <p><sup>b</sup> Ball to tracer ratio (mix), that is, 4 ball rds are loaded for every 1 tracer round loaded.</p>						

**Table 4-4. Firing Table II, all weapons, tripod transition fire.**

## RANGE FACILITIES

4-169. The transition range has several firing lanes. Each lane is 10 meters wide at the firing line and 100 meters wide at a range of 800 meters. Ideally, each lane has a fighting position with an adjacent prone firing position.

## TARGETS

4-170. Cardboard (NSN 6920-00-795-1806) and plastic (NSN 6920-00-071-4780) E-type silhouette targets are used. Both single and double are needed for qualification. The double E-type silhouette represents an enemy automatic weapon, which for the gunner is a priority target (Figure 4-21). The targets are at various ranges that the gunner might engage. All targets are plainly visible from the firing positions. Electrical targets are desirable.

## STOPPAGE

4-171. Firing Table I criteria are used.

## PENALTIES

4-172. Again, Firing Table I criteria are used.

**SCORES**

4-173. Ten points are given for each target hit, whether hit on the first or second burst. The total possible points are 110. The gunner must hit at least 7 targets (70 points) out of 11 exposures to qualify. Trainers use DA Form 85-R, *Scorecard for M249, M60, and M240B Machine Guns*, to record scores (Figure 4-22, page 4-50). A blank copy is included at the back of this manual for reproduction on 8 1/2" x 11" paper. The form may also be downloaded <http://www.army.mil/usapa/eforms/index.html>.

**POSITION**

4-174. Transition fire should be fired from the tripod, but the commander may specify that the gunner should fire it from the bipod.

**FIRERS**

4-175. The gunner and the assistant gunner both fire Table II.



**Figure 4-21. Single and double E-type silhouette targets.**



SCORECARD FOR M249, M60, AND M240B MACHINE GUNS																																	
For use of this form, see FM 3-22.68; the proponent agency is TRADOC.																																	
1. ID CODE*				2. UNIT			3. LANE		4. DATE (YYYYMMDD)																								
20070128ALW1				C CO 2/29			3		20070128																								
5. TABLE I, 10 METER				6. TABLE II, DAY TRANSITION						7. TABLE III, LIMITED VISIBILITY																							
TASK	RANGE (M)	TIME	TOT HIT PTS	TASK	RANGE (M)	TIME	PRACTICE		QUALIFY		TASK	RANGE (M)	TIME	PRACTICE		QUALIFY																	
							HIT	MISS	HIT	MISS				HIT	MISS	HIT	MISS																
1	10	N/A	N/A	1	500	N/A	N/A	N/A	N/A	N/A	1	10	N/A	N/A	N/A	N/A	N/A																
2	10	N/A	N/A	2	400	10 SEC	X		X		2	10	N/A	N/A	N/A	N/A	N/A																
3	10	N/A	N/A	3	500	15 SEC	X		X		3	500	N/A	N/A	N/A	N/A	N/A																
4	10	N/A	N/A	4	600	20 SEC		○	X		4	200	10 SEC		○	X																	
5	10	45 SEC	56	5	800	30 SEC	X		X		5	400	15 SEC	X		X																	
6	10	30 SEC	35	6	400	30 SEC	X		X		6	100	10 SEC		○	X																	
8. TABLE I POINTS (TOTAL HITS):			91	6	600	30 SEC	X		X		7	300	15 SEC	X		X																	
8. TABLE I POINTS (TOTAL HITS):			91	7	700	45 SEC	X		X		8	200	25 SEC	X		X																	
8. TABLE I POINTS (TOTAL HITS):			91	7	800	45 SEC	X		X		8	400	25 SEC		○	X																	
8. TABLE I POINTS (TOTAL HITS):			91	8	400	45 SEC	X		X		9	100	25 SEC	X		X																	
8. TABLE I POINTS (TOTAL HITS):			91	8	500	45 SEC	X		X		9	300	25 SEC	X		X																	
8. TABLE I POINTS (TOTAL HITS):			91	8	600	45 SEC		○	X		10	100	30 SEC	X		X																	
8. TABLE I POINTS (TOTAL HITS):			91	8	600	45 SEC		○	X		10	200	30 SEC	X		X																	
8. TABLE I POINTS (TOTAL HITS):			91	8	600	45 SEC		○	X		10	400	30 SEC	X		X																	
8. TABLE I POINTS (TOTAL HITS):			91	9. TABLE II POINTS (TOTAL HITS X 10):						110		10. TABLE III POINTS (TOTAL HITS):				11																	
11. REMARKS				* Do not use personal information, to include name, SSN, phone number, address, mother's maiden name, and so forth.																													
				12. RATING CALCULATOR						13. RATING SCALE																							
				<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">91</td> <td>TABLE I POINTS (BLOCK 8)</td> </tr> <tr> <td style="text-align: center;">110</td> <td>TABLE II POINTS (BLOCK 9)</td> </tr> <tr> <td style="text-align: center;">11</td> <td>TABLE III POINTS (BLOCK 10)</td> </tr> <tr> <td style="text-align: center;">212</td> <td>TOTAL POINTS</td> </tr> </table>						91	TABLE I POINTS (BLOCK 8)	110	TABLE II POINTS (BLOCK 9)	11	TABLE III POINTS (BLOCK 10)	212	TOTAL POINTS	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>TOTAL POINTS</th> <th>RATING</th> </tr> </thead> <tbody> <tr> <td>186 - 212:</td> <td>EXPERT <span style="float: right;">X</span></td> </tr> <tr> <td>157 - 185:</td> <td>FIRST CLASS</td> </tr> <tr> <td>139 - 156:</td> <td>SECOND CLASS</td> </tr> <tr> <td>BELOW 139:</td> <td>UNQUALIFIED</td> </tr> </tbody> </table>				TOTAL POINTS	RATING	186 - 212:	EXPERT <span style="float: right;">X</span>	157 - 185:	FIRST CLASS	139 - 156:	SECOND CLASS	BELOW 139:	UNQUALIFIED		
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139 - 156:	SECOND CLASS																																
BELOW 139:	UNQUALIFIED																																
14. GRADER'S INITIALS				15. DATE (YYYYMMDD)				16. OIC'S INITIALS				17. DATE (YYYYMMDD)																					
fw				20070128				mBA				20070128																					
DA FORM 85-R, AUG 2006				DA FORM 85-R, JAN 2003 IS OBSOLETE.								APD V1.00																					

Figure 4-22. Example completed DA Form 85-R, Scorecard for M249, M60, and M240B Machine Guns.

## TRANSITION CONDUCT OF FIRE WITH TRIPOD, PRACTICE

4-176. The unit is organized in firing orders based on range constraints. Each firing order has a gunner and an assistant gunner. The assistant gunner helps the gunner during prefire checks and zeroing. He also relays signals to the tower operator, checks the gunner's position, and helps with target detection and adjustments during qualification. The gunner uses the bipod-supported prone or fighting position. He fires the eight tasks as follows:

### TASK 1 (FIELD ZERO, 500-METER, DOUBLE E-TYPE SILHOUETTE)

4-177. The tower operator commands MACHINE GUN TO BE MOUNTED HERE (weapon squad leader's pointing to the firing points on the transition line), FRONT (weapon squad leader's pointing to the targets), ACTION.

- At the command ACTION, the machine gun crew places the machine gun into action (tripod mode).
- The gunner prepares the rear sight for field zeroing, and then he checks the front sight blade. He sets the range to the zero target on the range scale. The preferred range is 500 meters.
- He gunner assumes a good position.
- The tower operator tells the assistant gunner to prepare a 28-round belt.
- The gunner and assistant gunner repeat each element of the fire command exactly.

*FIRE MISSION  
FRONT  
TARGETS, TROOPS IN THE OPEN  
FIVE HUNDRED  
FIXED, FIVE- TO SEVEN-ROUND BURST  
AT MY COMMAND*

- The gunner loads one 28-round belt of ammunition, gets the proper sight picture, and signals "thumbs up" to the assistant gunner.
- The assistant gunner relays the ready signal to the tower operator.
- The tower operator commands FIRE.
- When ready, the gunner fires a 5- to 7-round burst at the target.
- The gunner observes the beaten zone. If the rounds miss the target, he adjusts windage and elevation.
- After adjusting, the gunner repeats steps 10 through 11 with the remaining rounds until the rounds impact on the target. He records his zero.

### TASK 2 (400-METER, SINGLE E-TYPE SILHOUETTE)

4-178. The tower operator tells the gunner to load one 154-round belt.

- When the fire command is given, the gunner and assistant gunner repeat each element. For tasks 2 through 8, it is only given once.

*FIRE MISSION  
FRONT  
TARGET, TROOPS IN THE OPEN  
ONE HUNDRED TO EIGHT HUNDRED METERS  
FIXED, FIVE- TO SEVEN-ROUND BURST  
AT MY COMMAND*

- The gunner signals "thumbs up" to the assistant gunner.
- The assistant gunner signals ready to the tower operator.
- The tower operator commands FIRE.

- The gunner scans the sector.
- A 400-meter, single E-type target is exposed for 10 seconds.
- The gunner determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a 5- to 7-round burst.
- If the gunner fails to hit the target, he fires another 5- to 7-round burst. To adjust fire, he uses the adjusted aiming point method.

**TASK 3 (500-METER DOUBLE E-TYPE SILHOUETTE).**

- 4-179. The gunner and assistant gunner continue to scan the sector.
- A 500-meter, double E-type target is exposed for 15 seconds.
  - The gunner determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a 5- to 7-round burst.
  - If the gunner fails to hit the target, he fires another 5- to 7-round burst. To adjust fire, he uses the adjusted aiming point method.

**TASK 4 (600-METER, DOUBLE E-TYPE SILHOUETTE).**

- 4-180. The gunner and assistant gunner continue to scan the sector.
- A 600-meter, double E-type target is exposed for 20 seconds.
  - The gunner determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a 5- to 7-round burst.
  - If the gunner fails to hit the target, he fires another 5- to 7-round burst. To adjust fire, he uses the adjusted aiming point method.

**TASK 5 (800-METER, DOUBLE E-TYPE SILHOUETTE).**

- 4-181. The gunner and assistant gunner continue to scan the sector.
- A 800-meter, double E-type target is exposed for 30 seconds.
  - The gunner determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a 5- to 7-round burst.
  - If the gunner fails to hit the target, he fires another 5- to 7-round burst using the adjusted-aiming-point method of fire adjustment.

**TASK 6 (400-METER, SINGLE AND 600-METER DOUBLE E-TYPE SILHOUETTES)**

- 4-182. The gunner and assistant gunner continue to scan the sector.
- A 400-meter single E-type target and a 600-meter double E-type target are exposed for 30 seconds.
  - The gunner determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a 5- to 7-round burst at each target.
  - If the gunner fails to hit the target, he fires another 5- to 7-round burst at each target using the adjusted-aiming-point method of fire adjustment.

**TASK 7 (700- AND 800-METER, DOUBLE E-TYPE SILHOUETTES).**

- 4-183. The gunner and assistant gunner continue to scan the sector.
- A 700-meter and an 800-meter double E-type targets are exposed for 45 seconds.
  - The gunner determines the range, places the proper setting on the rear sight, assumes the proper position, obtains correct sight alignment and sight picture, and fires a 5- to 7-round burst at each target.
  - If the gunner fails to hit the target, he fires another 7-round burst at each target using the adjusted-aiming-point method of fire adjustment.

**TASK 8 (400-METER SINGLE AND 500- AND 600-METER DOUBLE E-TYPE SILHOUETTES)**

- 4-184. The gunner and assistant gunner continue to scan the sector.
- The 400-meter single E-type silhouettes, and 500- and 600-meter double E-type silhouettes are exposed for 45 seconds.
  - The gunner determines the range, places the proper setting on the rear sight, assumes the proper position, obtains correct sight alignment and sight picture, and fires a 5- to 7-round burst at each target.
  - If the gunner fails to hit the target, he fires another 5- to 7-round burst at each target using the adjusted-aiming-point method of fire adjustment.

**TRANSITION CONDUCT OF FIRE WITH TRIPOD, QUALIFICATION**

- 4-185. Gunners fire Tasks 2 through 8 to qualify. The conduct of fire, ammunition, and targets are the same as for practice fire.

**TRANSITION FIRE, LIMITED VISIBILITY**

4-186. Night or limited visibility firing requires the Soldier to apply the fundamentals of gunner marksmanship while using nightsights. This training instills confidence in the machine gunner. Each Soldier learns how to engage targets using a nightsight. He learns to mount the sight, boresight the weapon at 10-meters, and zero the vision devices (IAW Appendix J for that device) at 10-meters using a 25-meter (M16A2) zero target. Finally, he learns to detect and engage a series of undetermined targets at various ranges with the aided vision device. Night firing exercises can be conducted during daylight with the AN/PVS-4 when the daylight cover is used. These exercises are for instructional, practice and qualification purposes. One point is given for each target hit, whether hit on the first or second burst. The total possible points are 11. Conduct of fire is identical to that in Firing Table II, except for target ranges and exposure times. Stoppage criteria from Firing Table II are also used. Firing Table III (Table 4-5) provides ammunition requirements.

FIRING TABLE III -- ALL WEAPONS Transition Fire, Limited Visibility, Machine Gun Role						
TASK	TIME	ROUNDS		TARGET	RANGE (M)	TYPE FIRE
		QTY	TYPE			
1	No limit	6	4:1 <sup>b</sup>	25-Meter Zero	10	6 single rounds
2	No limit	18	4:1 <sup>b</sup>	25-Meter Zero	10	18 single rounds
3	No limit	28	4:1 <sup>b</sup>	Double E	500	28 single rounds
4 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	200	14 single rounds
5 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	400	Fixed, 5- to 7-round burst
6 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	100	Fixed, 5- to 7-round burst
7 <sup>a</sup>	15 sec	14	4:1 <sup>b</sup>	Single E	300	Fixed, 5- to 7-round burst
8 <sup>a</sup>	25 sec	28	4:1 <sup>b</sup>	Single E Single E	200 400	Fixed, 5- to 7-round burst Fixed, 5- to 7-round burst
9 <sup>a</sup>	25 sec	28	4:1 <sup>b</sup>	Single E Single E	100 300	Fixed, 5- to 7-round burst Fixed, 5- to 7-round burst
10 <sup>a</sup>	30 sec	42	4:1 <sup>b</sup>	Single E Single E Single E	100 200 400	Fixed, 5- to 7-round burst
<p><b>NOTES:</b> Unit commander determines position.</p> <p><sup>a</sup> Qualification task.</p> <p><sup>b</sup> Four ball rounds to one tracer round mix.</p>						

Table 4-5. Firing Table III, all weapons, transition fire, limited visibility.

## SCORES

4-187. Rather than points, the gunner receives only a hit or a miss when he hits the target on the first or second hit. He must hit 6 out of 11 targets to qualify. The gunner must have qualified on both the 10-meter and transition in order to advance to this step. The scorer can record the number of hits on DA Form 85-R, *Scorecard for M249, M60, and M240B Machine Guns*. A blank copy is provided at the back of the book for reproduction on 8 1/2- by 11-inch paper. It may also be downloaded from the Internet at Army Knowledge Online (<http://www.army.mil/usapa/eforms/>).

## CONDITIONS

4-188. Firing Table III (Table 4-5) is used for engaging targets out to 400 meters in ideal moonlight or daylight. In the absence of ambient light, commanders may use field-expedient means to identify targets.

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*Note:* When ambient light is too low to engage targets at extended ranges, the commander may lower the ranges by 100 meters.

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## TARGETS

4-189. Firers use single and double E-type silhouette targets.

## POSITION

4-190. For the limited visibility transition firing table, the firers use the tripod, unless the commander directs that they use the bipod.

## FIRERS

4-191. Both the gunner and the assistant gunner fire limited visibility transition table.

## AN/PVS-4 ZEROING PROCEDURES

4-192. Appendix J and the appropriate TM discuss procedures for zeroing this sight.

### CAUTION

#### ALIGNMENT FOR MOUNTING

When mounting the AN/PVS-4 to the mounting bracket, align the screw hole in the sight with, and flush against, the bracket screw. Otherwise, the threads will strip the screw, making the sight useless.

## QUALIFICATION STANDARDS

4-193. Qualification with the M249, M60 or M240B machine gun requires the achievement of minimum standards for 10-meter and transition day firing tables (*see also* Appendix D).

### FIRING TABLE I

4-194. Allow 1 point for each round that impacts within the scoring space, up to a maximum of 7 points for each space. The firer must score between 63 and 91 points to qualify.

### FIRING TABLE II

4-195. For each hit, place an "X" in the HIT column. For a miss, place an "O" in the MISS column. Allow 10 points for each target hit, whether the firer hits it with the first or second burst. The firer must score between 70 and 110 points to qualify.

### FIRING TABLE III

4-196. For each hit, place an "X" in the HIT column; for each miss, place an "O" in the MISS column. The firer must score between 6 and 11 hits to qualify.

**ALL TABLES**

4-197. The firer must earn a total (combined) score (all firing tables added together) for each weapon as follows, and as shown in Table 4-6:

QUALIFICATION*	POINTS
EXPERT	186 to 212
GUNNER 1st CLASS	157 to 185
GUNNER 2nd CLASS	139 to 156
UNQUALIFIED	0 to 126

**Table 4-6. Machine gunner ratings.**

**SCORECARD**

4-198. The trainer uses DA Form 85-R, *Scorecard for M249, M60, and M240B Machine Guns*, to record the gunner's performance on the qualification range. A blank form is provided at the back of this book for reproduction on 8 1/2 by 11 inch paper, or it can be downloaded from the US Army e-forms website, <http://www.army.mil/usapa/eforms>. Table 4-7 shows ammunition requirements by table. DA Pam 350-38 provides STRAC ammunition requirements. Figure 4-22 shows an example completed form. Complete this form as follows (Blocks 1 through 4, 11, and 14 through 17 are self-explanatory):

4-199. **Block 5--Table I, 10 Meter.** Task 5 has eight target spaces; Task 6 has five. The firer may impact up to seven rounds per target space, so he can earn 56 points (8 x 7) for Task 5 and 35 points (5 x 7) for Task 6, for a maximum of 91 points for Table I.

4-200. **Block 6--Table II, Day Transition.** Mark each *qualifying* hit with an X, whether the firer hits the target on the first or second burst.

4-201. **Block 7--Table III, Limited Visibility.** Mark each *qualifying* hit with an X whether the firer hits the target on the first or second burst.

4-202. **Block 8--Table I Points.** Enter the sum of the points earned in Tasks 5 and 6.

4-203. **Block 9--Table II Points.** Enter total *qualifying* hits multiplied by 10.

4-204. **Block 10--Table III Points.** Enter total *qualifying* hits (no multiplication factor).

4-205. **Block 12.** Enter the total from each table, and then add them to obtain TOTAL POINTS.

4-206. **Block 13.** Using the TOTAL POINTS in Block 12, determine the firer's RATING.

FIRING TABLE	ROUNDS (ALL WEAPONS)	
	QTY	TYPE
Table I, Practice	131	Ball
Table I, Record	91	X4:1
Table II, Practice	182	X4:1
Table II, Record	154	X4:1
Table III, Practice	52	X4:1
Table III, Record	154	X4:1

Table 4-7. Ammunition requirements, all weapons, machine gun role.

FIRING TABLE	ROUNDS (ALL WEAPONS)	
	QTY	TYPE
Table I, Practice	131	Ball
Table I, Record	91	X4:1
Table II, Practice	182	X4:1
Table II, Record	154	X4:1
Table III, Practice	52	X4:1
Table III, Record	154	X4:1

Table 4-7. Ammunition requirements, all weapons, machine gun role.

## SECTION V. BASIC GUNNERY, M249 ONLY, AUTOMATIC RIFLE ROLE

The automatic rifle produces the most casualties for the squad. Although the weapon has changed, its role has not. The automatic rifleman supports the infantry squad in the offense and defense. The current automatic rifle, the M249 automatic rifle, is nearly as accurate as a standard rifle, but provides a volume of fire as heavy as that of a standard machine gun. This section discusses general training techniques and employment principles for using this weapon in the automatic rifle role (*see also* Appendix A).

### DESCRIPTION AND DATA

4-207. The M249 automatic rifle is a gas-operated, air-cooled, belt- and magazine-fed, automatic weapon that fires from the open-bolt position (Figure 1-1). It has a maximum rate of fire of 850 rounds per minute. It can be fired from the shoulder, hip, or underarm position; or from the bipod-steadied position. Both the M249 automatic rifle and the M249 machine gun are identical, but its employment is different.

- The M249 automatic rifle is operated by an automatic rifleman, but its ammunition may be carried by other Soldiers within the squad or unit. The M249 machine gun is a crew-served weapon.
- The M249 automatic rifle lacks a tripod, T&E mechanism, and pintle.



- Belted ammunition is fed from a 100-round assault magazine or 200-round ammunition box. As an emergency means of feeding, the M249 automatic rifle can use 20- or 30-round M16 rifle magazines, but this increases the chance of stoppages.
- Technical information is identical. See Chapter 1 for details:
  - Description.
  - Components.
  - Ammunition.
  - Maintenance.
  - Operation and function.
  - Performance problems and destruction.

## **OFFENSE**

4-208. In the offense, the automatic rifle contributes primarily to the maneuver element. That is, it gives the squad leader the fires of "ten Soldiers" for the close-quarter fight. Depending on the tactical situation, it may also be used in the base-of-fire element.

### **MANEUVER ELEMENT**

4-209. The squad undertaking the assault brings its automatic rifles with it to provide additional firepower. These weapons are fired either from the bipod or in an assault mode from the hip or underarm position. They target any enemy automatic weapons anywhere on the squad's objective. Once the enemy automatic weapons have been destroyed, or if there are none, the automatic riflemen distribute their fire over that portion of the objective that corresponds to their team's positions. In terms of engagement ranges, the automatic rifles in the assault engage from within the last 300 meters and most probably at point-blank ranges.

### **BASE-OF-FIRE ELEMENT**

4-210. Automatic rifles organic to the squad may augment the fires of the machine gun in the base of fire. In this case, the platoon sergeant positions and controls the fires of the automatic riflemen. Automatic rifle targets include any key enemy weapons, other than those covered by machine gun fire; or groups of enemy targets either on the objective or trying to reinforce or counterattack. In terms of engagement ranges, automatic rifles in the base-of-fire element may find themselves firing at targets anywhere from 800 meters to within the last 300 meters where the assault takes place. These ranges are just the average. The nature of the terrain and desire to achieve some stand-off leads the platoon leader to the correct tactical positioning of the base-of-fire element. If automatic rifles are employed as part of the base of fire, then that element must be within 800 meters.

### **TASK ORGANIZATION OF AUTOMATIC RIFLES**

4-211. The organization of the squad into two fire teams still leaves the squad leader the option of organizing his automatic rifles to conform to a specific situation. For example, when assaulting, he may require more firepower than one team can provide. He may designate the automatic rifles and one fire team leader to establish a base of fire, while he continues the assault with the remainder of the squad. However, such an organization takes time to accomplish and reduces both the squad's flexibility and its on-hand firepower in the assault.

## **DEFENSE**

4-212. The dismounted infantry defense centers around the platoon's machine guns. The platoon leader sites the rifle squad to protect the machine guns against the dismounted assault of an enemy formation. The

automatic rifle provides the range and volume of fire to cover the squad front in the defense. The squad leader sites each of his automatic rifles to cover the squad sector, cover an overlapping sector with the other automatic rifle, cover gaps between squads, or cover the front of other squads. The squad leader also assigns supplementary and alternate positions to automatic rifles to bolster other fires and to cover approaches from the flank and rear. Automatic rifles can also augment platoon and company machine gun fire out to the maximum ranges. The engagement range of a squad leader's weapon may extend from the last 300 meters where the enemy began his assault to point-blank range. Automatic rifle targets include enemy automatic weapons and command and control elements.

## **BASIC MARKSMANSHIP TRAINING**

4-213. This section is an aid for trainers in preparing and conducting basic marksmanship training for the M249 in the automatic rifle mode.

- In basic marksmanship, the automatic rifleman applies the fundamentals in live-fire exercises during day, night, and CBRN conditions. This includes 10-meter zeroing, 10 meter firing, field zeroing, transition firing, and record firing.
- Marksmanship training is conducted in three phases: preliminary marksmanship, basic marksmanship, and advanced marksmanship.
  - Preliminary marksmanship is covered in Section II, and training for automatic riflemen should concentrate on common skills for all machine guns and specifically for the M249 in the bipod-supported role.
  - Advanced marksmanship, including alternate firing positions for assault fire, is discussed in Chapter 5.

## **ZEROING PROCEDURES**

4-214. This is the necessary first step in basic marksmanship. Zeroing aligns the sights with the barrel so that the point of aim equals the point of impact. The 10-meter zeroing is for conducting 10-meter fire only and has no further application. Zeroing at range or field zeroing is the automatic rifleman's battlesight zero and must be recorded. (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

### **TEN-METER ZERO**

4-215. Set the sights (mechanical zero). The automatic rifleman indexes or places the elevation knob on a range of 700 meters. He centers the rear peep sight by rotating it clockwise (right) as far as it will go, then rotating counterclockwise (left) 5 clicks or half-turns. He rotates the windage knob toward the muzzle until the peep sight is *completely* to the right, and then rotates the windage knob toward the buttstock 12 clicks to the left. This places the peep sight in the approximate center of the sight. Each sight may vary as to how many clicks are needed. To check the sight, the automatic rifleman starts with the sight all the way to the right and, while counting the clicks, rotates the windage knob until it stops on the left side. He divides the clicks by two. If it is an uneven number, he rounds it up. To center the sight, he rotates the windage knob toward the center (right) while counting the appropriate number of clicks. He adjusts the sliding scale at the rear of the sight to center the large index line under the zeroed windage mark on the sight. Two threads are showing on the front sight post. If more or less are showing, the automatic rifleman turns in the weapon for maintenance. (Again, Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

### **THREE-ROUND GROUP**

4-216. The automatic rifleman fires three single rounds loaded individually at the center base of the aiming points on the basic machine gun marksmanship target. He fires the three rounds without adjusting the sights. The shot group must be about a 4-cm circle or smaller to establish the center of the group relative to the center base of the aiming paster. Establishing a smaller shot group is difficult, because the

M249 automatic rifle is an open-bolt weapon. Sight alignment is disturbed somewhat as the bolt moves forward during firing.

## GRID SQUARE OVERLAY

4-217. For a more accurate adjustment, the automatic rifleman moves downrange and places the grid square overlay over pasters 1 and 2. He ensures that he aligns the overlay with the pasters and squares.

- Count the number of squares it will take to move the shot group to the aiming paster.
- Upon completion, return to the firing line to make corrections to the weapon. Figure 4-23 shows a zero group size that can be adjusted and another group that is too loose for adjustments. If a group is too loose, check your position and grip.

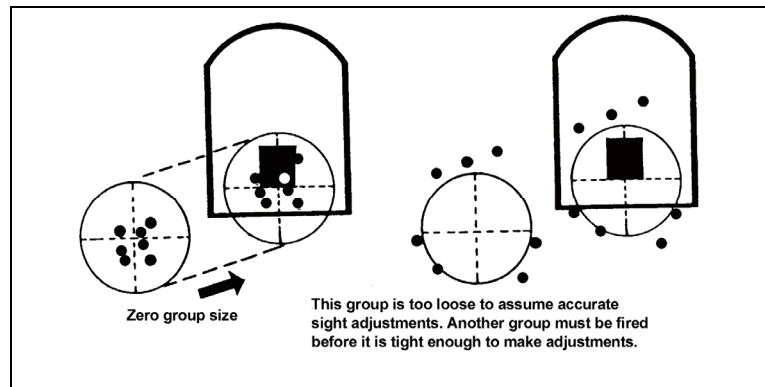


Figure 4-23. Zero group size.

## WINDAGE CORRECTION

4-218. If the center of the group is to the left or right of the black aiming paster, the automatic rifleman must correct for windage. To do this, he must rotate the windage knob to move the peep sight in the direction of the desired change (rotate windage knob toward the muzzle [counterclockwise] to move the strike of the round to the right; rotate the windage knob toward the buttstock [clockwise] to move the strike of the round to the left). One click in either direction moves the strike of the round 1/2 cm at 10 meters.

### EXAMPLE

*If the automatic rifleman sees that the center of the shot group is 2 cm (two black aiming pasters) to the left of the aiming point, he adjusts the point of impact four clicks in the direction of the aiming point (to the right) by rotating the windage knob toward the muzzle.*

## ELEVATION CORRECTION

4-219. Before making elevation adjustments, the range knob must be at its highest setting. If the center of the shot group is above or below the aiming point, the automatic rifleman rotates the peep sight clockwise to lower the strike of the round or rotates the peep sight counterclockwise to raise the strike of the round. One 180-degree turn in either direction moves the strike of the round 1/2 cm at 10 meters.

### **CONFIRMATION**

4-220. The automatic rifleman fires another three-shot group (loaded singly) after making his corrections for windage and elevation. If the center of the group is still off the aiming point, he adjusts further until the group is centered on the point of aim.

### **RECORD**

4-221. The gunner need not record the 10-meter zero, since it applies only to firing at the 10-meter basic machine gun target.

## **FIELD ZEROING PROCEDURES**

4-222. An automatic rifleman must know how to zero the M249 automatic rifle at a distance. He should select a target whose range he knows (a known-distance target), between 300 and 700 meters. As range increases, so does the difficulty of determining the exact center of the beaten zone relative to the target. Therefore, on the transition range, using a 300- rather than 700-meter target simplifies adjustment of fire.

### **SET THE SIGHTS**

4-223. The automatic rifleman uses the same procedures as for 10-meter zero, except that he sets the elevation knob on the range to the target. Again, the recommended range is 300 meters. (Appendix B discusses the 10-meter bore light and 25-meter target offsets.)

### **FIRE A THREE-ROUND BURST**

4-224. The automatic rifleman assumes a good stable position and fires a three-round burst at the center base of the target. He observes where the burst strikes.

### **CORRECT FOR WINDAGE**

4-225. If the center of the beaten zone is left or right of the target, he corrects for windage. Each click moves the round 1/2 mil or 6 inches at 300 meters.

### **CORRECT FOR ELEVATION**

4-226. If the center of the beaten zone is high or low relative to the target, he corrects for elevation. Because determining that relationship is difficult, automatic riflemen rely on trial and error to learn how to make reliable estimates. He corrects elevation the same as he did for the 10-meter zero.

### **CONFIRM**

4-227. After correcting for windage and elevation, the automatic rifleman fires a confirming burst of three rounds. If he misses the target, he repeats the procedures.

### **RECORD THE ZERO**

4-228. Upon confirming the zero, the automatic rifleman records it by counting how many (half-turns) he moved the peep sight for elevation relative to the initial setting of 5. For example, if he made two half-turns up, he records "Up 2." If he made two half-turns down, he records "Down 2." He need not record adjustments for the windage scale. Instead, he loosens the windage sliding scale screws and aligns the scale so that the large index line is under the windage mark on the sight. Then, he tightens the screws.

## TEN-METER FIRE

4-229. Automatic riflemen learn to apply the fundamentals of automatic rifle marksmanship in live-fire exercises during 10-meter fire. This table familiarizes the Soldier with the weapon's characteristics, noise, and recoil. It builds the Soldier's confidence in his weapon. Each automatic rifleman learns to zero his M249 automatic rifle, conducts controlled-burst fire at point targets, and uses traverse and search techniques of fire on area targets. The 10-meter firing table is conducted on a 10-meter or multipurpose range using the basic machine gun target. One automatic rifleman can use Sections A and B, while another uses Sections C and D of the same, basic, machine gun target. These exercises are fired with the bipod from both the prone position and the fighting position. The 10-meter firing exercises are for practice and record qualification. All 10-meter firing exercises are recorded and scored so the automatic rifleman can assess his performance. The 10-meter firing is conducted IAW Firing Table I (Table 4-8). The seven tasks follow:

FIRING TABLE I -- M249 BASIC 10-METER FIRE Prone or Fighting Position, Bipod Supported, Practice and Qualification, Automatic Rifle Role					
TASK	TIME	ROUNDS		TARGET	TYPE FIRE
		QTY	TYPE		
1	No limit	12	Ball/tracer	Pasters A1 and A2	3 single-round shot groups
2	No limit	6	4:1	Pasters A3 and A4	Fixed, 3-round burst each paster
3 <sup>a</sup>	No limit	15	4:1	Pasters A5 through A6	Fixed, 3-round burst each paster
4	No limit	24	4:1	Pasters A7 through A8	Fixed, 3-round burst each paster
5 <sup>b</sup>	20	12	4:1	Pasters B1 through B4	Fixed, 3-round burst each paster
6 <sup>ab</sup>	40	24	4:1	Pasters B7 through B8	Fixed, 3-round burst each paster
7 <sup>b</sup>	40	15	4:1	Pasters B5 through B6	Fixed, 3-round burst each paster
<p><b>NOTE:</b> The gunner fires pasters on sections A and B, and the assistant gunner fires on sections C and D.</p> <p><sup>a</sup> Protective mask and gloves required, at a minimum.</p> <p><sup>b</sup> Qualification task.</p>					

**Table 4-8. Firing Table I, M249 basic (10-meter) fire, automatic rifle role.**

### TASK 1--ZERO

4-230. The automatic rifleman fires single shots to determine his weapon's zero for 10 meters. This task reinforces the dry-fire experience. It also lets the automatic rifleman practice loading, while at the same time he obtains the tightest, most accurate shot group.

### TASK 2--CONTROLLED-BURST FIRE

4-231. Using point targets, the automatic rifleman fires a 3-round burst. This task exposes automatic riflemen to automatic fire and the action of the weapon. It also introduces trigger control.

### **TASK 3--CBRN TRAVERSE AND SEARCH FIRE**

- 4-232. This task requires the automatic rifleman--
- To wear a protective mask and gloves.
  - To change his body position to engage area targets in depth.
  - To fire a controlled burst.
  - To use a series of aiming points to disburse fire across the target.

### **TASK 4--TRAVERSE AND SEARCH FIRE**

- 4-233. This task requires the automatic rifleman--
- To change position to engage area targets with width and depth.
  - To fire a controlled burst.
  - To use a series of aiming points to disburse fire across the target.

### **TASK 5--TRAVERSE AND SEARCH FIRE**

- 4-234. This task allows the automatic rifleman to fire a controlled burst at a series of point targets while being timed.

### **TASK 6--CBRN TRAVERSE AND SEARCH FIRE**

- 4-235. This task requires the automatic rifleman to engage area targets with width and depth--
- While being timed.
  - While changing position.
  - While wearing protective mask and gloves.

### **TASK 7--TRAVERSE AND SEARCH FIRE**

- 4-236. This task requires the automatic rifleman to change position to engage area targets in depth while being timed.

## **TEN-METER CONDUCT OF FIRE**

4-237. The trainer teaches the automatic riflemen the objectives and fundamentals of firing from the bipod-supported prone and fighting positions, on fire commands used on the basic range, on the basic machine gun marksmanship target, and on analyzing and scoring the target. The unit is organized in firing orders based on range constraints. Each firing order has an automatic rifleman and a coach. The coach helps the automatic rifleman during prefire checks and zeroing. He also relays signals to the tower operator, checks the automatic rifleman's position, and coaches him. During qualification, all coaches are absent. The automatic riflemen fire the following seven tasks as follows:

### **TASK 1--ZERO**

- The automatic rifleman prepares the rear sight for zeroing and checks the front sight.
- The automatic rifleman assumes a good position.
- The tower operator instructs the automatic rifleman to prepare a single round.

- The tower operator commands the following, and the automatic rifleman and coach repeat each element as it is given:

*AUTOMATIC RIFLEMAN LOADS AND MOVES SAFETY TO FIRE  
FRONT (focuses on target or target area)  
PASTER A1 (locates target) AND A2  
THREE HUNDRED (adjusts sights and acquires sight picture)  
FIXED, ONE ROUND (method of fire)  
COM MENCE FIRING (on command, fires when ready)*

---

*Note:* Throughout *all* firing exercises, the automatic rifleman performs the appropriate tasks during each element of the fire command. Instead of stating the method of fire, the tower operator states the number of rounds. This is for control. Omitting the rate specifies RAPID fire, which is undesirable for the tasks.

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- The automatic rifleman loads one round, obtains the proper sight picture, and gives an "Up" to the coach.
  - The coach relays the "Ready" signal to the tower operator.
  - The tower operator gives the command: COMMENCE FIRING.
  - The automatic rifleman engages paster A1 with three single shots when he is ready.
  - The automatic rifleman moves downrange to observe, mark, and triangulate the shot group. Sight adjustments using the rear peep sight and windage knob are made at this time if the shot group is tight enough. If not, the automatic rifleman should fire another three rounds to ensure he has mastered the fundamentals before adjusting the sights.
  - The rifleman repeats steps 2 through 8, except that this time the automatic rifleman fires at paster A2.
- 

*Note:* If the automatic rifleman zeros his weapon using 9 rounds, he uses the remaining 3 to confirm his zero. If he is unable to zero with 12 rounds, he is removed from the firing line for remedial training.

---

## **TASK 2--CONTROLLED-BURST FIRE**

- The tower operator instructs the automatic rifleman to prepare a 6-round belt.
- When the fire command is given, the automatic rifleman and coach repeat each element as it is given.

*AUTOMATIC RIFLEMAN  
FRONT  
PASTER A3 THROUGH A4  
THREE HUNDRED  
FIXED, THREE-ROUND BURST  
AT MY COMMAND*

- The automatic rifleman acquires the proper sight picture and gives an "Up" to the coach.
- The coach relays the "Ready" signal to the tower operator.
- The tower operator gives the command to FIRE.
- The automatic rifleman fires the first burst of three rounds at paster A3.
- Steps 2 through 6 are repeated, but the automatic rifleman fires at paster A4.

## **TASK 3--CBRN TRAVERSE AND SEARCH FIRE**

- The tower operator instructs the automatic rifleman to prepare a 15-round belt.

- The tower operator gives the order to mask by stating GAS. Once the Soldiers are masked and have their gloves on, he gives the fire command.
- When the fire command is given, the automatic rifleman and coach repeat each element as it is given.

*AUTOMATIC RIFLEMAN  
FRONT  
PASTERS A5 THROUGH 6  
THREE HUNDRED  
TRAVERSE AND SEARCH, THREE-ROUND BURST  
AT MY COMMAND*

- The automatic rifleman acquires the proper sight picture and gives an "Up" to the coach.
- The coach relays the "Ready" signal to the tower operator.
- The tower operator gives the command to FIRE.
- Using the traverse and search technique, the automatic rifleman engages pasters A5 through A6, firing a three-round burst for each paster. Once complete, the trainer orders ALL CLEAR.
- The automatic rifleman restores his mask to the carrier, removes his gloves, and moves downrange to observe and analyze his targets.

#### **TASK 4--TRAVERSE AND SEARCH FIRE**

- The tower operator instructs the automatic rifleman to prepare a 24-round belt.
- The automatic rifleman and coach repeat each element as the trainer gives it.

*AUTOMATIC RIFLEMAN  
FRONT  
PASTERS A7 THROUGH 8  
THREE HUNDRED  
TRAVERSE AND SEARCH, THREE-ROUND BURST  
AT MY COMMAND*

- The automatic rifleman acquires the proper sight picture and gives an "Up" to the coach.
- The coach relays the "Ready" signal to the tower operator.
- The automatic rifleman engages pasters A7 through A8, firing a three-round burst at each paster, using the traverse and search technique.
- The automatic rifleman may move downrange to observe and analyze his targets.

#### **TASK 5--TRAVERSE AND SEARCH FIRE**

- The tower operator instructs the automatic rifleman to prepare a 12-round belt.
- When the fire command is given, the automatic rifleman and coach repeat each element as it is given.

*AUTOMATIC RIFLEMAN  
FRONT  
PASTERS B1 THROUGH 4  
THREE HUNDRED  
FIXED, THREE-ROUND BURST  
AT MY COMMAND*

- The automatic rifleman acquires the proper sight picture and gives an "Up" to the coach.
- The coach relays the "Ready" signal to the tower operator.
- The tower operator gives commands FIRE.
- The automatic rifleman engages pasters 1 through 4 in 20 seconds, firing a three-round burst at each paster.
- The automatic rifleman may move downrange to observe and analyze his targets.



## TASK 6--CBRN TRAVERSE AND SEARCH FIRE

- The tower operator instructs the coach to prepare a 24-round belt.
- The tower operator gives the order to mask by stating GAS. Once the Soldiers are masked and have their gloves on, he gives the fire command.
- When the fire command is given, the automatic rifleman and coach repeat each element of as it is given.

*AUTOMATIC RIFLEMAN  
FRONT  
PASTERS B7 THROUGH 8  
THREE HUNDRED  
TRAVERSE AND SEARCH, THREE-ROUND BURST  
AT MY COMMAND*

- The automatic rifleman acquires the proper sight picture and gives an "Up" to the coach.
- The coach relays the "Ready" signal to the tower operator.
- The tower operator gives the command to FIRE.
- Using the traverse and search technique, the automatic rifleman engages pasters B7 through B8 in 40 seconds, firing a three-round burst at each paster. Once complete, the Soldiers are given the order ALL CLEAR.
- The automatic rifleman restores his mask to the carrier, removes his gloves, and moves downrange to observe and analyze his targets.

## TASK 7--TRAVERSE AND SEARCH FIRE

- The tower operator instructs the automatic rifleman and coach to prepare a 15-round belt.
- When the fire command is given, the automatic rifleman and coach repeat each element as it is given.

*AUTOMATIC RIFLEMAN  
FRONT  
PASTERS B5 THROUGH 6  
THREE HUNDRED  
TRAVERSE AND SEARCH, THREE-ROUND BURST  
AT MY COMMAND*

- The automatic rifleman acquires the proper sight picture and gives an "Up" to the coach.
- The coach relays the "Ready" signal to the tower operator.
- Using the traverse and search technique, the automatic rifleman engages pasters B5 through B6 in 40 seconds, firing a three-round burst at each paster.
- The automatic rifleman may move downrange to observe and analyze his target, and the coach scores it.

## TEN-METER QUALIFICATION FIRE

4-238. The first phase of qualification has firing Tasks 2 through 4 of Firing Table I for practice, and Tasks 5 through 7 of Firing Table I for record. Before firing, all Soldiers must be familiar with the tasks, the time allowed, the ammunition allowances, the procedures to follow in the event of a stoppage, and the penalties imposed.

## TIME AND AMMUNITION

4-239. Each automatic rifleman finishes zeroing before record fire. The trainer gives him individual fire commands for each task. The automatic rifleman fires Task 5 in 20 seconds; Task 6 in 40 seconds; and Task 7 in 40 seconds.

**STOPPAGES**

4-240. If a stoppage occurs, the automatic rifleman must apply immediate action. If the stoppage is reduced, he continues to fire the course.

- If a stoppage occurs that cannot be reduced by immediate action, the automatic rifleman raises his hand and awaits assistance.
- Once the stoppage is reduced, the automatic rifleman completes firing beginning with the next task.
- If a stoppage is caused by an error on the part of the automatic rifleman, additional time is disallowed. The automatic rifleman receives the score he earned before the stoppage occurred.
- If the M249 automatic rifle must be replaced, then the automatic rifleman must zero the new weapon. He may refire the exercise.
- Automatic riflemen who cannot fire a task or cannot complete firing in the time allowed (because of malfunctions) can finish the exercise in an "alibi run" after all other automatic riflemen complete firing. They fire only those tasks they failed to engage because of the malfunction.

**PENALTIES**

4-241. Five points are deducted from the score of any automatic rifleman who fails to stop firing at the command or signal to cease fire. If an automatic rifleman fires at the wrong target or exercise, he loses the points for those rounds. An automatic rifleman whose target was fired upon by another automatic rifleman is permitted to refire the exercise.

**SCORES**

4-242. Two automatic riflemen use a basic machine gun target for practice and qualification in Table I. One automatic rifleman uses sections A for practice and B for qualification, while the second uses sections C for practice and D for qualification. When scoring the 10-meter target, the trainer (not the automatic rifleman) counts the hits in sections B and D. One point is given for each round impacting within the scoring space. The maximum point value is 3 points for each target. Rounds inside or touching the line on the target are considered a hit. When firing B/D1 through B/D4, the automatic rifleman engages 4 point targets with a maximum possible score of 12 points. When firing B/D5 through B/D6, the automatic rifleman engages 5 targets with a maximum possible score of 15 points. When firing pasters B/D7 through B/D8, the automatic rifleman engages eight targets for a maximum score of 24 points. During qualification firing, at least 35 points must be achieved on Firing Table I. DA Form 7304-R, *Scorecard for M249AR*, is used to record scores. A blank copy is included at the back of this manual for reproduction on 8 1/2" x 11" paper. During qualification firing, at least 35 points must be achieved on Firing Table I.

**POSITION**

4-243. Based on his METL, the commander selects either the bipod-supported prone position or bipod-supported fighting position for qualification.

**TRANSITION FIRE**

4-244. Transition firing provides the automatic rifleman the experience necessary to progress from 10-meter firing to field firing at various types of targets at longer ranges. The automatic rifleman experiences and learns the characteristics of fire, field zeroing, and range determination. He uses the adjusted aiming-point method of fire adjustment. Transition firing is conducted on a machine gun transition range or the MPRC. These exercises are fired with the bipod from the prone or fighting position. Each automatic rifleman fires the transition table twice, once for practice and once for qualification. Transition firing is

fired and scored for both practice and qualification to provide feedback to the automatic rifleman. Firing Table II has eight tasks (Table 4-9).

FIRING TABLE II -- M249 TRANSITION FIRE Limited Visibility, Automatic Rifle Role						
TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No Limit	12	4:1	Single E	300	Fixed, 3-round burst (field zero)
2	5sec	6	4:1	Single E	200	Fixed, 3-round burst
3	10sec	6	4:1	Double E	400	Fixed, 3-round burst
4 *	10sec	6	4:1	Single E	100	Fixed, 3-round burst
5 *	15sec	6	4:1	Single E	300	Fixed, 3-round burst
6 *	20sec	12	4:1	Single E Single E	100 300	Fixed, 3-round burst
7	20sec	12	4:1 4:1	Single E Double E	200 400	Fixed, 3-round burst
8	25sec	18	4:1 4:1 4:1	Single E Single E Double E	100 200 400	Fixed, 3-round burst
<p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1. The unit commander determines the firing position.</li> <li>2. Boresighting requires 12 rounds, and seating the device requires 6 rounds.</li> </ol> <p>* Qualification task.</p>						

**Table 4-9. Firing Table II, M249 transition fire, limited visibility, automatic rifle role.**

## RANGE FACILITIES

4-245. The transition range has several firing lanes. Each lane is 10 meters wide at the firing line and 100 meters wide at a range of 800 meters. Ideally, each lane has a fighting position with an adjacent prone firing position.

## TARGETS

4-246. Two target configurations are used for the automatic rifle: single and double E-type silhouettes. The double represents an enemy automatic weapon, a priority target for the automatic rifleman (Figure 4-24). The targets are set at the ranges that an automatic rifleman is most likely to engage. All targets must be clearly visible from the firing positions. Electric targets are desirable.

## STOPPAGES

4-247. Same as Firing Table I qualification fire.

## PENALTIES

4-248. Same as Firing Table I qualification fire.

## SCORES

4-249. Each target hit is worth 5 points, whether the firer hits the target on the first or second burst. There are 11 targets, so the maximum score is 55 points. The automatic rifleman must hit at least 7 (times 5 equals 35 points) targets out of the 11 to qualify. Trainers use DA Form 7304-R, *Scorecard for M249AR*, to record scores. Task 1 in the qualification firing table, field zero, is unscored.

## FIRING POSITION

4-250. Based on his METL, the commander selects either the bipod-supported prone position or the bipod-supported foxhole firing position for qualification.

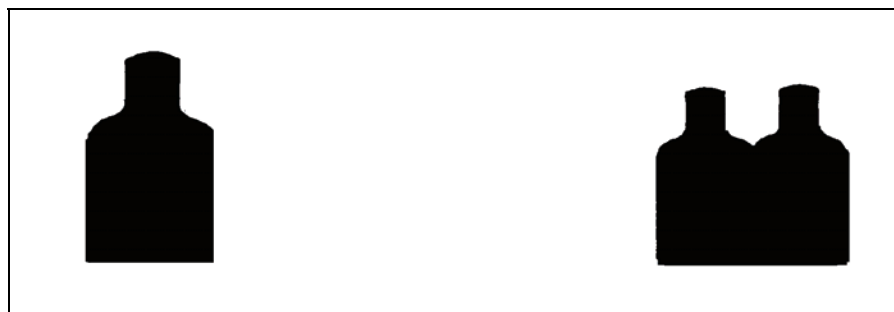


Figure 4-24. Single E-type and double E-type silhouette targets.

## TRANSITION CONDUCT OF FIRE

4-251. The unit is organized in firing orders based on range constraints. Each firing order has an automatic rifleman and a coach. The coach helps the automatic rifleman during prefire checks and zeroing. He also relays signals to the tower operator, checks the automatic rifleman's position, and coaches him except during qualification. The bipod-supported prone and fighting positions are used. The eight tasks are fired in the following manner.

### TASK 1--FIELD ZERO, SINGLE E-TYPE SILHOUETTE

4-252. The zero target may be located from 300 to 700 meters from the firing line, but the best range is 300 meters.

- The automatic rifleman prepares his rear sight for field zeroing and checks the front sight post. He sets the range to the zero target on the elevation knob.
- He assumes a good position.
- The tower operator instructs the automatic rifleman to prepare a 12-round belt.
- On hearing the fire command, the automatic rifleman and coach repeat each element as it is given.

*AUTOMATIC RIFLEMAN  
FRONT  
TARGETS: TROOPS IN THE OPEN  
THREE HUNDRED  
FIXED, THREE-ROUND BURST  
COMMENCE FIRING*

- The automatic rifleman loads one 12-round belt of ammunition, obtains the proper sight picture, and gives an "Up" to the coach.

- The coach relays the "Ready" signal to the tower operator.
- The tower operator gives the command--
- COMMENCE FIRING
- When ready, the automatic rifleman fires a three-round burst at the target when ready.
- The automatic rifleman observes the beaten zone. If the rounds miss the target, he adjusts for windage and elevation.
- He repeats Steps 8 through 9 with the remaining rounds, until rounds start hitting the target. He records his zero.

### **TASK 2--200-METER, SINGLE E-TYPE SILHOUETTE**

- The tower operator instructs the automatic rifleman to load one 66-round belt.
- The fire command is given once for Tasks 2 through 8. The automatic rifleman and the coach both repeat each element as it is given.

*AUTOMATIC RIFLEMAN  
FRONT  
TARGET: TROOPS IN THE OPEN  
ONE HUNDRED TO FOUR HUNDRED METERS  
FIXED, THREE-ROUND BURST  
AT MY COMMAND*

- The automatic rifleman gives an "Up" to the coach.
- The coach gives the "Ready" signal to the tower operator.
- The tower operator commands

*FIRE*

- The automatic rifleman scans the sector.
- A 200-meter, single E-type target is exposed for 5 seconds.
- The automatic rifleman determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a three-round burst.
- If he fails to hit the target, he fires another three-round burst at the target using the adjusted-aiming-point method of fire adjustment.

### **TASK 3--400-METER, DOUBLE E-TYPE SILHOUETTE**

- Automatic rifleman continues to scan the sector.
- A 400-meter, double E-type target is exposed for 10 seconds.
- The automatic rifleman determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a three-round burst.
- If he fails to hit the target, he fires another three-round burst at the target using the adjusted-aiming-point method of fire adjustment.

### **TASK 4--100-METER, SINGLE E-TYPE SILHOUETTE**

- The tower operator orders GAS, and the automatic rifleman and coach put on their masks and gloves.
- The automatic rifleman continues to scan the sector.
- A 100-meter, single E-type target is exposed for 10 seconds.

- The automatic rifleman determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a three-round burst.
- If he fails to hit the target, he fires another three-round burst at the target using the adjusted-aiming-point method of fire adjustment.

**TASK 5--300-METER, SINGLE E-TYPE SILHOUETTE**

- The automatic rifleman continues to scan the sector, still wearing a protective mask and gloves.
- A 300-meter, single E-type target is exposed for 15 seconds.
- The automatic rifleman determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a three-round burst.
- If he fails to hit the target, he fires another three-round burst at the target using the adjusted-aiming-point method of fire adjustment.

**TASK 6--100- AND 300-METER, SINGLE E-TYPE SILHOUETTES**

- The automatic rifleman continues to scan the sector, while wearing a protective mask and gloves.
- A 100-meter and a 300-meter, single E-type target are exposed for 20 seconds.
- The automatic rifleman determines the range, places the proper setting on the rear sight, assumes the proper position, obtains the correct sight alignment and sight picture, and fires a three-round burst at each target.
- If he fails to hit the target, he fires another three-round burst at each target using the adjusted-aiming-point method of fire adjustment.
- The tower operator orders ALL CLEAR. The automatic rifleman and coach restore their masks to their carriers and remove their gloves.

**TASK 7--200-METER SINGLE AND 400-METER DOUBLE E-TYPE SILHOUETTES**

- The automatic rifleman continues to scan the sector.
- The 200-meter single E-type and the 400-meter double E-type targets are exposed for 20 seconds.
- The automatic rifleman determines the range, places the proper setting on the rear sight, assumes the proper position, obtains correct sight alignment and sight picture, and fires a three-round burst at each target.
- If he fails to hit the target, he fires another three-round burst at each target using the adjusted-aiming-point method of fire adjustment.

**TASK 8--100- AND 200-METER SINGLE AND 400-METER DOUBLE E-TYPE SILHOUETTES**

- The automatic rifleman continues to scan the sector.
- The 100-meter and 200-meter single E-type and 400-meter double E-type targets are exposed for 25 seconds.
- The automatic rifleman determines the range, places the proper setting on the rear sight, assumes the proper position, obtains correct sight alignment and sight picture, and fires a three-round burst at each target.
- If he fails to hit the target, he fires another three-round burst at each target using the adjusted-aiming-point method of fire adjustment.

## **TRANSITION FIRE, LIMITED VISIBILITY**

4-253. Night or limited visibility fire requires the Soldier to use the AN/PVS-4 nightsight while applying the fundamentals of automatic rifle marksmanship. He mounts the sight, boresights the weapon at 10 meters (10-meter range), and zeroes the nightsight to the weapon at 25 meters (same transition or multipurpose MG range used in Firing Table II). Then, he uses the nightsight to detect and engage a series of targets at various ranges. When the Soldier uses the daylight cover, he can fire these practice exercises in daylight. The commander can use this training to assess his unit's METL. Because Firing Tables II and III are so similar in their tasks and conduct of fire, the commander can opt to fire only Table II, but with the targets and ranges from Table III. This saves him from having to fire Table III at all.

## **TIME AND AMMUNITION**

4-254. Firing Table III provides ammunition requirements. No time requirements apply.

## **STOPPAGES**

4-255. Same as Firing Table I.

## **PENALTIES**

4-256. No penalties are used.

## **SCORING**

4-257. Rather than entering points, no points are used; commanders can use this training for assessment. DA Form 7304-R, *Scorecard for M249AR*, provided in the back of this manual for reproduction on 8 1/2 by 11 inch paper, or downloadable from <http://www.army.mil/usapa/eforms>, can be used to record the number of hits.

## **CONDITIONS**

4-258. Firing Table III (Table 4-10) is for engaging targets out to 400 meters under ideal moonlight or during daylight conditions. If visibility is limited because of a lack of ambient light, commanders may use field-expedient means to identify targets.

FIRING TABLE III -- M249 TRANSITION FIRE Limited Visibility, Prone or Fighting Position, Bipod Supported Practice and Instructional, Automatic Rifle Role						
TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No Limit	12	4:1	Single E	25	Fixed, 3-round burst (zero)
2	No Limit	6	4:1	Single E	200	Fixed, 3-round burst
3	No Limit	6	4:1	Double E	400	Fixed, 3-round burst
4	No Limit	6	4:1	Single E	100	Fixed, 3-round burst
5	No Limit	6	4:1	Single E	300	Fixed, 3-round burst
6	No Limit	6	4:1	Single E	100	Fixed, 3-round burst

**NOTES:**

1. The unit commander determines the firing position.
2. Boresighting requires 12 rounds, and seating the device requires 6 rounds.

**Table 4-10. Firing Table III, M249 transition fire, limited visibility, automatic rifle role.**

## TARGETS

4-259. Single E-type silhouette targets or double E-type silhouette targets are used.

## FIRING POSITION

4-260. The commander selects the bipod-supported foxhole firing position.

## AN/PVS-4 ZEROING PROCEDURES

4-261. The procedures to mount, seat, boresight, and zero the AN/PVS-4 to the M249 automatic rifle are the same as for the M249 MG. Appendix J provides more details. The automatic rifleman gets into a good prone or foxhole-supported position, acquires the proper sight picture, and fires a series of 3 single rounds to determine and confirm the zero. On command, he moves to the target.

---

*Note:* Rezero every time you dismount and remount the AN/PVS-4, because it loses the zero when it is removed from the weapon anyway.

---

## QUALIFICATION STANDARDS

4-262. Qualification with the M249 automatic rifle requires the Soldier to achieve the minimum standards for 10-meter day and transition day firing tables. One point is allowed for each round that impacts in the scoring space (maximum of 3 for each space) for Firing Table I. The maximum possible score for Firing Table I is 51 points. A minimum of 35 points is required. For Firing Table II, 5 points are allowed for each target hit whether the target is hit on the first or second burst. The maximum score for Table Firing II is 55 points; at least 35 points must be scored on this table to qualify. The minimum total score is 70; the maximum total score is 106. Figure 4-25, which shows an example completed 7304-R, *Scorecard for M249 AR*, shows the ratings. The trainer uses this scorecard to record the automatic rifleman's performance on the M249 automatic rifle qualification range. A blank, reproducible form is provided at the back of this book for local reproduction on 8 1/2 by 11-inch paper. The form is also



available for downloading from <http://www.army.mil/usapa/eforms>. For the trainer's convenience, Appendix D repeats all of the firing tables in this manual in one place.

RATING	MINIMUM	MAXIMUM
Expert	90	106
Automatic Rifleman 1st Class	80	89
Automatic Rifleman 2d Class	70	79
Unqualified	0	69

Table 4-11. M249 automatic rifleman ratings.

SCORECARD FOR M249 AR																									
For use of this form, see FM 3-22.68; the proponent agency is TRADOC.																									
1. ID CODE*				2. UNIT				3. LANE		4. DATE (YYYYMMDD)															
20061218A004				C/Co 291N				3		20061218															
5. TABLE I, 10M WITH CBRN				6. TABLE II, DAY TRANSITION WITH CBRN						7. TABLE III, LIMITED VISIBILITY															
TASK	RANGE (M)	TIME	TOT HIT PTS	TASK	RANGE (M)	TIME	PRACTICE		QUALIFY		TASK	RANGE (M)	TIME	QUALIFY											
							HIT	MISS	HIT	MISS				HIT	MISS										
1	10	N/A	N/A	1	300	N/A	N/A	N/A	N/A	N/A	1	25	N/A	N/A	N/A										
2	10	N/A	N/A	2	200	5 SEC	X		X		2	200	N/A	X											
3	10	N/A	N/A	3	400	10 SEC		X	X		3	400	N/A	X											
4	10	N/A	N/A	4	100	10 SEC	X		X		4	100	10 SEC		X										
5	10	20 SEC	9	5	300	15 SEC	X			X	5	300	15 SEC	X											
6	10	40 SEC	21	6	100	20 SEC		X	X		6	100	10 SEC		X										
7	10	40 SEC	12	6	300	20 SEC		X	X		6	100	10 SEC	X											
8. TABLE I POINTS (TOTAL HITS):			42	9. TABLE II POINTS (TOTAL HITS X 5):						50	11. RATING CALCULATOR														
10. REMARKS				* Do not use personal information, to include name, SSN, phone number, address, mother's maiden name, and so forth.						42 TABLE I POINTS (BLOCK 8) 50 TABLE II POINTS (BLOCK 9) 92 TOTAL POINTS															
12. RATING SCALE						<table border="1"> <thead> <tr> <th>TOTAL POINTS</th> <th>RATING</th> </tr> </thead> <tbody> <tr> <td>90 - 106:</td> <td>EXPERT</td> </tr> <tr> <td>80 - 89:</td> <td>FIRST CLASS</td> </tr> <tr> <td>70 - 79:</td> <td>SECOND CLASS</td> </tr> <tr> <td>BELOW 70:</td> <td>UNQUALIFIED</td> </tr> </tbody> </table>										TOTAL POINTS	RATING	90 - 106:	EXPERT	80 - 89:	FIRST CLASS	70 - 79:	SECOND CLASS	BELOW 70:	UNQUALIFIED
TOTAL POINTS	RATING																								
90 - 106:	EXPERT																								
80 - 89:	FIRST CLASS																								
70 - 79:	SECOND CLASS																								
BELOW 70:	UNQUALIFIED																								
13. GRADER'S INITIALS				14. DATE (YYYYMMDD)				15. OIC'S INITIALS				16. DATE (YYYYMMDD)													
PZ				20061218				BO				20061218													
DA FORM 7304-R, AUG 2006				DA FORM 7304-R, FEB 1994 IS OBSOLETE.				APD V1.00																	

Figure 4-25. Example completed DA Form 7304-R, Scorecard for M249 AR.

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## Chapter 5

# Combat Techniques of Fire

Techniques of fire are the methods used to deliver and control fire effectively. Before the machine gun can be employed to its full potential, the gunner must master the following:

- Section I Characteristics of Fire
- Section II Classes of Fire
- Section III Application of Fire
- Section IV Predetermined Fires
- Section V Fire Control
- Section VI Range Determination
- Section VII Advanced Gunnery
- Section VIII Advanced Crew Gunnery Exercises

### SECTION I. CHARACTERISTICS OF FIRE

Each gunner must know the effects of the rounds they fire. Many more factors influence the path and strike of the rounds besides the application of the fundamentals. These additional factors include, among others, the velocity of the round, gravity, terrain, atmospheric conditions, and the differences between each type of round.

#### TRAJECTORY

5-1. The trajectory is the path of the round in flight (Figure 5-1). The gunner must know the trajectory of each machine gun round to effectively fire the weapon throughout its full range. For example, the path of a round is almost flat at ranges up to 300 meters; then it begins to curve, and the curve becomes greater as the range increases.

#### MAXIMUM ORDINATE

5-2. Maximum ordinate is the highest point of the trajectory between the muzzle of the weapon and the base of the target. It occurs about two-thirds of the distance from the weapon to the target. The maximum ordinate increases as the range increases (Figure 5-1).

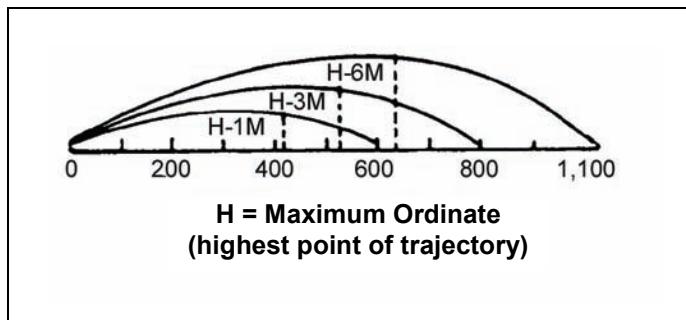


Figure 5-1. Trajectory and maximum ordinate.

### CONE OF FIRE

5-3. When several rounds are fired in a burst from any machine gun, each round follows a slightly different trajectory. The pattern these rounds form on the way to the target is called the "cone of fire" (Figure 5-2). This pattern is caused mostly by the vibration of the machine gun and the variations in ammunition and atmospheric conditions.

### BEATEN ZONE

5-4. This area (Table 5-1 and Figure 5-2) is the elliptical pattern formed on the ground or target by the striking rounds. The length of the beaten zone changes when the range to the target changes or when the machine gun is fired on different types of terrain. Shorter ranges and downward slopes produce *lengthen* beaten zones, and vice versa.



		BEATEN ZONE	
		LONG 	SHORT 
RANGE	SHORT	LONG	
SLOPE	DOWNWARD	UPWARD	

Table 5-1. Effect of range and slope on length of beaten zone.

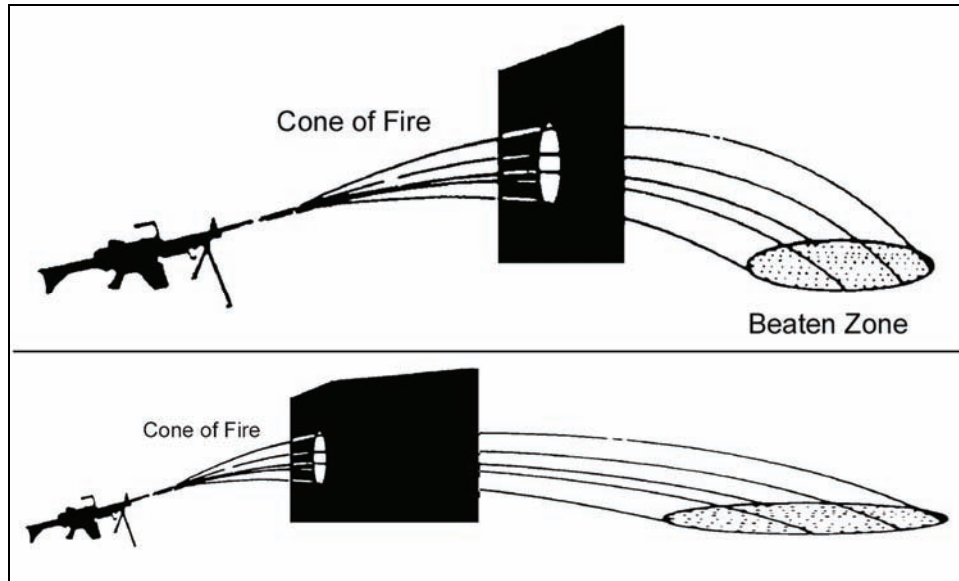


Figure 5-2. Cone of fire and beaten zone.

## DANGER SPACE

5-5. This is the space between the machine gun and the target where the trajectory rises less than 1.8 meters (the average height of a standing Soldier) from the ground. This space includes the beaten zone. When the machine gun is fired on level or uniformly sloping terrain at a target within 700 meters, the trajectory remains at or below the average height of a standing Soldier. When targets are engaged on level or uniformly sloping terrain at ranges greater than 700 meters, the trajectory rises above the average height of a standing Soldier. Therefore, only part of the distance between the machine gun and the target is automatically danger space.

## SECTION II. CLASSES OF FIRE

Machine gun fire is classified with respect to the ground, the target, and the weapon.

### RESPECT TO GROUND

5-6. Fire with respect to the ground (Figure 5-3) includes grazing and plunging fires.

#### GRAZING FIRE

5-7. Grazing fire occurs when the center of the cone of fire rises less than 1 meter aboveground. When firing on level or uniformly sloping terrain, the gunner can only graze fire out to 600 meters.

#### PLUNGING FIRE

5-8. Plunging fire occurs when the danger space is within the beaten zone. Plunging fire also occurs when firing at long ranges, from high ground to low ground, into abruptly rising ground, or across uneven terrain, resulting in a loss of grazing fire at any point along the trajectory.

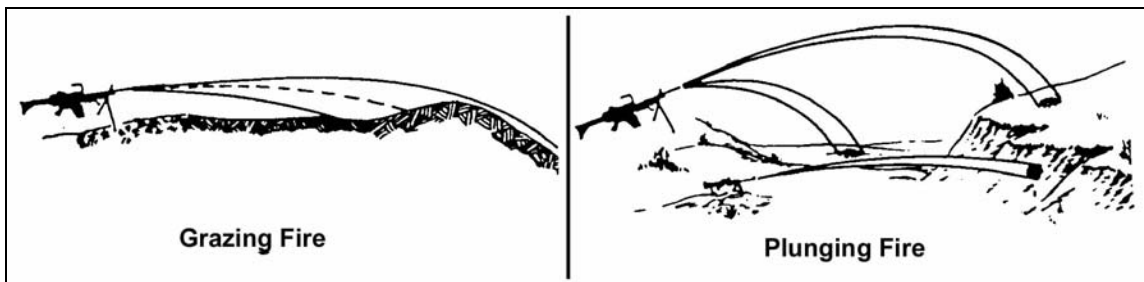


Figure 5-3. Classes of fire with respect to the ground.

## RESPECT TO TARGET

5-9. Fire with respect to the target includes frontal and flanking (Figure 5-4), and oblique and enfilade (Figure 5-5) fires.

### FRONTAL FIRE

5-10. Fire occurs when the long axis of the beaten zone is at a right angle to the front of the target. An example is when firing at the front of a target.

### FLANKING FIRE

5-11. Flanking fire occurs when the gunner fires at the side of a target.

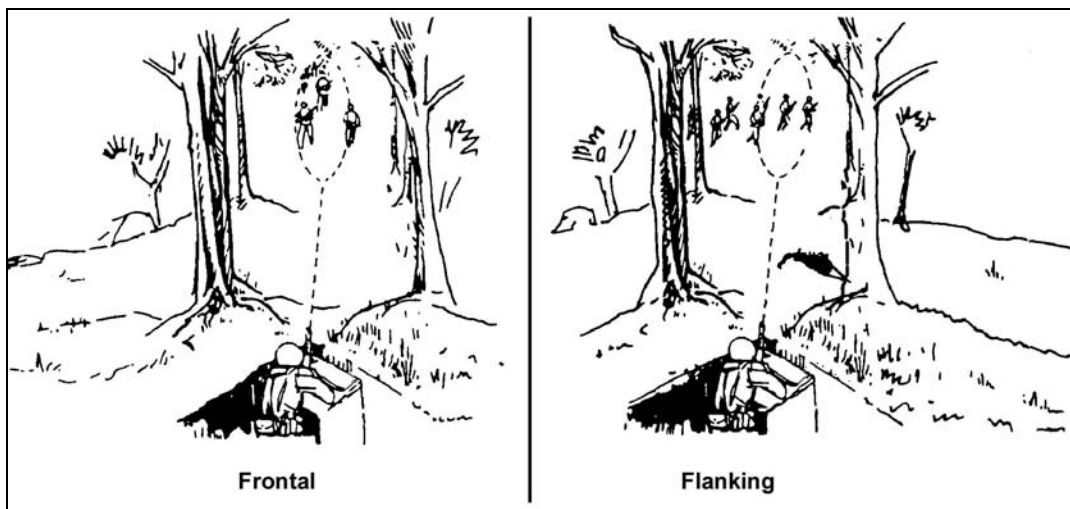


Figure 5-4. Frontal fire and flanking fire.

### OBLIQUE FIRE

5-12. Oblique fire occurs when the long axis of the beaten zone is at an angle other than a right angle to the front of the target.

## ENFILADE FIRE

5-13. Enfilade fire occurs when the long axis of the beaten zone coincides or nearly coincides with the long axis of the target. This type of fire is either frontal or flanking. This is the most desirable type of fire with respect to a target, because it makes the best use of the beaten zone.

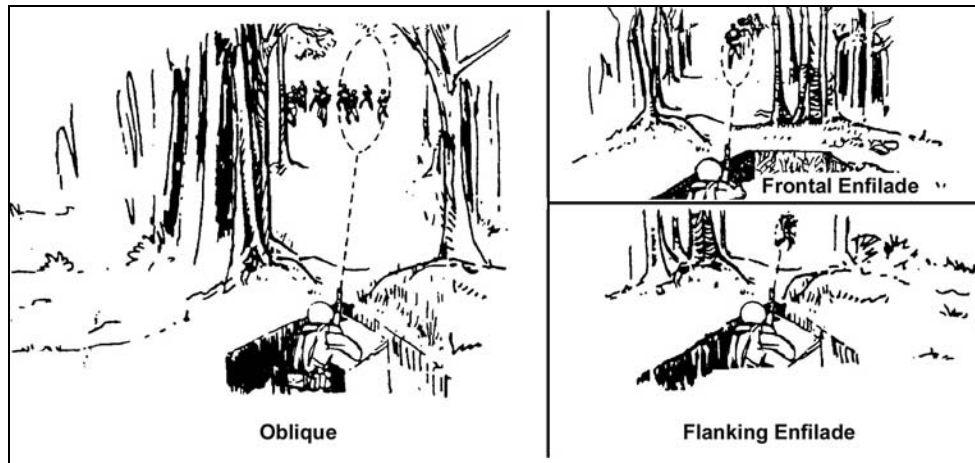


Figure 5-5. Oblique fire and enfilade fire.

## RESPECT TO WEAPON

5-14. Fire with respect to the weapon (Figure 5-6) includes fixed, traverse, search, traverse and search, and free-gun fires.

### FIXED FIRE

5-15. This is fire delivered against a point target when the depth and width of the beaten zone covers the target. Fixed fire also means only one aiming point is necessary to provide coverage of the target.

### TRAVERSING FIRE

5-16. This is fire distributed in width by successive changes in direction. The gunner selects successive aiming points throughout the width of the target. These aiming points must be close enough to ensure adequate coverage but not so close as to waste ammunition.

### SEARCHING FIRE

5-17. This is fire distributed in depth by successive changes in elevation. The gunner selects successive aiming points in depth. The changes made in each aiming point will depend on the range and slope of the ground.

### TRAVERSING AND SEARCHING FIRE

5-18. This is fire distributed in width and depth by successive changes in direction and elevation. Combining traversing and searching fire provides good coverage of the target. Adjustments are made in the same manner as described for traversing and searching fire.

**FREE-GUN FIRE**

5-19. This is fire delivered against targets requiring rapid major changes in direction and elevation that cannot be applied with the T&E mechanism. To deliver this type of fire, the gunner removes the T&E mechanism from the traversing bar on the tripod so he can move the weapon freely in any direction.

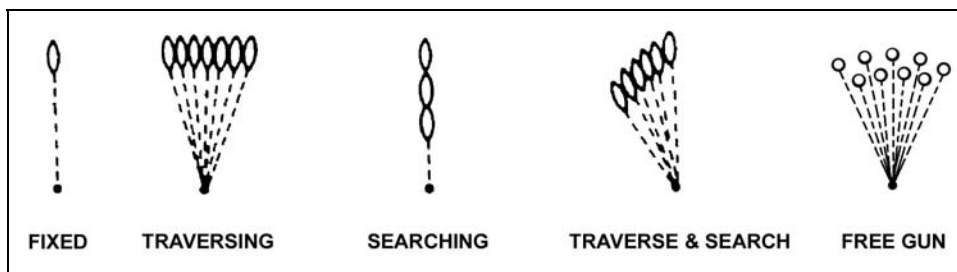


Figure 5-6. Classes of fire with respect to the machine gun.

### SECTION III. APPLICATION OF FIRE

Application of fire refers to the methods used to cover a target area. Training these methods of "applying" fire is possible only after the Soldiers learn to recognize the different types of targets they might find in combat, how to distribute and concentrate their fire, and how to maintain the proper rate of fire. Normally, gunners are exposed to two types of targets in the squad or platoon sector: enemy Soldiers, and supporting automatic weapons. These targets have priority and should be engaged immediately.

### TYPES OF TARGETS

5-20. Targets presented to gunners in combat usually include enemy troops in various formations, which require distribution and concentration of fire. The gunners must thoroughly cover all targets in width and depth.

#### POINT TARGETS, FIXED FIRE

5-21. Point targets, such as enemy troops, bunkers, weapons emplacements, and lightly armored vehicles, require the use of a single aiming point.

#### AREA TARGETS, TRAVERSING AND SEARCHING FIRE

5-22. Area targets can be very wide and deep. When they are, they require extensive traversing or searching fire. Area targets include those whose exact locations are unknown. Area targets include--

##### Linear Targets (Traversing Fire)

5-23. Linear targets are wide enough to require successive aiming points delivered via traversing fire. The beaten zone effectively covers the depth of the target area (Figure 5-7).

##### Deep Targets (Searching Fire)

5-24. Deep targets require successive aiming points delivered via searching fire (Figure 5-8).



### Linear Targets with Depth (Traversing and Searching Fire)

5-25. Linear targets with depth have sufficient width requiring successive aiming points in which the beaten zone does not cover the depth of the target area. A combined change in direction and elevation, delivered by traversing and searching fire, is necessary to effectively cover the target (Figure 5-9).



Figure 5-7. Linear target.



Figure 5-8. Deep target.



Figure 5-9. Linear targets with depth.

## DISTRIBUTION, CONCENTRATION, AND RATE OF FIRE

5-26. The size and nature of the target determine how the gunner applies his fire. He must manipulate the machine gun to move the beaten zone throughout the target area. He must control the rate of fire to adequately cover the target, but at the same time to conserve ammunition and preserve the barrel.

### DISTRIBUTION OF FIRE

5-27. Distribute fire in width and depth on large targets such as enemy formations.

### CONCENTRATION OF FIRE

5-28. Concentrate fire on point targets such as automatic weapons or an enemy fighting positions.

### RATE OF FIRE

5-29. Use sustained, rapid, and cyclic rates of fire with the machine gun (Table 5-2). These rates enable leaders to control and sustain your fire and to help you avoid destroying your barrel. More than anything else, the size of the target and ammunition supply dictate your rate of fire.

#### Sustained Fire

5-30. *This is the normal rate of fire for the gunner.* Sustained fire for the M249 is 50 rounds per minute in bursts of 3 to 5 rounds, with 4 to 5 second intervals between bursts. The M60 and M240B are 100 rounds per minute in bursts of 6 to 9 rounds. The gunner pauses 4 to 5 seconds between bursts. The barrel should be changed after firing at sustained rate for 10 minutes.

#### Rapid Fire

5-31. For all three weapons, the barrel should be changed after firing at a rapid rate for 2 minutes. This allows an exceptionally high volume of fire, but for only a short period of time. Specifics for each weapon follow:

**M249**

5-32. Rapid fire for the M249 is 100 rounds per minute in bursts of 8 to 10 with an interval of 2 to 3 seconds between bursts.

**M60 AND M240B**

5-33. For the M60 and M240B, rapid fire is 200 rounds per minute in bursts of 10 to 12 rounds again with an interval of 2 to 3 seconds between bursts.

**Cyclic Fire**

5-34. Cyclic fire uses the most ammunition that can be used in 1 minute. The cyclic rate of fire with the machine gun is achieved when the trigger is held to the rear and ammunition is fed into the weapon uninterrupted for one minute. Normal cyclic rate of fire for the M249 is 850 rounds, M60 is 550 rounds, and for the M240B it is 650 to 950 rounds. Always change the barrel after firing at cyclic rate for 1 minute. This procedure provides the highest volume of fire that the machine gun can fire, but this adversely affects the machine gun, and should only be fired in combat under emergency purposes only.

<b>Sustained Rate of Fire</b>	Application:	This is the gunner's normal rate of fire.
	Rate:	<ul style="list-style-type: none"> <li>• M249 50 rounds per minute, in 3- to 5-round bursts.</li> <li>• M60, M240B 100 rounds per minute, in 6- to 9-round bursts.</li> </ul>
	Maintenance:	Gunner pauses for 4 to 5 seconds between bursts.
	Barrel:	Gunner changes barrel after 10 minutes sustained rate.
<b>Rapid Rate of Fire</b>	Application:	This rate of fire works best when the gunner is trying to establish fire superiority.
	Rate:	100 rounds per minute M249 in bursts of 6 to 8 rounds 200 rounds per minute M240 or M60 in bursts of 10 to 12 rounds
	Maintenance:	Pause for 2 to 3 seconds between bursts.
	Barrel:	Change after firing 2 minutes at rapid rate.
	Disadvantages:	Feasible only for short periods of time Requires frequent barrel changes.
<b>Cyclic Rate of Fire</b>	Application:	This rate of fire should only be used in combat emergencies.
	Method:	Hold trigger to the rear; feed ammunition uninterrupted for 1 minute.
	Normal Rate:	<ul style="list-style-type: none"> <li>• M249 850 rounds per minute.</li> <li>• M60 550 rounds per minute.</li> <li>• M240B 650 to 950 rounds per minute.</li> </ul>
	Advantage:	Places the most possible rounds on the enemy in one minute.
	Disadvantage:	Damaging to barrel.
	Barrel:	Change after firing 1 minute at cyclic rate.

**Table 5-2. Rates of fire.**

## TARGET ENGAGEMENT

5-35. Gunners engage targets throughout their respective sectors. They must know how to effectively engage all types of targets, either individually or with other gunners.

### SINGLE GUNNER

#### Point Target

5-36. When engaging a point target, the gunner uses fixed fire (Figure 5-10). If the target moves after the initial burst, he adjusts fire onto the target by following its movement.

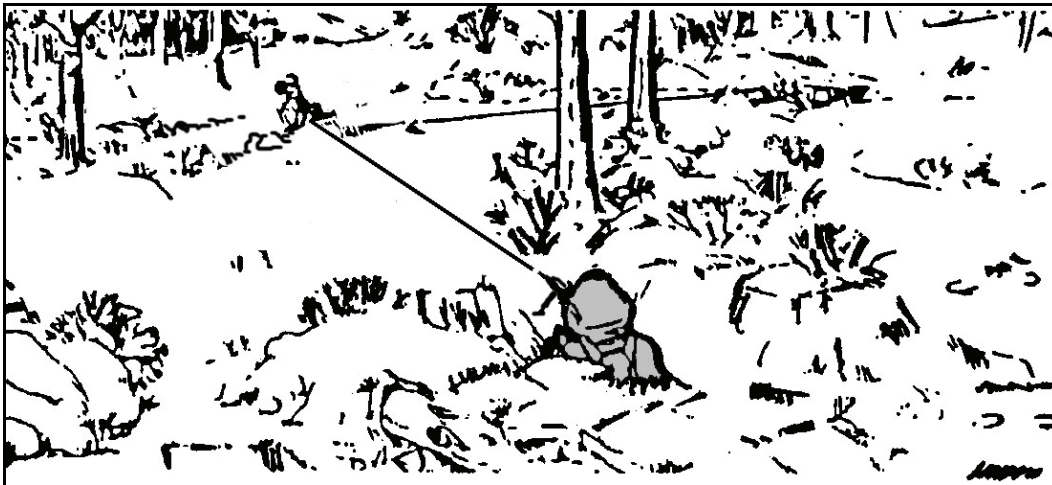


Figure 5-10. Engagement of point target.

#### Area Target

5-37. When engaging an area target, the gunner fires in the center of mass, then traverses and searches to either flank (Figure 5-11). Upon reaching the flank, he reverses direction and traverses and searches in the opposite direction. A leader may indicate the width and depth of the target.

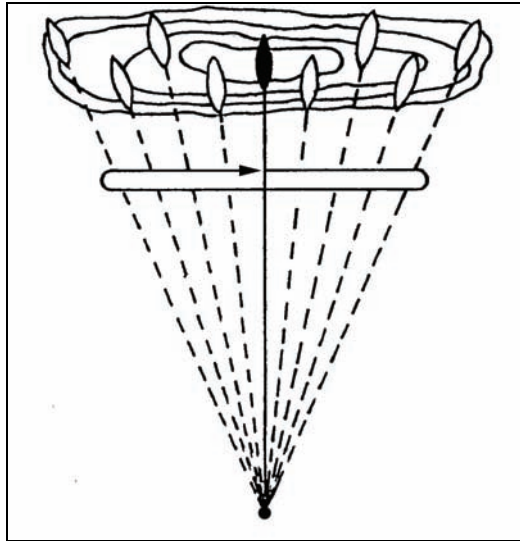


Figure 5-11. Engagement of area target.

### Linear Target

5-38. When engaging a linear target, the gunner traverses the machine gun to distribute fire evenly onto the target. He must cover the entire width of a linear target. His initial point of aim is the midpoint, and then he manipulates fire to cover the rest of the target. If the gunner has trouble identifying a linear target, then a leader may designate one with a reference point (Figure 5-12). With this method, the leader determines the target's center mass and announces the distance between that point and the reference point in meters. The reference point might be either within or adjacent to the target (Figure 5-13). However, it (the reference point) should lie on line with the target for the most accurate results. After the leader issues the fire command, he maintains and controls the fire by subsequent fire commands.

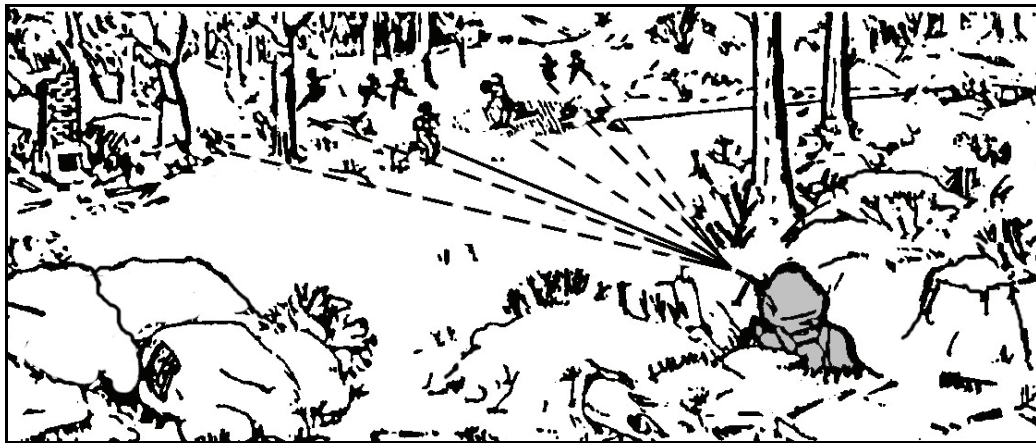


Figure 5-12. Engagement of hard-to-identify linear targets with a reference point outside the target area.

### Deep Target

5-39. When engaging deep targets, the gunner must use searching fire. If the range is announced, he initially aims on the midpoint of single deep targets, unless another portion seems more critical or threatening. He then searches down to one aiming point in front of the near end, and back up to one aiming

point beyond the far end. If the gunner cannot identify a deep target, then the leader uses reference points to designate the target's center mass. He gives the extent (depth) of the target in meters.

### Linear Target With Depth

5-40. When engaging a linear target with depth, the gunner traverses and searches. He starts by engaging the midpoint of his target unless another portion seems more critical or threatening. He traverses and searches to the near flank, then back to the far flank. When engaging a hard-to-identify linear target with depth, the leader designates the flanks and midpoints of the target with rifle fire. He avoids using the reference-point method, because he would need at least two points to show the angle to the target.



Figure 5-13. Engagement of hard-to-identify targets with a reference point within the target area.

### PAIR OF GUNNERS

#### Area Targets

5-41. When a pair of machine guns engages area targets, each gunner fires on his half (side) of area. Their initial points of aim and adjustment are the midpoints of their respective halves. After adjusting fire on the center of mass, both gunners distribute fire by applying direction and elevation changes for best coverage. The right gunner traverses to the right, applies the necessary amount of search, and fires a burst. Then, he traverses and searches up and down until the right flank of the area target has been reached. The left gunner just reverses the procedure for his side. Both then reverse their directions and return to the center mass, firing a burst after each combined direction and elevation change (Figure 5-14).



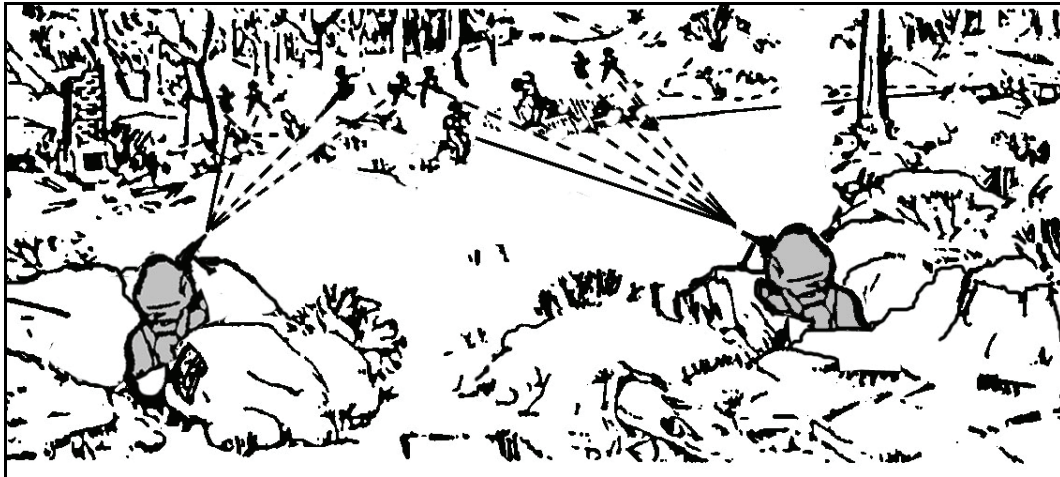


Figure 5-14. Engagement of area target by a pair of gunners.

### Linear Targets

5-42. When a pair of machine guns engages a linear target, the gunners divide the target at midpoint, with each firing on his half, starting with adjusting on his respective midpoint (Figure 5-15). Then, each gunner traverses to the outside of the target on his side, then in to his inner boundary, firing a burst after each change in direction. This ensures complete target coverage. For each burst fired, the gunner must select an aiming point rather than just spraying his half of the target. However, if one part of the target poses a greater threat, the leader can designate unequally sized sectors to allow a greater concentration of fire on the greater threat. To avoid confusion, the gunners always start with their respective midpoints, regardless of the size of their sector.

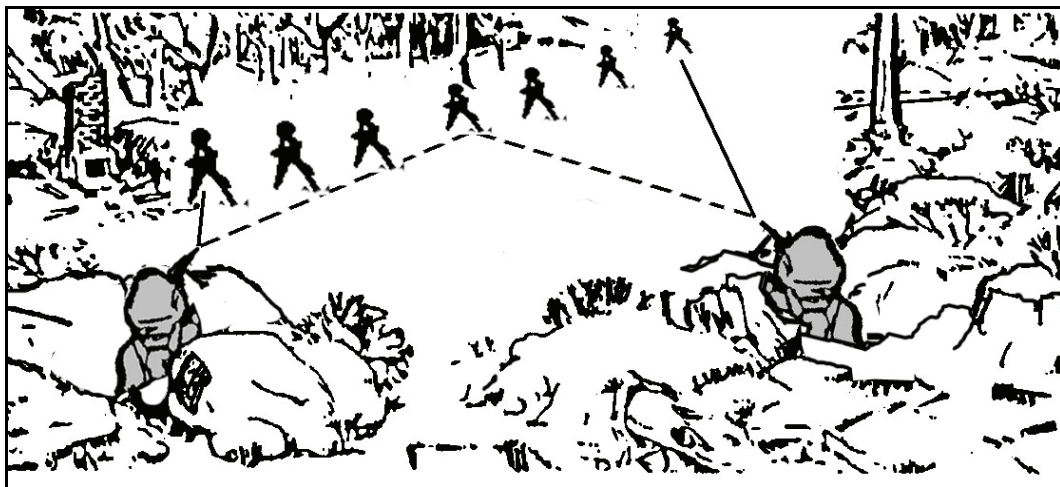


Figure 5-15. Engagement of linear targets by a pair of gunners.

### Deep Targets

5-43. When using a pair of machine guns to engage a deep target, the initial point of aim is also on the midpoint for both gunners. Normally, the gunner on the right has the near half and the gunner on the left has the far half. Since they are using enfilade fire, they need not adjust on the midpoint of the target, because the long beaten zone compensates for range errors. After the initial burst, the gunner on the right

searches down to one aiming point in front of the near end of the target. The gunner on the left searches up to one aiming point beyond the far end. Both gunners then reverse their direction of search and return to the midpoint (Figure 5-16).

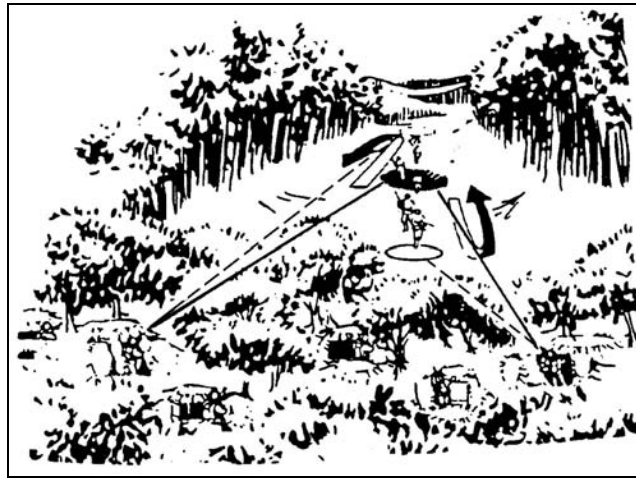


Figure 5-16. Engagement of deep targets with a pair of gunners.

### Linear Target with Depth

5-44. When using a pair of machine guns to engage a linear target with depth, the gunners use the same initial point of aim and extent of manipulation as described for linear targets (Figure 5-17).

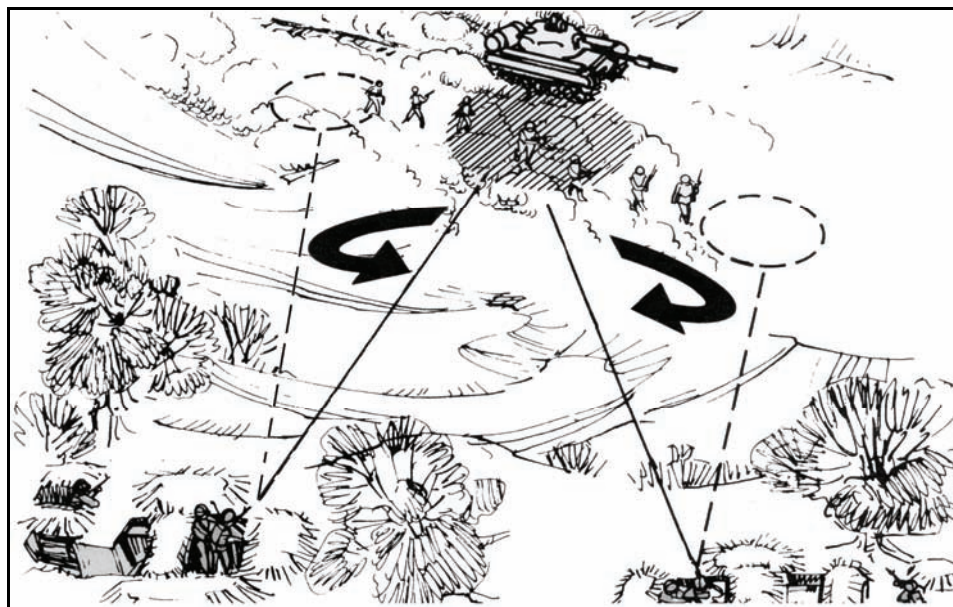


Figure 5-17. Engagement of linear target with depth with a pair of gunners.



## TARGET ENGAGEMENT DURING LIMITED VISIBILITY

5-45. Gunners have problems detecting and identifying targets during limited visibility. The leader's ability to control the fires of his weapons is also reduced, therefore, he may instruct the gunners to fire without command when targets present themselves.

- Gunners should only engage targets they can identify, unless ordered otherwise. For example, if one gunner detects and engages a target, the other gunner observes the area fired upon and only adds his fire if he can also identify the target, or on order.
- Tracer ammunition helps gunners engage targets during limited visibility, so they should use it, if possible. If firing unaided, gunners must train to fire low at first, and then adjust upward. This helps them overcome the tendency to fire high.
- When two or more gunners engage linear targets, linear targets with depth, or deep targets, they do so differently than they would in good visibility. With limited visibility, the center and flanks of these targets may be poorly defined. Therefore, each gunner observes his tracers and covers what he believes to be the entire target.

## OVERHEAD FIRE

5-46. Fire delivered over the heads of friendly Soldiers is called overhead fire. During training, gunners only fire overhead *after Soldier safety is checked and verified*. Terrain and visibility also help dictate when overhead fire is safe. (AR 385-63 summarizes training safety requirements.) Gunners can deliver overhead fire with any machine gun mounted on a tripod, because machine guns deliver stable, accurate fire, and because elevating mechanisms allow measurement in vertical mils.

### DANGER

#### OVERHEAD FIRE

**To avoid causing death or injury, overhead fire must be delivered--**

- **On targets within 850 meters of the machine gun.**
- **From a support-by-fire position atop a vehicle, building, or other location higher than that of friendly personnel.**

- Ideally, gunners fire overhead only when friendly Soldiers to the front are positioned in a depression between the machine gun and the target. The depression should be deep enough that the line of aim is well above the heads of the Soldiers in the depression.
- The squad leader normally controls overhead fire. He lifts or shifts fire when friendly Soldiers reach an imaginary line, parallel to the target, where the terrain rises, placing the Soldiers in harm's way. This imaginary line is called the "safety limit." The leader can direct the lifting of fire by prearranged signals transmitted by radio, wire, or visual means. He can determine the safety limit by observing fire or by using the gunner's rule (targets between 350 and 850 meters only) (Figure 5-18). To determine the safety limit by observation, the leader uses binoculars to see how close the fire is to advancing friendly Soldiers. Before the weapon is fired, the leader selects a safety limit using the gunner's rule. The accuracy and safety of this method depends on using a zeroed machine gun and on knowing the range to the target.
- Determine the range to the target. Set the range on the rear sight.
  - Aim the machine gun to hit the target.
  - Set the rear sight to 1,000 meters.
  - Using the elevating handwheel (one click equals 1 mil), depress the muzzle 10 mils.

- Look through the rear sight and note where the new line of aim strikes the ground. (Draw an imaginary line through this point and parallel to the target to determine the safety limit.)
- On the rear sight, reset the range to the target. Aim on the target and prepare to fire.
- Cease or shift fire when Soldiers reach the safety limit.
- Gunners must follow these safety measures when delivering overhead fire:
  - Firmly emplace the tripod mount.
  - Use field-expedient depression stops to avoid dipping muzzle, and therefore the line of fire, below the safety limit.
  - Keep overhead fire out of the trees.
  - Before delivering fire over the heads of friendly Soldiers, inform their commanders.
  - Ensure that all members of the crew know the safety limit.
  - Deliver overhead fire only between 350 and 850 meters.
  - Use only barrels that are in good repair.
  - During training exercises, avoid aiming any machine guns where their trajectories will cross over the heads of friendly Soldiers. (AR 385-63 and local safety regulations discuss overhead fire further.)

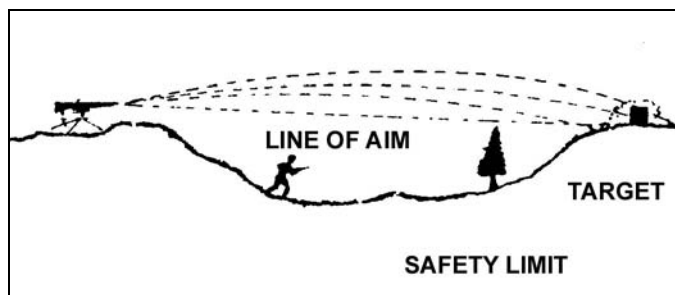


Figure 5-18. Overhead fire safety limit (gunner's rule).

## DEFILADE POSITIONS

5-47. A machine gun is in defilade when the weapon and its crew are completely behind terrain that masks them from the enemy (usually on the reverse slope of a hill). An observer controls fire from defilade positions. He can be either the leader or a member of the crew, as long as he can both see the target and communicate with the gunner (Figure 5-19).

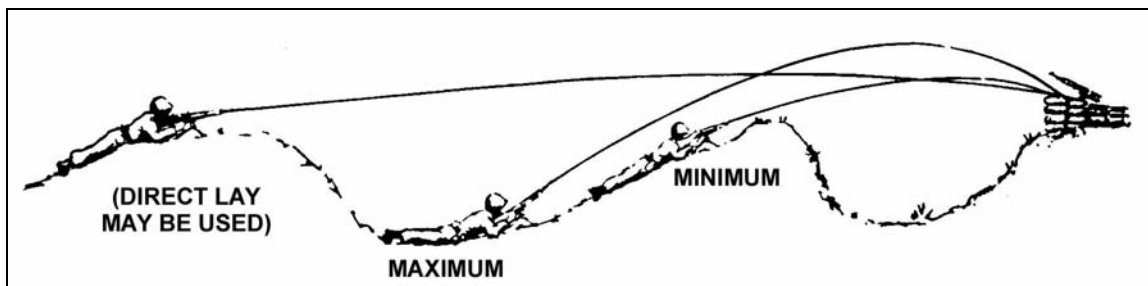


Figure 5-19. Defilade positions.

- The machine gun must fire up and over the hill. An observer adjusts fire from a higher position to the flank or rear of the weapon. A defilade position allows little opportunity to engage new targets. Gunners use the tripod mount when firing from defilade, because they can

use the mount to help them measure vertical angles. This simplifies elevation changes. Also, if the crew obtains the data in daylight, it can fire from the same position after dark. A machine gun is in partial defilade when it is positioned just back of the crest of a hill, which offers some protection from enemy direct-fire, but that allows the machine guns to engage by direct-lay techniques.

- *Advantages.* The crew has cover and concealment from enemy direct-fire weapons. It has some freedom of movement near the position. Control and supply are easier. The smoke and flash of the machine gun are hidden from the enemy.
- *Disadvantages.* Rapidly moving ground targets are hard to engage, because an observer is needed for adjustment of fire. Also, targets close to the mask are seldom engageable, and the concept of a "final protective line" is hard to understand.
- Essential to target engagement from defilade are mask clearance, direction, and adjustment of fire. If possible, determine a minimum mask clearance (minimum elevation) for the entire sector of fire. However, you might have to determine a mask clearance for each target, depending on the slope of the mask. Read elevation as follows to determine the minimum elevation for the sector or target(s). Then, record the minimum elevation on a range card:
  - If the mask is 300 meters or less from the machine gun position, the gunner places a 300-meter range setting on the rear sight, aims on the top of the mask, and adds 3 mils (clicks) of elevation with the elevating handwheel.
  - If the mask is over 300 meters from the machine gun position, the gunner places the range setting to the mask on the rear sight, aims on the top of the mask, and adds 3 mils (clicks) of elevation.
- The observer places himself to the rear of the machine gun on the gun-target line and where he can see the machine gun and the target. He aligns the machine gun for general direction by directing the gunner to shift the gun until it aligns on the target. The observer selects as an aiming point a prominent terrain feature or landmark that the gunner can see through his sights. The aiming point should be farther out than the target and at higher elevation. When laying the machine gun on the aiming point, the gunner ensures that the range setting on the rear sight corresponds to the range to the target (Figure 5-20).

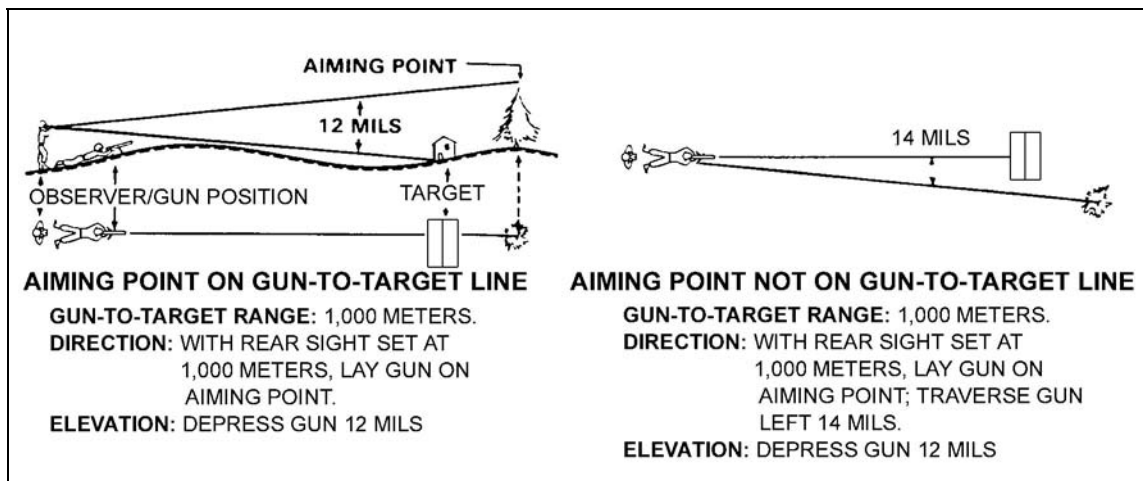


Figure 5-20. Observer adjustment of fire.

- If the aiming point is on the gun-to-target line, the gunner simply lays on the aiming point.
- If the aiming point is off the gun-target line, then the observer determines the horizontal distance in mils using the best means available (usually binoculars), and announces it to the gunner. The gunner then applies this setting using the traversing handwheel.

- The observer uses the best means available to measure the vertical distance from the aiming point to the base of the target. Then, he directs the gunner to depress the muzzle of the machine gun by the number of mils measured. This should lay the machine gun right on the target.

## SECTION IV. PREDETERMINED FIRES

Predetermined fires organize the battlefield for the gunners. They allow the leader and gunner to select the most likely or tactically significant potential targets or target areas. These targets or areas include dismounted enemy avenues of approach, likely positions for automatic weapons, and probable enemy assault positions. Leaders allocate gunners individual sectors of fire, designate final protective lines, or specify a principal direction of fire and selected target areas. These preparations maximize the effectiveness of the machine gun in all visibility conditions. They enhance fire control by reducing the time required to identify targets, determine range, and manipulate weapons onto targets. Also, using abbreviated fire commands and recording data ahead of time allow the gunner to aim or adjust fire on the target quickly and accurately. When practical, to confirm the data, the gunners should fire on selected targets in daylight. The range card identifies the targets and provides a record of firing data.

### TERMINOLOGY

5-48. The gunner needs to know the following terms with regard to predetermined fire:

#### SECTOR OF FIRE

5-49. This is a target area assigned to an individual, a weapon, or a unit. Leaders normally assign each gunner a primary and a secondary sector of fire.

#### FINAL PROTECTIVE FIRE

5-50. An FPF is an immediately available, prearranged barrier of fire. It is used to stop enemy movement across defensive lines or areas.

#### FINAL PROTECTIVE LINE

5-51. An FPL is a predetermined line along which grazing fire is placed to stop an enemy assault. If an FPL is assigned, the machine gun sights along it, except when engaging other targets. An FPL becomes the machine gun's part of the unit's final protective fire. Although an FPL is fixed in direction and elevation, the gunner must make a small shift for searching. This keeps the enemy from crawling under the FPL, and compensates for terrain irregularities or the sinking of tripod legs in soft soil. Gunners fire on FPLs as needed, regardless of visibility conditions.

#### PRINCIPAL DIRECTION OF FIRE

5-52. A PDF is just what it sounds like: the main direction of fire, usually into an area with good fields of fire or with a likely dismounted avenue of approach. Gunners firing on a PDF may also provide fire support to an adjacent unit. Machine guns are sighted on the PDF only in the absence of an assigned FPL. If a PDF is assigned and other targets are unengaged, machine guns continue to sight on the PDF. A PDF has the following characteristics.

- It is used only if an FPL is not assigned; it then becomes the machine gun's part of the unit's final protective fires.
- Gunners determine the direction to wide targets by aiming on one edge of the target area and noting the amount of traverse needed to cover the entire target.

- The gunner covers the entire wedge-shaped area from the muzzle of the weapon to the target, although elevation might start out set for a priority portion of the target.

### **GRAZING FIRE**

5-53. A good FPL covers the maximum area with grazing fire, which is effective over various types of terrain out to 600 meters. To graze fire as far out as possible over level or uniformly sloping terrain, the gunner sets the rear sight at 600 meters; selects a point on the ground that he estimates to be 600 meters from the machine gun; aims; fires; and adjusts on that point. To prevent enemy troops from crawling under grazing fire, he searches (downward) by lowering the muzzle of the weapon. To do this, he must separate his elbows.

### **DEAD SPACE**

5-54. The extent of grazing fire and dead space is determined in two ways. Ideally, the gunner adjusts the machine gun for elevation and direction. A member of the squad then walks along the FPL, while the gunner aims through the sights. Anyplace that the Soldier's waist (midsection) falls below the gunner's point of aim is dead space. The leader or gunner uses arm-and-hand signals to direct the walking Soldier and to accurately record the dead space and its location. Another way to designate dead space is to stand behind and to the flank of the weapon and watch while the gunner fires tracer ammunition.

### **FIRE CONTROL**

5-55. The gunner engages predetermined targets, including the FPL or PDF, on order or IAW SOP. The defense order normally gives the signal to call for these fires. The leader or observer controls fire on predetermined targets with arm-and-hand signals, voice commands, or pyrotechnic devices. Gunners fire the FPL or PDF at a sustained rate of fire unless the situation calls for a higher rate. When engaging other predetermined targets, the gunner also uses a sustained rate of fire, unless ordered to use a different rate.

### **PRIMARY SECTOR OF FIRE**

5-56. The primary sector of fire is the area to be covered by an individual gunner or unit.

### **SECONDARY SECTOR OF FIRE**

5-57. The secondary sector of fire is a separate area covered by the same gun team. To establish a secondary sector of fire, the Soldier or unit moves the gun to an alternate firing platform. He does this by removing the gun from the tripod, and firing the secondary sector from the bipod-supported position.

### **RANGE CARD**

5-58. The standard range card (DA Form 5517-R, FM 7-8) provides a record of firing data and helps the leader plan defensive fires. Using a range card improves fire control and expedites the engagement of predetermined targets. It also helps the gunner estimate ranges to other targets in the sector of fire. Each gunner makes two copies—one for his position and one for the squad leader. The squad leader uses his copy of each of the gunners' range cards to prepare his squad sector sketch.

- The gunner prepares the range card as soon as he occupies the position, and he revises it constantly. He includes the following information on the range card:
  - Weapon symbol (Figure 5-21).
  - Sector of fire.
  - Primary direction of fire or final protective line.
  - Range, azimuth, and number label to predetermined targets.

- Dead space.
- Distance and azimuth from a known point or coordinates (reference point).
- Magnetic North arrow.
- Data section.

























Weapon Type	(Blue) Friend	(Red) Hostile	(Green) Neutral	(Yellow) Unknown
Rifle/Automatic M249	 M249			
				
Rifle/Automatic Rifle M240B	 M240B			
				
Rifle/Automatic Light Machine Gun M60	 M60			
				

Figure 5-21. Symbols for M249, M60, or M240B machine gun.

- The gunner uses the tripod to emplace the machine gun where he will be firing it. He sketches the appropriate machine gun symbol on the range card, and orients (points) it toward the most dangerous target in the sector.
  - If using the FPL, the gunner aims the machine gun along the FPL, which is the same as either the left or right limit of the sector of fire. To set the limit, he slides the T&E mechanism all the way to the left or right end of the traversing bar. Then, he moves the tripod until the barrel lines up on the FPL. The sector of fire is now set up with the FPL along one limit (side). The gunner always identifies the FPL as target number 1.
  - To determine the range for all targets in the sector, the gunner ensures each circle, except the first one, represents a range (circumference) increment of 100 meters. The lowest setting on the M249 and M60 is 300 meters; the lowest on the M240B is 200 meters. Therefore, the innermost (first) circle represents a range from the gun (circumference) of

either 200 or 300 meters. The gunner marks the range in the data section, just below the circles. On the top half of the range card, he draws the left or right limits from the weapon position to the machine gun's maximum effective range.

- If the leader assigns an FPL, the gunner draws the machine gun symbol along that line (left or right limit, Figure 5-22). The leader determines the extent of grazing fire and the gunner sketches a shaded blade inside the FPL to represent it. He indicates dead space along the FPL, if any, by breaks in the shaded area. He records the ranges to the *near* and *far* edges of the dead space above the FPL, and the *extent* of the grazing fire along the FPL. The leader determines the magnetic azimuth of the FPL, and the gunner records it below the shaded blade of the FPL. He also records the elevation reading and other data in the data section.
- If the leader does not assign an FPL, then the gunner locks the T&E mechanism on "0" on the traversing bar scale, and shifts the tripod until the muzzle points to the PDF. He sketches the machine gun symbol in the center of the left and right limits, pointed toward the PDF (Figure 5-23).
- The gunner then draws the opposite primary sector limit. If a target lies on this line, he adds the target information to the data section. If he cannot use the opposite side of the traversing bar to mark the opposite side of the primary sector, then he must record a direction reading in the sketch section.
- Next, he draws a broken line to represent the left and right limits of the secondary sector. He labels the area between the primary and secondary sectors as dead space.
- He draws an arrow in the magnetic North block (upper right hand corner), pointing in the direction of magnetic north.

### STANDARD RANGE CARD

For use of this form see FM 7-8 The proponent agency is TRADOC.

SQD <u>2</u> PLT <u>1</u> CO <u>C</u>	May be used for all types of direct fire weapons.	MAGNETIC NORTH
---	---	-------------------

DATA SECTION					
POSITION IDENTIFICATION			DATE <u>9 Jun 05</u>		
WEAPON <u>M240B</u>			EACH CIRCLE EQUALS <u>100 METERS</u>		
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
1		<u>+50/3</u>	<u>600</u>		FPL
2	<u>R350°</u>	<u>+50/45</u>	<u>600</u>		LONE TREE
3	<u>L300°</u>	<u>0/20</u>	<u>650</u>		TRAIL JUNCTION
REMARKS:					

DA Form 5517-R, FEB 86

Figure 5-22. Final protective line.



### STANDARD RANGE CARD

For use of this form see FM 7-8 The proponent agency is TRADOC.

SQD <u>2</u> PLT <u>2</u> CO <u>C</u>	May be used for all types of direct fire weapons.	MAGNETIC NORTH
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**DATA SECTION**

POSITION IDENTIFICATION		DATE <u>9 Jun 05</u>			
WEAPON <u>M60 #2</u>			EACH CIRCLE EQUALS <u>100 METERS</u>		
NO.	DIRECTION/DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
1	L 25°	$\phi/24$	700		PDF (ROAD JUNCTION)
2	R 60°	-50/15	500		BARN
3	L 29°	-50/40	400		HEDGE ROW
REMARKS:					

DA Form 5517-R, FEB 86

Figure 5-23. Principal direction of fire.

- The gunner orients the firing position with a prominent terrain feature (recognizable on a map). He obtains a magnetic azimuth between the terrain feature and the position, and he draws a line between these two points. He draws barbed arrows along this line pointing in the direction the magnetic azimuth was taken. He records the magnetic azimuth in mils or

degrees below the line. In the absence of a prominent terrain feature, he marks the position's eight-digit grid coordinate on the range card, just below the position.

- The gunner records his unit designation (SQD, PLT, CO), and date in the box in the upper left-hand corner of the range card. For security, he only designates up to company level.
- He identifies all targets within his sector. For each, he draws the appropriate symbol in the appropriate place in the sector of fire. In the primary sector of fire, the appropriate symbol is a target number within a circle. However, when the leader has assigned an FPL, it is always target number 1. He numbers other targets in order of tactical importance.

### **Target Width**

5-59. The gunner usually engages a wide target in the primary sector in its center. However, he can place the initial burst wherever the leader designates. The gunner measures the target width and records it in the data section on the range card; for example, "*TW-20*" to indicate a target width of 20 mils. The gunner lays on the point on the target where he will place the initial burst. Then, he counts how many clicks are needed to traverse to one edge of the target. He records the direction he moves the muzzle and the number of clicks required. For example, he records "*TW-20/R7*" for a target width of 20 mils; traverse (to edge of target) right (direction="*R*") 7 clicks. This means that, after the initial burst, he traverses 7 clicks to the right edge of the target and back to the left 20 clicks to cover the target area. If he plans to start on the left edge of the target, he records "*TW-20/R20*."

5-60. When the gunner uses field expedients with the machine gun to engage targets, he sketches them above the drawing of the target. He sketches predetermined targets in the secondary sector on the range card, and he records the ranges to these targets below the targets, but not in the data section. He uses field expedients for targets in the secondary sector.

## **FIELD EXPEDIENTS**

5-61. In the absence of other means, the gunner can lay the machine gun for and engage predetermined targets using field expedients. (These methods are less effective than the traversing bar and T&E mechanism methods.)

### **BASE STAKE TECHNIQUE**

5-62. Use a base stake to define sector limits and provide the lay for the FPL or predetermined targets along a primary or secondary sector limit. This technique is effective in all visibility conditions.

- Define the sector limits by laying the gun for direction along one sector limit and emplacing a stake along the outer edge of the folded bipod legs. Rotate the legs slightly on the receiver so you can take up the "play." Use the same procedure to place a stake on the opposite sector limit.
- Lay the machine gun along the FPL by moving the muzzle of the machine gun to a sector limit. Adjust for elevation by driving a stake into the ground, so that the top of the stake is under the gas cylinder extension. Allow a few mils of depression to cover irregularities in the terrain.
- Lay the machine gun to engage other targets within a sector limit in a primary sector the same as previously described, but keep the elevation fixed.

### **NOTCHED-STAKE OR TREE-CROTCH TECHNIQUE**

5-63. Use the notched-stake or tree-crotch technique (Figure 5-24) with the bipod mount to engage predetermined targets within a sector or to define sector limits. This technique is effective during all levels of visibility, and it requires little additional material.

- Drive either a notched stake or tree crotch into the ground where you expect targets to appear. Place the stock of the machine gun in the nest of the stake or crotch. Adjust the weapon to hit the selected targets and to define your sector limits.

*Note:* If notched stakes and crotches are unavailable, use tent poles. You need four poles for the left and right limits and extra poles for target areas. Drive two poles in the ground in the shape of an "X," and then place the stock in the "X."

- Dig shallow, curved trenches or grooves for the bipod feet. The trenches let you rotate the bipod feet as you move the stock from one "X" or stake to another.

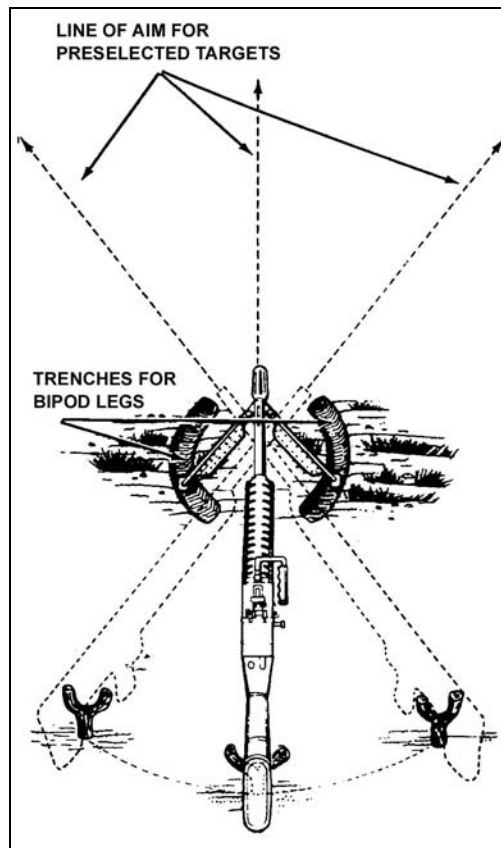


Figure 5-24. Notched-stake or tree-crotch technique.

## HORIZONTAL LOG OR BOARD TECHNIQUE

5-64. Use this technique with the bipod or tripod mount to mark sector limits and engage wide targets. This technique is also good in all visibility conditions, and it works best on level terrain.

### Bipod-Mounted Machine Gun

5-65. Place a log or board beneath the stock of the weapon so the stock can slide across it freely. Dig shallow, curved trenches or grooves for the bipod feet. This lets you rotate the feet as you move the stock along the log or board. To mark the sector limits, notch or place stops on the log or board. When you fire, use the bipod firing position and grip.

### **Tripod-Mounted Machine Gun**

5-66. Place a log or board beneath the barrel, positioning it so that the barrel, when resting on the log or board is at the proper elevation for grazing fire. Marks the sector limits, when appropriate, as described for the bipod in the preceding paragraph. Use this technique only if you have no T&E mechanism.

## **SECTION V. FIRE CONTROL**

Fire control includes all leader and Soldier planning, preparing, and applying of fire on a target. The leader selects and designates targets. He also designates the midpoint, flanks, or ends of a target, unless they are obvious to the gunner. The gunner fires when ready. He then adjusts fire, regulates the rate of fire, shifts between targets, and ceases fire. He continues to fire until the target is neutralized or until signaled or commanded otherwise.

### **METHODS**

5-67. The noise and confusion of battle might limit the use of some of these methods. Therefore, the leader must choose the best method(s) to accomplish the mission.

#### **VERBAL**

5-68. Noise and distance reduce the effectiveness of verbal fire commands.

#### **ARM-AND-HAND SIGNALS**

5-69. This method obviously requires that the leader and gunner be able to see each other, and that the gunner know standard arm-and-hand signals. The leader gets the gunner's attention, and then points to the target. When the gunner signals "*Ready*," the leader commands FIRE.

#### **PREARRANGED SIGNALS**

5-70. These include visible or audible signals such as casualty-producing devices and pyrotechnics (visible and audible), whistle blasts (audible), or tracers (visible). These signals should be defined in the unit SOP. For example, if a leader wants to shift fire at a certain time, he gives the prearranged signal such as smoke or pyrotechnics. On seeing the signal, the gunner shifts his fire to a prearranged point.

#### **PERSONAL CONTACT**

5-71. In many situations, the leader must issue orders directly to individual Soldiers. A small-unit leader uses personal contact more often than any other method. However, he must make maximum use of cover and concealment to keep from compromising his own location or those of the Soldiers.

#### **RANGE CARDS**

5-72. When using this method of fire control, the leader must ensure all range cards are current and accurate. Once he does this, he can designate certain targets for certain weapons using limiting stakes or fire commands. He should also designate no-fire zones or restricted fire areas to others. For range cards to work well, each gunner must exercise self-discipline and must pay attention to detail.

## **STANDING OPERATING PROCEDURES**

5-73. Standing operating procedures (SOPs) are actions to be executed without command. These procedures are developed during squad training. Using SOPs eliminates the need for many commands and simplifies fire control:

### **Observation**

5-74. Gunners continuously observe their sectors.

### **Fire**

5-75. Gunners open fire without command on appropriate targets that appear within their sectors.

### **Check**

5-76. While firing, the gunners periodically check with the leader for instructions.

### **Return Fire**

5-77. The gunners return enemy fire without order, concentrating fire on enemy automatic weapons.

### **Shift Fire**

5-78. Gunners shift their fires without command when more dangerous targets appear.

### **Rate of Fire**

5-79. When gunners engage a target, they initially fire at the rate necessary to gain and maintain fire superiority.

### **Mutual Support**

5-80. When two or more gunners engage the same target, and one gunner stops firing, the other increases his rate of fire and covers the entire target. When only one gunner is needed to engage a target, and the leader has alerted two or more, the gunner not firing aims at and follows the movements of the target. This way, he is ready to fire immediately if the other machine gun malfunctions or ceases fire before the target is destroyed.

## **FIRE COMMANDS**

5-81. The leader gives a fire command to deliver effective fire on a target quickly and without confusion. When the leader decides to engage a target that is not obvious to the squad, he must provide them with the information they need to engage it effectively. He must alert them; give them the direction and range to and a description of the target, name the desired method of fire; and give the command to fire. The first time he gives a command to fire on a particular target, it is an *initial* fire command. Any changes to that command are considered *subsequent* fire commands.

## **INITIAL FIRE COMMANDS**

5-82. An initial fire command gives the gunner the information needed to adjust onto the target, to change the rate of fire after a fire mission has started, to interrupt fire, or to terminate the alert. All direct-fire

commands share similar elements. A machine gun fire command has six elements: *alert*, *direction*, *description*, *range*, *method of fire*, and command to *open fire*. The gunners repeat each element of fire command as it is given.

### **ALERT**

5-83. This element prepares the gunners for further instructions. The leader may alert both gunners in the squad and might have only one fire, depending upon the situation. To alert and have both gunners fire, the leader commands FIRE MISSION. If he wants to alert both gunners, but he has only one fire, he commands GUN NUMBER ONE, FIRE MISSION. In all cases, upon receiving the alert, the gunners load their machine guns and place them on FIRE.

### **DIRECTION**

5-84. This element indicates the general direction to the target and may be given in one or a combination of the following methods:

#### **Speak**

5-85. The leader verbally announces the direction to the target relative to the position of the gunner, for example, FRONT, LEFT FRONT, RIGHT FRONT.

#### **Point**

5-86. The leader designates a small or obscure target by pointing with his finger or aiming with a weapon. When the leader points with his finger, a Soldier standing behind him should be able to look over his shoulder, along the leader's arm and index finger, and see the target. When aiming his weapon at a target, a Soldier looking through the sights should be able to see the target. (Appendix J discusses advanced optics and lasers.)

### **Fire Tracer Ammunition**

5-87. Tracer ammunition is a quick and sure method of designating a target that is not clearly visible. When using this method, the leader should first give the general direction to direct the gunner's attention to the target area. To preserve the element of surprise when using tracer ammunition, the leader gives all the elements of the fire command except the actual command to commence fire. His command can specify that he will fire tracers to signal the gunners to commence fire.

*FIRE MISSION  
FRONT  
FIVE HUNDRED  
WATCH MY TRACER(S)*

---

**Note:** Remember that, with the night vision device, temporary blindness (also known as "white out") can occur when you fire tracer ammunition at night, or when you are exposed to other external light sources. Using lens covers might reduce this effect.

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### **Give Reference Points**

5-88. Another way to designate obscure targets is to use easy-to-recognize reference points. All leaders and gunners must know the terrain features and the terms used to describe them (FM 3-25.26). When the leader uses a reference point, he precedes the description of the target with the word REFERENCE. This avoids confusion, and gives the general direction to the reference point.

---

*Note:* Sometimes the reference point is outside the target area. At other times, you must designate a target using successive reference points.

---

*FIRE MISSION  
FRONT  
REFERENCE: BUNKER, CENTER MASS  
TARGET: TROOPS EXTENDING SHORT ONE HUNDRED, OVER ONE HUNDRED  
FOUR HUNDRED  
FIRE*

*FIRE MISSION  
FRONT  
REFERENCE: BUNKER, RIGHT FOUR FINGERS, CENTER MASS  
TARGET: TROOPS EXTENDING SHORT ONE HUNDRED, OVER ONE HUNDRED  
THREE HUNDRED  
SEARCH  
AT MY COMMAND  
FIRE*

*GUN NUMBER ONE, FIRE MISSION  
RIGHT FRONT  
REFERENCE: RED-ROOFED HOUSE, LEFT TO HAYSTACK, LEFT TO BARN*

---

*Note:* The leader can use finger measurements to direct the gunner's attention to the right or left of reference points.

---

*FIRE MISSION  
LEFT FRONT  
REFERENCE: CROSSROADS, RIGHT FOUR FINGERS*

### **DESCRIPTION**

5-89. To properly apply fire, Soldiers must know the type of target they are to engage. The leader briefly describes the target to create a picture of it in the minds of the gunners. Of course, if the target is obvious, he can skip the description.

### **RANGE**

5-90. The leader *always* announces the estimated range to the target. This indicates how far the gunner must look for the target and tells him roughly what range setting to put on the rear sight. The leader announces the range in meters. However, since the meter is the standard unit of range measurement, he need not say the word "meters." Thus, with machine guns, the leader announces the range to the nearest hundred or thousand meters, for example, THREE HUNDRED, or ONE THOUSAND.

*FIRE MISSION  
FRONT  
REFERENCE: KNOCKED OUT TANK, LEFT TWO FINGERS  
TARGET: TROOPS  
THREE HUNDRED*

### **METHOD OF FIRE**

5-91. This element includes manipulation and rate of fire. *Manipulation* prescribes the class of fire with respect to the weapon. The leader announces it as FIXED, TRAVERSE, SEARCH, or TRAVERSE AND SEARCH. *Rate* refers to the volume of fire (*sustained, rapid, or cyclic*). Normally, the gunner uses a sustained rate of fire, so the leader omits the rate of fire from the fire command. The *method of fire* for the machine gun is usually 3- to 5-round bursts for the M249 or 6- to 9-round bursts for the M60 or M240B.

*FIRE MISSION  
FRONT  
REFERENCE: KNOCKED-OUT TANK, LEFT TWO FINGERS  
TARGET: TROOPS  
THREE HUNDRED  
TRAVERSE*

### **COMMAND TO OPEN FIRE**

5-92. When the leader wants the gunners to withhold fire so that they can surprise a target, or to ensure that both gunners open fire at the same time, he can start the command to commence fire with AT MY COMMAND or AT MY SIGNAL. When the gunners are ready to engage the target, they report "Ready" to the leader, who then commands FIRE when he desires.

*FIRE MISSION  
FRONT  
TROOPS  
FOUR HUNDRED  
AT MY COMMAND or AT MY SIGNAL  
(Leader pauses until gunners are ready and fire is desired)  
FIRE (Gunner fire on prearranged command or signal)*

---

**Note:** If immediate fire is required, command FIRE without pausing, and the gunners will fire when ready.

---

### **SUBSEQUENT FIRE COMMANDS**

5-93. The leader gives subsequent fire commands to adjust direction and elevation, to change current rates of fire, to interrupt fire, or to terminate the alert. If the gunner fails to properly engage a target, the leader must promptly correct him by announcing or signaling the desired changes. When the leader gives these changes, the gunner makes the appropriate corrections and resumes fire without further command.

### **DIRECTION AND ELEVATION**

5-94. The leader always adjusts for direction and elevation in meters; the number of fingers he uses equals the number of meters. The leader first adjusts fire for direction, for example, RIGHT ONE ZERO METERS or LEFT FIVE METERS. Then, he adjusts for elevation, for example, ADD FIVE METERS or DROP ONE FIVE METERS. He can issue these changes orally or visually (arm-and-hand signals).



## **RATE OF FIRE**

5-95. The leader gives changes in the rate of fire orally or visually (arm-and-hand signals).

## **FIRE COMMAND**

5-96. To interrupt firing, the leader commands or signals CEASE FIRE. The gunners remain on the alert. They resume firing when the leader commands FIRE.

## **TERMINATION**

5-97. To terminate the alert, the leader commands, CEASE FIRE, END OF MISSION.

## **DOUBTFUL ELEMENTS AND CORRECTIONS**

5-98. When the gunner is in doubt about any element of the fire command, he replies "*Say again range, target.*" The leader then repeats the command, saying, THE COMMAND WAS, repeating the element in question, and then continuing with the rest of the fire command.

- When the leader makes an error in the initial fire command (in this example, SIX HUNDRED is the element he wants to correct), he immediately says CORRECTION, gives the corrected element (in this example, THREE HUNDRED), and then continues with the rest of the fire command.

*FIRE MISSION  
FRONT  
TROOPS  
SIX HUNDRED  
CORRECTION  
THREE HUNDRED  
TRAVERSE  
AT MY COMMAND*

- When the leader makes an error in a subsequent fire command, he says CORRECTION, and then repeats the entire subsequent fire command.

*LEFT FIVE METERS, DROP ONE METER  
CORRECTION  
LEFT FIVE METERS, DROP ONE HUNDRED METERS*

## **ABBREVIATED FIRE COMMANDS**

5-99. Fire commands need not be complete to be effective. In combat, the leader gives only the elements the gunner needs to place quick and effective fire on a target. During training, however, he practices using all of the elements. This gets gunners in the habit of thinking and reacting properly. Once the gunner receives his initial training in fire commands, he should receive additional training on how to react to abbreviated fire commands, delivered by one of the following methods:

## ORAL SIGNALS

5-100. To direct the gunner to place the fire of one machine gun on an enemy machine gun, the leader commands--

*GUN NUMBER ONE, FIRE MISSION  
MACHINE GUN  
FOUR HUNDRED  
FIRE*

## ARM-AND-HAND SIGNALS

5-101. Noise and distance can make verbal communication between leader and gunners impossible. However, if they can see each other, they can use visual or manual (arm-and-hand) signals, such as "I'm ready," "Are you ready?" to control fire (Figure 5-25). When the leader wants just one of the gunners to act or move, he gives a preliminary signal to that gunner only. Common arm-and-hand signals for fire control include--

### Ready

5-102. The gunner indicates that he is ready to fire by yelling "*Up*" or by having the assistant gunner raise a hand overhead toward the leader.

### Commence Fire or Change Rate of Fire

5-103. The leader brings his hand (palm down) to the front of his body about waist level, and moves it horizontally in front of his body. To signal that he wants the gunner to increase his rate of fire, the leader moves his hand faster, and vice versa.

### Change Direction or Elevation

5-104. The leader extends his arm and hand in the new direction and indicates the amount of change by the number of fingers he extends: each finger represents a 1 mil, or 1 meter, change. He spreads the extended fingers so the gunner can count them more easily. If the desired change is more than 5 meters, he leader extends his hand repeatedly to indicate the total amount of change. For example, he indicates RIGHT NINE by extending all five fingers once and four fingers the next time, for a total of nine fingers.

### Interruption or Cessation of Fire

5-105. The leader raises his arm and hand (palm out) in front of his forehead, then lowers his arm and hand sharply.

### Other Signals

5-106. The leader can devise other signals to control his weapons. A detailed description of arm-and-hand signals is given in FM 21-60.

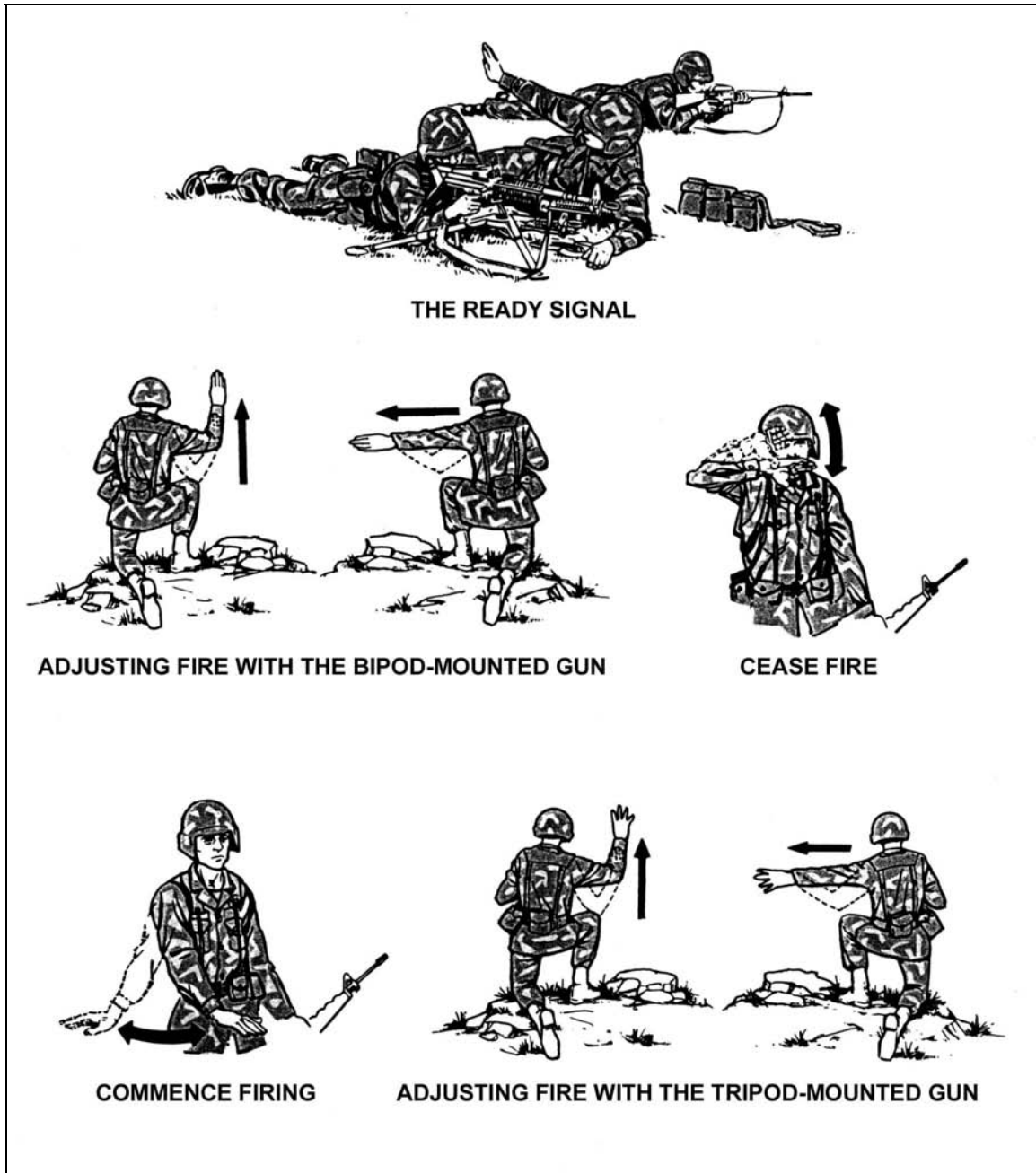


Figure 5-25. Arm-and-hand signals.

## SECTION VI. RANGE DETERMINATION

During combat, ranges are seldom known. Poor visibility and damp ground render observation as a means of fire adjustment difficult, at best. However, as always, correct range determination is critical for effective fire. Two other means may be used to determine the range to the target: range estimation and lateral distance measurement.

### RANGE ESTIMATION

5-107. Range estimation is determining the distance between two points. In most situations, one of these points is the gunner's own position. The other point might be a target or prominent terrain feature. To set the sights and place effective fire with the first burst, the gunner must accurately determine the range to the target. Not only does accurate estimation of range affect marksmanship, but it is also necessary for reporting information and adjusting artillery and mortar fires (Table 5-3).

FACTORS AFFECTING RANGE ESTIMATION	FACTORS CAUSING UNDERESTIMATION	FACTORS CAUSING OVERESTIMATION
Clarity of target outline and details.	When most of the target is visible	When only a small portion of the target is small in relation to its surroundings.
Nature of terrain or position of gunner.	When looking across a depression that is mostly hidden from view.	When looking across a depression that is totally visible.
	When looking downward from high ground.	When looking from low ground toward high ground.
	When looking down a straight, open road or along a railroad.	When vision is narrowly confined as in streets, draws, or forest trails.
	When looking over uniform surfaces like water, snow, desert, or grain fields.	
Light and atmosphere.	In bright light or when the sun is shining from behind the gunner.	In poor light such as dawn and dusk; in rain, snow, fog; or when the sun is in the gunner's eyes.
	When the target is in sharp contrast with the silhouette because of its size, shape, or color.	When the target blends into the background or terrain.
	When seen in the clear air of high altitudes.	

Table 5-3. Factors of range estimation.

### METHODS OF ESTIMATION

5-108. The methods of estimating range include measuring distance on a map, pacing the distance between two points, and using an optical range finder. However, a gunner rarely has a map or an optical range finder. Instead, he can pace the distance between two points, assuming the enemy is out of range. Firing rounds to determine range is undesirable, since it may reveal the position to the enemy. Most of the time, the gunner must use techniques that do not require equipment, and that he can use without exposing

himself or revealing his position. Two methods meet these requirements: the appearance-of-objects method and the 100-meter-unit-of-measure method:

### **APPEARANCE-OF-OBJECTS METHOD**

5-109. This method, the most commonly used, consists of estimating range based on the size and traits of a person or object.

- For example, a motorist trying to pass another car must judge the distance of oncoming vehicles based on her knowledge of how vehicles look at various distances. The motorist only needs enough information to ensure that she has enough road space to pass the car safely. Suppose, however, the motorist knew that, at a distance of 1 kilometer, an oncoming vehicle appears to measure 1 centimeter between headlights. Then, anytime she saw other oncoming vehicles that fit these dimensions, she would know they were also about 1 kilometer away.
- The gunner can use the same technique to estimate ranges on the battlefield. If he knows the typical size and visible detail of humans and equipment at known ranges, then he can compare these characteristics to similar objects at unknown ranges. When characteristics match, so does the range.
- To use the appearance-of-objects method with any degree of accuracy, the gunner must know the visible characteristics of common objects at various ranges. For example, he should study the appearance of a male human being standing at a range of 100 meters. He fixes person's appearance firmly in his mind, carefully noting details of size and characteristics of the clothing or uniform, and equipment. Next, he studies the same person kneeling, then prone. By comparing the person's appearance at known ranges from 100 to 500 meters, the gunner builds a set of mental images that will help in determining range on unfamiliar terrain. He should also receive training on the appearance of other familiar objects such as weapons or vehicles. Because the successful use of this method depends on visibility, any obscurant, such as weather, smoke, or darkness, will limit the effectiveness of this method.

### **100-METER-UNIT-OF-MEASURE METHOD**

5-110. To use this method, the gunner visualizes a distance of 100-meters on the ground. For ranges up to 500-meters (Figure 5-26), he determines the number of 100-meter increments between the two points he wishes to measure. Beyond 500-meters (Figure 5-27), he selects a point halfway to the target, determines the number of 100-meter increments to the halfway point, and then doubles it to find the range to the target.

- During training, the gunner must learn how sloping terrain affects the appearance of a 100-meter increment. Terrain that slopes upward looks farther away, so observers tend to overestimate the 100-meter increment. The opposite is also true: terrain that slopes downward looks closer, causing the gunner to underestimate the 100-meter increment, and thus underestimate the range.
- Proficiency in using this method of measurement requires continual practice. When training in this technique, the gunner should frequently compare his estimated ranges to those he determines by pacing or other accurate means. The best training technique is to pace the range immediately after determining it visually. This way, he discovers the actual versus his estimated range for himself. The gunner will learn more this way than if trainers simply told him the correct range.

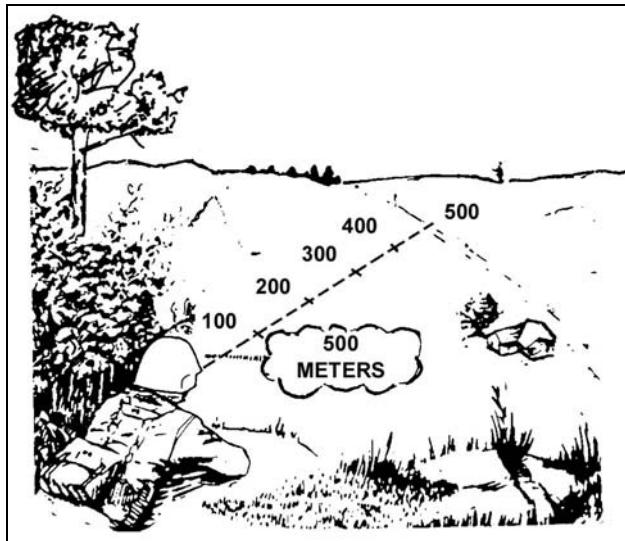


Figure 5-26. Application of the 100-meter-unit-of-measure method for ranges up to 500 meters.

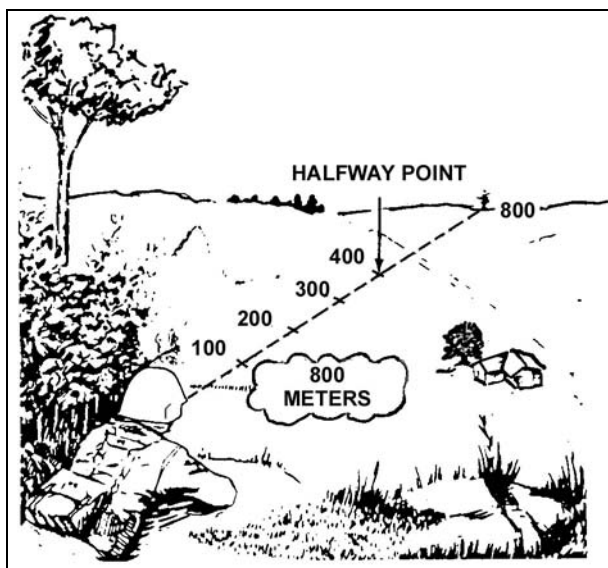


Figure 5-27. Application of the 100-meter-unit-of-measure method for ranges up to 800 meters.

- One factor that limits the effectiveness of this (the 100-meter-unit-of-measure) method is that its accuracy depends on how much terrain the gunner can see, especially at longer ranges. For example, if a target appears at or beyond 500 meters, and the gunner can see only part of the ground between himself and the target, the accuracy of the gunner's estimation will suffer.

### COMBINATION OF METHODS

5-111. Under ideal conditions, either the appearance-of-objects method or 100-meter-unit-of-measure method is an effective way to estimate range. However, ideal conditions rarely exist on the battlefield, so the gunner must combine methods. The terrain might limit the use of the appearance-of-objects method. For example, a gunner might not see all the terrain out to the target, but he might be able to see enough to get a general idea of the distance. A slight haze might obscure many of the target details, but the gunner

should still be able to judge its size. By carefully considering the ranges estimated by both methods, an experienced gunner should arrive at a number close to the true range. The best way to reduce errors using these two methods is to train often.

## **LATERAL DISTANCE MEASUREMENT**

5-112. The gunner also needs a quick way to measure the lateral distance between a reference point and a target.

### **TRIPOD**

5-113. With a tripod mount, he aims on a reference point, turns the traversing handwheel, and counts the clicks between the two points of aim. Each click is 1 mil, or 1 meter width (laterally) at 1,000 meters range, or half (that width) at half (that range), in other words, half a mil at 500 meters.

### **BIPOD**

5-114. With a bipod mount, he uses his fingers to measure the lateral distance between the reference point and target. He extends his arm and locks his elbow with his hand out, fingers straight, and palm down. Then, he closes one eye, raises his index finger, and sights along its edge, placing the edge of his finger so that it appears to be along the flank of the target or reference point. He fills the space remaining between the points by raising his fingers one by one until he covers the space. He states the measurement from the reference point to the target by giving the number of fingers raised.

## **SECTION VII. ADVANCED GUNNERY**

Once the gunner masters the four fundamentals of marksmanship in the prone and fighting positions, he must practice engaging the targets that most closely replicate a battlefield. The advanced gunnery field firing exercise exposes the gunner to different types of targets at various ranges to simulate combat conditions. The gunner must acquire targets quickly and deliver an accurate volume of fire. This training reinforces the fundamentals of marksmanship, and increases the gunner's effectiveness by building his confidence. Advanced gunnery is not used for qualification.

### **ORGANIZATION**

5-115. The unit is assembled in the bleachers and given the training objectives, a range briefing, and a safety briefing. Gunners are then organized into firing orders, each consisting of one gunner and one assistant gunner. Concurrent training stations are set up for Soldiers off the firing line.

### **AMMUNITION**

5-116. The advanced gunnery exercise requires 280 rounds of 5.56 or 7.62-mm linked ammunition. These include the rounds allocated for zeroing. For each target, the gunner and assistant gunner receives 10 rounds, or enough for two 5-round bursts. In other words, he may fire twice on each target.

### **FIRING SEQUENCE**

5-117. Gunners fire in the same sequence as in Firing Table I (Table 5-4). Commanders may score their Soldiers to identify the most proficient gunners, to assess the marksmanship program itself, and to encourage competition.

**TASK 1**

5-118. This task requires the gunner to field zero the 500-meter, single E-type silhouette. He is allocated 20 rounds of ammunition.

**TASK 2**

5-119. This task requires the gunner to engage single E-type silhouettes from the prone and fighting position, bipod-supported (point targets), at various ranges. The gunner uses his CBRN equipment (mask and gloves). Targets are at 100, 200, 250, 300, and 400 meters. The gunner receives 50 rounds of ammunition, and has 60 seconds to engage all targets.

**TASK 3**

5-120. This task requires the gunner to engage double E-type silhouettes (in automatic weapon positions) at various ranges. Targets are at 250, 300, 400, 500, and 600 meters. He is allocated 50 rounds of ammunition, and has 120 seconds to engage all targets.

**TASK 4**

5-121. This task requires the gunner to engage linear E-type silhouettes (troops on line) at various ranges. The gunner uses CBRN equipment (mask and gloves). Targets are at 300 and 600 meters. The gunner is allocated 20 rounds of ammunition, and has 120 seconds to engage all targets.

FIRING TABLE I -- ADVANCED GUNNERY Machine Gun Role							
TASK	FIRING POSITION	RANGE (M)	TIME	TOTAL ROUNDS PER PERSON	TARGET	AMMO	TYPE FIRE
1	Field Zero	500		20	Single E-type	4:1	Zeroing round bursts
2*	Bipod-Supported Position	100 200 250 300 400	60 sec	50	Single E-type	4:1	5-round bursts
3	Bipod-Supported Position	250 300 400 500 600	120 sec	50	Double E-type	4:1	5-round bursts
4*	Bipod-Supported Position	300 600	120 sec	20	Linear single E-type, 1 meter apart	4:1	5-round bursts
* Fired while wearing at least the protective mask and gloves.							

Table 5-4. Firing Table I, advanced gunnery, machine gun role.



## ALTERNATE FIRING POSITIONS

5-122. Although all gunners must master the bipod- and tripod-supported prone firing positions to be effective, they must also know other positions. Each gunner must be trained to assume different positions quickly in various combat conditions. The situation determines which position is best. The gunner establishes his position so that he can effectively observe and engage the target, but that limits his exposure to enemy fire.

### UNDERARM FIRING POSITION

5-123. Use this position almost exclusively when moving in and around the objective during the assault (Figure 5-28).

- Put the bipod legs and rear sight down so you can drop to the prone position and fire with the bipod at a moment's notice.
- Face the target with your feet spread about shoulder width apart.
- Place your left foot in front of your right foot, with most of your weight on your left foot.
- Bend both legs at the knees and lean forward at the waist.
- With your right hand, firmly grasp the pistol grip. With your right forearm, holds the stock firmly against the side of your body, between your armpit and waist.
- With your left hand, grasp the handguard firmly.
- Point your left foot in the direction of the target, and stabilize yourself with your right.
- Depress (lower) the muzzle of the machine gun slightly so you can see the strike of the rounds. This helps keep you from shooting high, and it uses ricochets.
- Lean toward the target before and during firing.



Figure 5-28. Underarm firing position.

## HIP FIRING POSITION

5-124. Use this position when closing with the enemy, when placing a heavy volume of fire in the target area, and when you can move slowly (Figure 5-29). This position differs from the underarm position only in that you—

- Hold the rear of the stock firmly against the forward position of your right thigh.
- Extends your arms fully downward.



Figure 5-29. Hip firing position.

## ALTERNATE ASSAULT FIRING POSITION EXERCISE

5-125. The assault fire exercise challenges the gunner. Point and area targets present in a variety of conditions that replicate the battlefield. Because these exercises include fire and maneuver, leaders must control them carefully for safety purposes.

### OBJECTIVES

5-126. This exercise lets the gunner practice engaging targets as fast as he can from any of the alternate firing positions.

### ORGANIZATION

5-127. The unit assembles in the bleachers, receives instructions, and receives a briefing on the training that will occur while it is on the range. After the briefing, the unit organizes into firing orders and moves to firing lanes. The exercise is conducted and the lanes used IAW local range policies.

### AMMUNITION

5-128. This exercise requires a total of 168 rounds of 7.62-mm linked ammunition. The gunner may fire two bursts per target exposure. He must also conduct at least one rapid reload during the exercise; he fires this twice also. The commander decides when the gunner conducts the rapid reload. Ammunition is loaded in two belts of any size that requires the gunner to reload.

## FIRING SEQUENCE

5-129. Trainers use the same sequence of fire as Firing Table II (Table 5-5), as follows:

### Task 1, Familiarization

5-130. The gunner conducts a dry run... On arriving at the firing position, he walks through his lane and familiarizes himself with the targets. When he returns, he draws his ammunition.

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*Note:* The commander ensures that gunners reload rapidly at least once during the movement phase of training.

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### Task 2, Single Target, Hip

5-131. After receiving his ammunition, the gunner starts moving. From the time the single, E-type silhouette appears at 25 meters, the gunner has 5 seconds to engage it from the hip.

### Task 3, Single Target, Underarm

5-132. As the gunner continues to move through the course, two E-type silhouettes appear at 50 and 25 meters for 5 seconds each. He engages them from the underarm firing position.

### Task 4, Single Target, Underarm or Hip

5-133. Three E-type silhouettes appear, at 25, 50, and 75 meters, for 5 seconds each. He can engage any of them from either the underarm or hip firing position.

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*Note:* The commander can integrate limited visibility into selected tasks in this course, or he can conduct a separate course entirely in limited visibility.

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FIRING TABLE II -- ADVANCED GUNNERY Machine Gun Role							
TASK	FIRING POSITION	RANGE (M)	TIME	TOTAL ROUNDS PER PERSON	TARGET	AMMO	TYPE FIRE
1	Dry Fire Walk-Through	NA	NA	NA	NA	NA	NA
2	Hip-Firing Position	25	5 sec	10	Single E-type silhouette	4:1	5-round bursts
3	Underarm-Firing Position	50 25	5 sec ea tgt	20	Single E-type silhouette	4:1	5-round bursts
4	Underarm or Hip-Firing Position	25 50 75	5 sec ea tgt	30	Single E-type silhouette	4:1	5-round bursts

Table 5-5. Firing Table II, advanced gunnery, machine gun role.

## MOVEMENT, SPEED, AND ALIGNMENT

5-134. The gunner uses individual movement techniques to keep up with the other Soldiers in the assaulting element. He moves as fast as he can and still fire accurately and maintain alignment.

## RELOADING PROCEDURES

5-135. To avoid lulls in firing, the gunner reloads rapidly. This requires practice and the use of the following techniques:

- Before the assault, conduct prefire checks on the machine gun. Inspect ammunition to ensure that it is clean and serviceable, and check the box for serviceability.
- During the assault, continue moving forward and reload as fast as you can. The sling allows you to use both hands to reload.

## SECTION VIII. ADVANCED CREW GUNNERY EXERCISES

The two field firing tables in this section expose gunners to different types of targets at various ranges to simulate combat conditions.

### M240B AND M249, MOUNTED AND DISMOUNTED

5-136. These two exercises test the application of fire from two or more guns against stationary, area, and moving targets. Specifically, they test collective individual skills, fire control, leader skills, adjustment of fire, methods of target engagement, and the control of one or more fire units. Table 5-6, *Advanced Crew Gunnery Firing Table I*, is used for day and *dismounted* night phases, whereas Table 5-7, *Advanced Crew Gunnery Firing Table II*, is used for the day and *mounted* night phases. Both tables are used for practice and qualification as well as for offense, defense, and retrograde. They are fired on any range or terrain that supports M240B and M249 machine gun fire. For the dismounted role, terrain dictates which type of fire and maneuver to use the 3 to 5 second rush or the bounding overwatch. During scoring procedures, the

grader positions himself so that he can observe both the gunner and the target. Once the exercise starts, he--

- Times the tasks with time standards.
- Observes and informs the gunner of the strike of the rounds.
- Records the results of each task in the right hand column with a “T” for fully trained, “P” for needs practice, and “U” for untrained.
- Sums the results. Assigns an overall score based on the scores in the bottom box.

FIRING TABLE I -- ADVANCED CREW GUNNERY Day and <i>Dismounted</i> Night Phases					
ACTION	CONDITIONS	STANDARDS	AMMO	TIME	T/P/U
1. Set up a support-by-fire position with two machine gun crews.	Given an OBJ with 4 to 7 personnel targets and 1 light vehicle at a distance of 600 meters	Kill vehicle, kill 1 to 2 personnel, suppress the OBJ	120 rds per gun	32 sec	
2. Conduct Hasty Defense or Repel Counterattack on the OBJ with two machine gun crews.	Given 10 to 14 personnel and 2 light vehicles at a distance of 600 to 800 meters	Destroy 2 vehicles, kill 5 to 7 personnel, suppress area	300 rds per gun	2 min	
3. Break Contact and move to alternate fighting position with two machine gun crews.	Given 7 to 10 personnel and 1 light vehicle at a distance of 400 meters	Kill vehicle, kill 3 to 6 personnel, suppress area	160 rds per gun	1 min 15 sec	
4. Break Contact with two machine gun crews.	Given 7 to 10 personnel and 1 light wheeled vehicle at a distance of 800 meters	Disable or destroy vehicle, kill 3 to 6 personnel, suppress enemy	160 rds per gun	1 min 25 sec	
<p>NBC fire should be conducted during the hasty defense.                      Building facades, suicide bombers, and COBs should be used to vary the conditions in some engagements.                      Smoke should be used in moving from the SBF position to the OBJ.                      Day and Night 740 rds each for a total of 1,480 rounds.</p> <p><b>EXERCISE SCORING</b></p> <p>Fully Trained (T) = Satisfactory on 4 of 4 actions.                      Need Practice (P) = Satisfactory on 3 actions.                      Untrained (U) = Unsatisfactory on 2 or fewer actions.                      Night vision devices as prescribed by unit commander.</p>					

Table 5-6. Firing Table I, advanced crew gunnery, day and *dismounted* night phases.

FIRING TABLE II -- ADVANCED CREW GUNNERY Day and <i>Mounted</i> Night Phases					
ACTION	CONDITION	STANDARDS	AMMO	TIME	T/P/U
1. Conduct movement to contact. Engage stationary targets from two moving vehicles.	Given 4 to 7 personnel with RPGs and small arms between 300 and 400 meters	Kill 2 to 3 personnel	60 rds per gun	30 sec	
2. Conduct a hasty defense. Engage stationary targets from two stationary vehicles.	Given 4 to 7 personnel and a light wheeled vehicle between 400 and 600 meters	Kill vehicle, kill 2 to 3 personnel, suppress area	120 rds per gun	21 sec	
3. Break contact. Move to alt position. Engage moving targets from two stationary vehicles.	Given 5 to 7 personnel and 1 to 2 light vehicles between 400 and 600 meters	Kill 3 to 4 personnel, kill 1 vehicle, suppress area	200 rds per gun	21 sec	
4. Break contact. Engage stationary targets from two stationary vehicles.	Given 10 to 15 personnel and 2 light wheeled vehicles between 600 and 800 meters	Kill 5 to 10 personnel, kill 2 vehicles, suppress area	300 rds per gun	34 sec	
<p>NBC fire should be conducted during the hasty defense.</p> <p>Building facades, suicide bombers, and COBs should be used to vary the conditions in some engagements.</p> <p>Smoke should be used in moving from the SBF position to the OBJ.</p> <p>Day and night, 680 rounds each for a total of 1,360 rounds</p> <p><b>EXERCISE SCORING</b></p> <p>Fully Trained (T) = Satisfactory on 4 of 4 actions</p> <p>Need Practice (P) = Satisfactory on 3 actions</p> <p>Untrained (U) = Unsatisfactory on 2 or fewer actions</p> <p>Night vision devices as prescribed by unit commander</p>					

Table 5-7. Firing Table II, advanced crew gunnery, day and *mounted* night phases.

## ENGAGEMENT STANDARDS

5-137. Engagement standards consist of task and subtask standards. The crew must meet task standards to succeed in the engagement. Each task standard includes a combination of subtask standards: critical, leader, and noncritical. Critical subtasks are those that must be accomplished to meet the task standards. Leader and noncritical subtasks support the engagement task. The task standards apply to every engagement. Figure 5-30 shows engagement evaluation criteria for crew gunnery.

T	GO	On <i>all</i> task standards On <i>all</i> critical subtask standards On <i>all</i> leader subtask standards
	NO GO	On <i>no more than one</i> noncritical subtask standard.
P	GO	On <i>all</i> task standards On <i>all</i> critical subtask standards
	NO GO	On <i>one or more</i> leader subtask standards OR On <i>two or more</i> noncritical subtask standards
U	NO GO	On <i>one or more</i> task standards OR On <i>one or more</i> critical subtask standards

Figure 5-30. Criteria for evaluating crew gunnery engagements.

## TARGETS

5-138. All stationary targets should be mounted on pop-up mechanisms (FM 17-12-7) to simplify target acquisition and scoring. Moving targets should be presented at speeds between 24 and 32 kmph (15 to 20 mph). HMMWV gunnery tables use various targets. Figure 5-31 shows the target types: PC (BMP, BTR, BRDM), truck, RPG team, bunker, and troop targets. Commanders and range-operation personnel must ensure that targets are built to the correct dimensions.

<i>Target Type</i>	<i>Standard Target</i>
Frontal BMP	M-1
Flank BMP	M-2
Frontal BRDM	M-5
Flank BRDM	M-6
Frontal BTR	M-11
Frontal truck	L-1
Flank truck	L-2
Troops	L-6, L-7, L-9

Figure 5-31. Targets.

## TARGET-LIFT MECHANISMS

5-139. When target-lift mechanisms are used, a target that is hit might fail to fall. The control officer or vehicle crew evaluator (VCE) should observe every round fired. To avoid wasting ammunition, if the

target is killed and does not fall, the control officer or VCE announces a sensing of “Kill, kill, kill” over the control net. This is the only situation in which anyone other than the firing crew announces a sensing. Targets that fail to drop after being hit should be repaired as quickly as possible. When feasible, targets should be physically scored and patched.

## **TARGET MALFUNCTIONS**

5-140. If a target malfunctions, the crew will be alerted after that engagement. Based on the availability of targets, the crew may be presented with the same target again, either then or in another place. Regardless, the same target type must be used and the same conditions met. Alternate engagements are used if a moving target fails.

## **TARGET TYPES**

### **Point Targets**

5-141. An RPG team has three stationary infantry targets (SITs) (also known as "troop targets") in the open. Full and half silhouettes are displayed in a tactical array using both width and depth. A vehicle target is a flank or frontal silhouette. Stationary point targets are mounted on individual target-lift mechanisms, which are set to KNOCKDOWN mode of operation.

### **Area Targets**

5-142. Area targets are shown as 5 to 15 SITs in the open. Full and half silhouettes display in a tactical array using both width and depth. The silhouettes are placed no more than 5 meters apart and 10 meters in depth. The target area is defined as one target form up, down, left, or right of any target in the array.

### **Civilians on the Battlefield and Other Friendly Targets**

5-144. Noncombatant targets can include any number of silhouettes dispersed in a small group. These targets can be wrapped in civilian shirts and be painted with colors that represent civilian attire, or have life-size digital photos adhered to plywood cutouts. All noncombatant and friendly targets are placed within the range fans and within the capabilities of the weapon systems. Friendly forces are marked IAW the firing unit's SOP. Identification methods include, among others, VS-17 panels, thermal reflective tape, Battlefield Reference Marking System (BRMS), and infrared (IR) strobe lights.

## **TARGET SIGNATURE DEVICES**

5-145. The commander may use target signature devices such as the LA06 or LA07. However, he may use no more than one device for target signature purposes. When such a device is used, at least 5 seconds of target exposure time must elapse before the device is detonated or activated. Failure of a target signature device is not a valid alibi. The LA06 and LA07 should be used on targets such as tanks, PCs, trucks, and bunkers that can mount a larger weapon type. When the number of LA06 and LA07 targets falls short of the number allocated by STRAC, the commander and master gunner decide which targets get the devices.

5-146. The LA06 is a flash-bang device that simulates the fire of a large-caliber weapon. It replaces the Hoffman device.

5-147. The LA07 is a star cluster device that shows where the target hits. However, this manual discusses the use of the LA07 as a target-destruction signature device. The star cluster signature is visible both in day and thermal sights. This allows the gunner to see when the prescribed amount of hits has been achieved.



## **CREW PROTECTION STATUS**

5-148. All crewmembers should be in mission-oriented protective posture 4 (MOPP4) when conducting CBRN engagements. The commander will decide if environmental conditions warrant MOPP4. At the least, Soldiers wear the mask and gloves.

## **TARGET KILL STANDARDS**

5-149. Machine gun crews use the M240B and or M249 machine guns to suppress and destroy targets. When they do so, they receive full credit for it.

## **TIMING PROCEDURES**

5-150. Scoring and timing make crews train as they will fight. They should be rewarded for engaging targets rapidly, but not penalized when artificial maneuver constraints prevent them from continuing to do so. The VCE's judgment is critical in implementing this policy. He must apply his knowledge of the vehicle's capabilities and observe firing conditions to maintain standards without penalizing the firing crew. VCEs must stay where they can observe the firing vehicle. The commander or master gunner decides how to implement these basic policies on any gunnery range.

## **TARGET EXPOSURE TIME**

5-151. Limiting exposure time allows for situation-dependent events beyond crew control. Tables 5-6 and 5-7 list the target exposure time for each target. Tasks are designed so that--

- All stationary targets are exposed for 50 seconds while in a stationary position (defense), starting from the time the target is in the fully locked (up) position.
- All stationary targets are exposed for 30 seconds while on the move (offense). This time starts when the target is in the fully locked (up) position.
- Exposure time for all moving targets is 50 seconds. (Range constraints limit target exposure for targets moving 20 miles per hour or more.)
- Each target in a target array has its own exposure time.

## **DISMOUNTED AND MOUNTED CREW EXPOSURE TIME**

5-152. Exposure time is based on how long a dismounted and mounted crew might be exposed to a target before that target can engage. Each target presents its own threat to the exposed vehicle. Therefore, a dismounted and mounted crew might be exposed to more than one target at the same time.

### **DEFENSE**

#### **Time Start**

5-153. In the defense, the dismounted and mounted crew exposure time *starts* when the first round is fired.

#### ***Moving Engagement***

5-154. For moving engagements, the mounted or dismounted crew exposure time starts when the first round is fired.

***Multiple Targets***

5-155. For multiple targets, the crew has a 15-second delay before the second target appears. For each target, exposure time starts when the first round is fired.

**Time Stop**

5-156. In the defense, exposure time continues until the dismounted or mounted crew moves. In the defense, the dismounted or mounted crew exposure time *stops* when the crew destroys the target.

**OFFENSE**

**Time Start**

5-157. In the offense, just as in the defense, the dismounted and mounted crew exposure time *starts* when the first round is fired.

**Time Stop**

5-158. In the offense, the exposure time *stops* when the crew destroys the target.

***Moving and Defensive Engagements***

5-159. For moving and defensive engagements, exposure time to the other targets continues until the crew destroys it.

***Multiple Target Engagements***

5-160. In multiple target engagements, the dismounted or mounted crew is exposed to more than one target. Once they destroy the target, exposure time for that target stops.

**TIME RESET**

5-161. Once a vehicle moves back into a barrel-down position, vehicle exposure time resets. It does so because the target must now reacquire, re-lay, and reengage the vehicle. A vehicle that has pulled back into a barrel-down position is assumed to be about to maneuver and engage from another position.

**TARGET KILL TIME**

5-162. Target kill time is how long it takes the crew to engage and suppress the target. For the crew to receive a "T," the target kill time must not exceed the maximum vehicle exposure time.

**TIMING DEVICES**

5-163. To score Firing Tables 5-6 and 5-7, you will need at least two stopwatches to time the vehicle exposure time in a two-target engagement. Tower or target-control personnel track this automatically. The best timing device has multiple stopwatches with a common start button and independent stop buttons.

**ALIBIS**

5-164. Commanders have the final say on alibis. Alibis are limited to two occurrences: target or range malfunctions and weapon malfunctions that are not the fault of the crew, and that are not

correctable through immediate action. Commanders should ensure that gunnery is as close to real combat as possible. This means that crews should train to fight through problems.

## REMEDIAL TRAINING PROCEDURES

5-165. Unit commanders and master gunners must make sure that crews who fail tables or who habitually fail specific tasks receive remedial training. Virtual trainers or, as a last resort, dry runs, are the recommended techniques for remedial training. Once the crews complete remedial training and have been cleared by the master gunner to continue training, they should fire the failed engagements, given the time and ammunition.

## ALL-WEATHER FIRING PROCEDURES

5-166. As in combat, firing should continue under all weather conditions. The commander decides what constitutes effective training, based on many factors, including mission and range availability. If the training can still be effective during reduced visibility, it should be consistent with the unit's mission requirement. Safety, along with the following considerations, determines when all-weather firing can continue and when it must stop:

- Training effectiveness.
- Operational mission.
- Preparation and planning.
- Safety restrictions.

## CREW-DUTY PENALTIES

5-167. During the conduct of gunnery tables, VCEs monitor crew duties. They assess crew-duty penalties for specific safety violations. This helps ensure that crews practice safe firing procedures. The two crew-duty penalties are immediate disqualification and assessment of a "U" rating. Immediate disqualification is assessed for extremely hazardous conduct or other actions as defined by the commander; a "U" rating is assessed for blatant disregard for the announced task, conditions, or standards. The VCEs can assess unlimited crew-duty penalties for each task, but the penalties do not carry over to other tasks. When a VCE assesses a penalty that stops a task, he conducts an immediate AAR to discuss what happened. Table 5-8 shows the five categories of safety violations and the penalty assessed for each.

<i>Categories of Safety Violations</i>	<i>Penalty Assessed</i>
1. Extremely hazardous conduct	Disqualified
2. Blatant disregard for the announced task, conditions, and standards	Untrained ("U")
3. Failure to employ correct safety techniques and exceeding of maximum vehicle-exposure times	Untrained ("U")
4. Failure to adhere to basic doctrinal and safety guidelines	Untrained ("U")
5. Failure to employ correct engagement techniques or to respond properly to fire commands	Untrained ("U")

**Table 5-8. Safety violations and penalties.**

## DISQUALIFIED

- Extremely hazardous conduct such as firing outside the range fan.
- Commander-defined actions.
- Cheating.

## UNTRAINED

5-168. The VCE assigns a rating of "U" to any crew who--

- Blatantly disregards the announced task, conditions, and standards.
- Fails to mask during a CBRN engagement.
- Engages friendly targets (if applicable).
- Fails to employ correct safety techniques or exceeds maximum vehicle exposure times.
- Leaves the gun armed or the selector on "F" when loading or between engagements (points are deducted from previous engagement).
- Fires into the berm, that is, fails to ensure that the weapon clears the berm.
- Kills target after the maximum vehicle exposure time (multiple engagements only, maximum of once per engagement).
- Fails to adhere to basic doctrine and safety guidelines.
- Fails to follow the instructions of the VCE; the control or safety officer; or the troop or company commander while negotiating the course.
- Fires or announces "On the way" before receiving the fire command.
- Uses an improper engagement technique, that is, fires at the least dangerous target first in a multiple-target engagement; uses improper suppressive fire techniques; or fails to halt before firing during a moving engagement.
- Gives an improper fire command.
- Fails to return to a turret-down position after completing a defensive engagement or, on a multiple-target engagement, between targets.
- Fails to employ correct engagement techniques or respond properly to fire commands.
- Responds incorrectly to a fire command or subsequent fire command.
- Reports improperly, for example, fails to send a SALT (size, activity, location, and time) or BDA (battle damage assessment) report after the engagement, or, for digital-equipped units, fails to use digital equipment to send report.
- Uses incorrect driving techniques, that is, fails to maintain speed or steady platform. For example, the driver makes jerky starts and stops, drives too fast for the maneuver box, or goes off the course or road.

## MOUNTED CREW QUALIFICATION

5-169. This crew qualification table tests the individual gunner's skills, the leader's fire control abilities, and the driver-assistant gunner's ability to maneuver the vehicle. It therefore combines individual and collective (team or crew) training.

## COMMON CREW TASKS

5-170. Common crew task training is the first level of collective training. Common crew tasks are the basic, technical collective tasks that the crew performs to accomplish the wartime mission.

- Conduct a Tactical Movement.
- Occupy Battle Position.
- Load/Reload Machine Gun.

**BATTLE DRILLS**

5-171. A battle drill is one kind of a critical collective tasks. Battle drills are mostly independent of METT-TC and require few leader actions to execute.

**LEADER TASKS**

5-172. These are found in ARTEPs 7-91-MTP and -Drill and in FM 7-8.

- Fire commands.
- Fire control.
- Situation Reports and CBRN 1 Reports.

**COLLECTIVE TASKS**

5-173. The commander incorporates the following collective tasks into the crew qualification table, based on his unit METLs and SOPs:

- React to Contact.
- Break Contact.
- Conduct Vehicle-Mounted CBRN Procedures.
- Conduct Dismounted CBRN Procedures.
- Identify Targets (Enemy/Friendly).

**SUGGESTED SUPPORT REQUIREMENTS**

5-174. The following support requirements are recommended when conducting the mounted crew qualification:

**Minimum Evaluators**

- Evaluators will not help the gunner find and identify targets.
- One evaluator per section and squad (dismounted).
- One VCE per section and squad (mounted).
- Two evaluators in the range tower to record scores on engagement.

**Opposing Forces**

- None provided.

**Support Troops**

- None provided.

**Vehicles and Communications.**

- One AN/PRC-119 radio per section and squad evaluator.
- Two AN/PRC-119 radios for the tower evaluators (one primary, one alternate).

**Maneuver Area**

- Multipurpose range complex, recommended range of 1,000 meters.
- Use of facades and noncombatant targets to facilitate a COE environment.

## Firing Area

- Smoke may be used: mechanical for mounted, handheld for dismounted.

## TRAINING AIDS, DEVICES, AND SPECIAL EQUIPMENT

5-175. Table 5-9 shows the training aids, training devices, and other special equipment used to conduct this firing exercise on a multipurpose range complex (MPRC). Trainers and evaluators might have to mark the firing positions anytime but, at night, they must use luminous tape or chemical lights to mark roads (ARTEPs 7-91-Drill and -MTP; and FM 3-22.22, 3-22.65, 3-21.91, and 7-8. (*See also* Appendix F.)

Weapon and Configuration	M240B mounted	M249 dismounted
Blank firing attachment or adapter	M240B BFA	M249 BFA
Ammunition		
Practice Rounds	680 per gun 1,360 total	370 per gun 740 total
Live Fire Rounds	880 per gun 1,760 total	370 per gun 740 total

**Table 5-9. Ammunition allocations.**

## DISMOUNTED CONDUCT OF ACTION

5-176. Table 5-10 allows the gun crews to coordinate while stationary or moving from one cover and concealed position to another. The engagements in this firing table integrate battlefield conditions and realistically arrayed targets. Figure 5-32 shows an example dismounted scenario. During the AAR, the range evaluation officer or noncommissioned officer critiques the crew.

## EXECUTION

5-177. Trainers or evaluators brief crewmembers on the enemy situation and his weapon capabilities before the exercise starts. All defensive engagements start with the gun crew in the prone position to engage the targets.

## SCORING

5-178. Trainers rate the crew using the T/P/U system for each engagement:

- T Fully trained
- P Needs practice
- U Untrained

FIRING TABLE III -- M249 DAY AND NIGHT PHASES Dismounted														
ACTION	CONDITION	STANDARDS	AMMO	TIME	TPU									
1. Set up a support-by-fire position with two machine gun crews.	Given an objective with 4 to 7 personnel targets and 1 light vehicle at 600 meters	<ul style="list-style-type: none"> <li>• Kill vehicle</li> <li>• Kill 1 to 2 personnel</li> <li>• Suppress the objective</li> </ul>	120 rounds per gun	32 sec										
2. Conduct hasty defense or repel a counterattack on the objective with two machine gun crews.	Given 10 to 14 personnel and 2 light vehicles between 600 and 800 meters	<ul style="list-style-type: none"> <li>• Destroy 2 vehicles</li> <li>• Kill 5 to 7 personnel</li> <li>• Suppress area</li> </ul>	300 rounds per gun	2 min										
3. Break contact and move to alternate fighting position with two machine gun crews.	Given 7 to 10 personnel and 1 light vehicle at 400 meters	<ul style="list-style-type: none"> <li>• Kill vehicle</li> <li>• Kill 3 to 6 personnel</li> <li>• Suppress area</li> </ul>	160 rounds per gun	1 min 15 sec										
4. Break contact with two machine gun crews.	Given 7 to 10 personnel and 1 light wheeled vehicle at 800 meters	<ul style="list-style-type: none"> <li>• Disable or destroy vehicle</li> <li>• Kill 3 to 6 personnel</li> <li>• Suppress the enemy</li> </ul>	160 rounds per gun	1 min 25 sec										
<p>During the hasty defense, trainers conduct CBRN fire using building facades, suicide bombers, and COBs to vary the conditions in some of the engagements. Use smoke only while moving from the SBF position to the objective. Day and night, 370 rounds each for a total of 740 rounds.</p> <p><b>EXERCISE SCORING</b></p> <table> <tr> <td>Fully trained</td> <td>T</td> <td>Satisfactory on 4 of 4 actions</td> </tr> <tr> <td>Needs practice</td> <td>P</td> <td>Satisfactory on 3 actions</td> </tr> <tr> <td>Untrained</td> <td>U</td> <td>Unsatisfactory on 2 or fewer actions</td> </tr> </table> <p>Night vision devices are used as prescribed by unit Commander.</p>						Fully trained	T	Satisfactory on 4 of 4 actions	Needs practice	P	Satisfactory on 3 actions	Untrained	U	Unsatisfactory on 2 or fewer actions
Fully trained	T	Satisfactory on 4 of 4 actions												
Needs practice	P	Satisfactory on 3 actions												
Untrained	U	Unsatisfactory on 2 or fewer actions												

Table 5-10. Firing Table III, M249 day and night phase, dismounted.

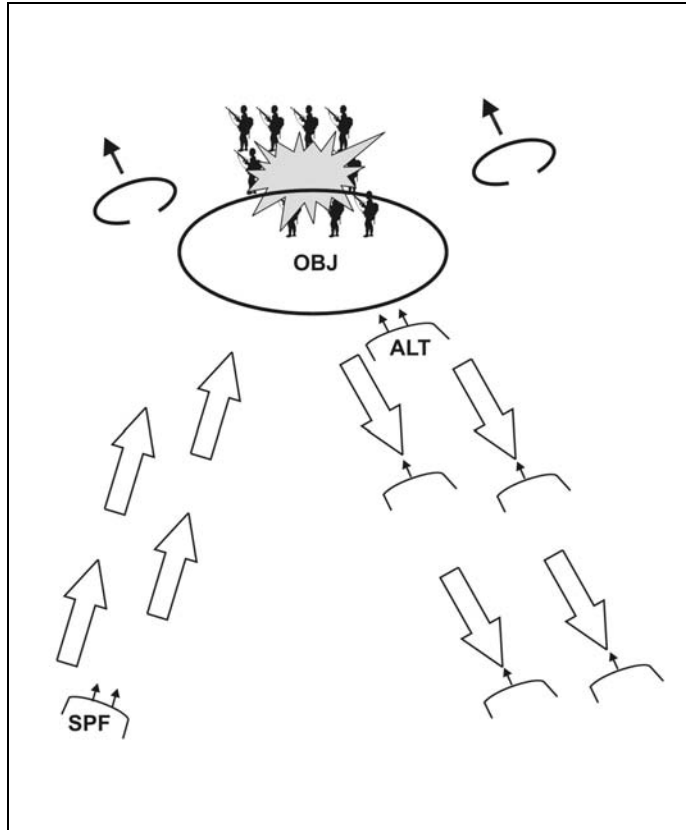


Figure 5-32. Dismounted scenario.

## MOUNTED CONDUCT OF ACTION

5-179. Table 5-11 lets the gun crews integrate the crew's coordination. By moving their vehicle in and out of firing positions, moving from one position to another. Figure 5-33 shows an example mounted scenario.



**EXECUTION**

5-180. Trainers brief crewmembers on the enemy situation and vehicle capabilities before they conduct this table. All defensive engagements start with the vehicle in the weapon-down position and moving where the crew can engage the target(s). On a range that prohibits this, units should train with simulated battle positions. They fire all moving engagements from a short halt.

**SCORING**

5-181. Trainers rate each crew for each engagement using the T/P/U system. During the AAR, the range evaluator officer or NCO critiques the crew.

- T Fully trained.
- P Needs practice.
- U Untrained.

<b>FIRING TABLE IV -- M240B DAY AND NIGHT PHASES</b>														
<b>Mounted</b>														
<b>ACTION</b>	<b>CONDITION</b>	<b>STANDARDS</b>	<b>AMMO</b>	<b>TIME</b>	<b>TPU</b>									
1. Conduct movement to contact. Engage stationary targets from two moving vehicles	Given 4 to 7 personnel with RPGs and small arms between 300 and 400 meters	Kill 2 to 3 personnel	60 rounds per gun	30 sec										
2. Conduct hasty defense. Engage stationary targets from 2 stationary vehicles.	Given 4 to 7 personnel and 1 light wheeled vehicle between 400 and 600 meters	Kill vehicle Kill 2 to 3 personnel Suppress area	120 rounds per gun	21 sec										
3. Break contact and move to alternate position. Engage moving targets from 2 stationary vehicles.	Given 5 to 7 personnel and 1 or 2 light vehicles between 400 and 600 meters	Kill 3 to 4 personnel Kill 1 vehicle Suppress area	200 rounds per gun	21 sec										
4. Break contact. Engage stationary targets from 2 stationary vehicles.	Given 10 to 15 personnel and 2 light wheeled vehicles between 600 and 800 meters	Kill 5 to 10 personnel Kill 2 vehicles Suppress area	300 rounds per gun	34 sec										
<p>During the hasty defense, trainers conduct CBRN fire using building facades, suicide bombers, and COBs to vary the conditions in some of the engagements. Use smoke while moving from the SBF position to the objective. Day and night, 680 rounds each for a total of 1,360 rounds.</p> <p><b>EXERCISE SCORING</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Fully trained</td> <td style="width: 10%;">T</td> <td>Satisfactory on 4 of 4 actions</td> </tr> <tr> <td>Needs practice</td> <td>P</td> <td>Satisfactory on 3 actions</td> </tr> <tr> <td>Untrained</td> <td>U</td> <td>Unsatisfactory on 2 or fewer actions</td> </tr> </table> <p>Night vision devices are used as prescribed by unit Commander.</p>						Fully trained	T	Satisfactory on 4 of 4 actions	Needs practice	P	Satisfactory on 3 actions	Untrained	U	Unsatisfactory on 2 or fewer actions
Fully trained	T	Satisfactory on 4 of 4 actions												
Needs practice	P	Satisfactory on 3 actions												
Untrained	U	Unsatisfactory on 2 or fewer actions												

**Table 5-11. Firing Table IV, M240B mounted, day and night phases.**

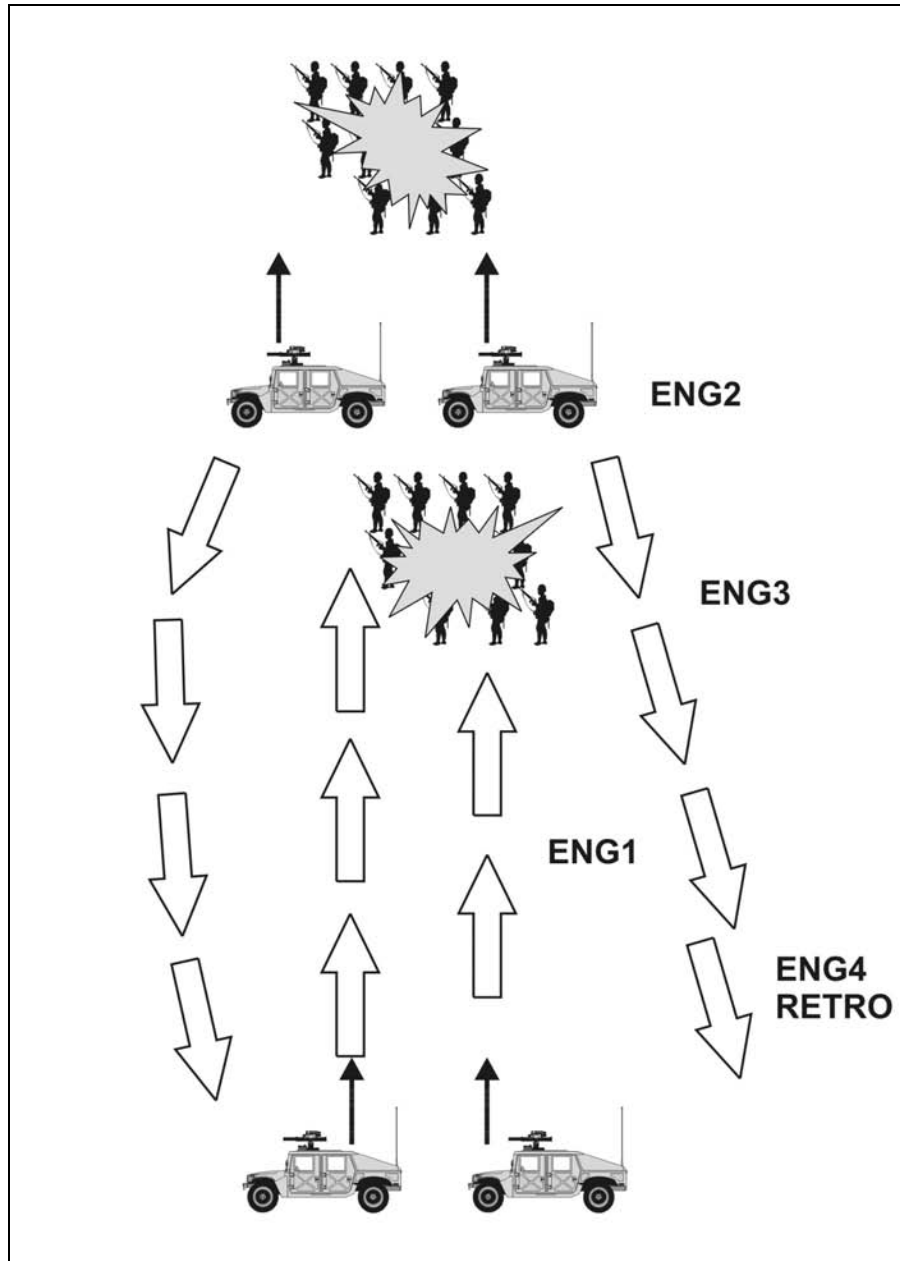


Figure 5-33. Day or night mounted scenario.

## Chapter 6

# Train-the-Trainer Program

This chapter helps the leader develop a good train-the-trainer program. The goal of this program is to certify qualified machine gun trainers and achieve a high state of combat readiness. Knowledgeable, small-unit leaders and trainers are the key to any successful marksmanship training program; however, the entire leadership must be involved in the execution of training to standard. An effective train-the-trainer program reflects the priority, emphasis, and interest of the leaders and trainers to see that execution of training to standard is achieved.

The objectives of the train-the-trainer program are to develop in every machine gun trainer the confidence, willingness, knowledge, and skills required to consistently train their Soldiers to be effective in combat.

### MISSION-ESSENTIAL TASK LIST

6-1. The unit's combat mission is considered when establishing training priorities. This not only applies to the tasks selected but to the conditions under which the tasks are to be performed. The tasks for the METL are developed for both defensive and offensive operations. Machine gun marksmanship will be a critical individual, crew and leader task. Each commander should develop a METL and organize a training program that devotes adequate time to conduct marksmanship training.

### TRAINER ASSESSMENT

6-2. The leaders are also involved in determining the proficiency of potential trainers by reviewing the following information.

### SELECTION

6-3. Trainers should be selected from the most highly qualified Soldiers available within the unit. These Soldiers should be knowledgeable of the machine guns, a high degree of proficiency in applying the fundamentals, and demonstrate a motivated attitude for marksmanship training. The leaders must ensure that a high level of proficiency is maintained. Knowledgeable trainers are the key to any successful training program.

### TRAINER COURSE

6-4. Once the leaders have identified these Soldiers possessing the required knowledge, skills, and motivation in machine gun marksmanship, they must then ensure this knowledge can be effectively taught to other Soldiers.

### TRAINING

6-5. There are several available means that may be used in the progression of trainer training or that can easily be tailored to the certain needs of the command. The more time and training initially invested, the

better the trainer will be. The leaders should periodically evaluate each trainer and replace any that loses his motivation or desire. To maintain Soldiers' interest in the program, leaders should have a way of promoting competition and awarding the best trainer.

## **ASSISTANT TRAINERS AND CADRE COACHES**

6-6. Assisting the trainer and coaching a Soldier to fire the machine gun are highly technical jobs that must be done well. The most valuable Soldiers in the program are those who not only have obtained a high standard, but those who can effectively teach this knowledge to others. Once the individual is consistent in this train-the-trainer program, he can then develop into a competent assistant trainer. It is worth the effort to train these individuals to become a successful assistant trainer, because experience has shown that such training also develops leadership ability. The primary responsibility of assistant trainers is to train individuals in the effective use of the machine gun. In addition, assistant trainers are responsible for enforcing safety regulations. They must maintain strict discipline on the firing lane at all times and constantly enforce compliance with the range regulations and training guidance. To be an assistant trainer, a Soldier must know the principles of accurate firing and coaching techniques, and he must have the following qualifications as well.

### **KNOWLEDGE**

6-7. The assistant trainer must know this manual. He must be prepared to answer any question on the subject of marksmanship accurately. Then, he must develop his ability to observe the actions of the Soldier quickly and to correct them with sound recommendations.

### **PATIENCE**

6-8. Gunners can be persuaded to accept the principles and procedures by patient repetition and demonstration.

### **UNDERSTANDING**

6-9. The assistant trainers that have good "firing lane manners" enhance the success of training. Training new gunners is stressful to the Soldiers and the trainers. The Soldier may be sensitive to abruptness, impatience, or a lack of sympathy with his difficulties; and he will immediately react unfavorably to evidence of such attitude on the part of the coach.

### **CONSIDERATION**

6-10. Most Soldiers, even those who do not fire well, enjoy firing and begin with a positive interest in their performance on the range. If the assistant trainer is considerate of his pupils' feelings from the beginning and encourages them throughout their training, he will find training a pleasant and rewarding duty.

### **ABILITY TO MAINTAIN RESPECT**

6-11. A Soldier assigned the duties of assistant trainer is also considered an expert and should receive the same respect as the primary trainer. The assistant trainer must retain that respect throughout his contact with students by showing a thorough knowledge of his subject in a dignified manner.

### **ALERTNESS**

6-12. Even the most capable student may forget or neglect some essential point in his instruction in the excitement of firing on the range. The assistant trainer must always be alert and patiently correct him as

often as necessary. He must keep the gunners encouraged throughout the instruction by making the most of all progress. The assistant trainer must not allow his students to become discouraged or to lose interest.

### **HELPFUL ATTITUDE**

6-13. When assisting on the range, as in most other lines of instruction, a combative, hard-boiled attitude is rarely effective.

### **ABILITY TO PROVIDE ENCOURAGEMENT**

6-14. The assistant trainer can encourage his Soldiers by convincing them there is no mystery about good firing: The weapon and ammunition are mechanically developed for accuracy. The assistant trainer is there to help the gunner become a good marksman.

## **PROGRAM PHASES**

6-15. Since firing is a learning process, certain prerequisites must be satisfied before a trainer passes from one phase of marksmanship to another. The trainer must qualify with the machine gun (the trainer must pass all tasks and qualify on the 10-meter and transition fire) that he will be teaching to the machine gunners in his unit. To obtain maximum results on the battlefield, the machine gunners are trained in the fundamentals before they engage a combat target. The phases of the train-the-trainer program are to develop this structure in the most progressive manner. They are sequenced to train-the-trainer in teaching tasks necessary to produce a quality machine gunner and a machine gun team.

### **PRELIMINARY GUNNERY**

6-16. The machine gunners must receive this training before live firing. It is during this phase that sound foundations of good firing principles are constructed, reviewed, and reinforced. The degree of proficiency obtained or retained by the machine gunners depends on the foundation built during this phase. Correct firing and good safety habits must become natural. Drilling of the fundamentals and continued leader emphasis will bring the greatest return in the shortest time. Proper firing is a physical skill, which must be learned. When practiced, the process becomes a learned skill that will be retained. However, good firing is a perishable skill. All machine gunners must periodically familiarize themselves with the fundamentals regardless of their years of marksmanship experience. Even experienced machine gunners will develop a deficiency in applying certain fundamentals, for example, overconfidence.

### **BASIC GUNNERY**

6-17. This training teaches the trainers how to qualify, plan, set up, and conduct 10-meter and transition firing exercises on the available ranges.

### **ADVANCED GUNNERY**

6-18. This training teaches the trainer how to develop teamwork among the machine gun teams. This training also gives them confidence in their ability to deliver a large volume of accurate fire against targets. During this phase, the trainer is responsible for the conduct of assault firing exercises. These exercises consist of assault fire, CBRN assault fire, and field fire on available ranges.

## **TRAINING TASKS**

6-19. This paragraph assists trainers in effectively training Soldiers assigned to any machine gun team. It explains the tasks, organization, equipment needed, and instruction sequence for the three phases of

gunnery. However, unit SOPs or post regulations may direct increases or decreases in these prescribed requirements.

### **PHASE I, PRELIMINARY GUNNERY TRAINING**

6-20. This phase covers the basics that each trainer must know to teach the general care and maintenance of the machine gun.

#### **Task 1 (071-312-3025), Disassemble the Machine Gun**

6-21. The trainer stresses that this task is not done hurriedly, because the Soldiers may damage parts of the machine gun.

##### *Equipment Needed*

6-22. A table is needed for placement of the machine gun so that the Soldiers may better see the removal of parts of the gun. Nomenclature charts or mats are material aids in explaining mechanical training, and they help the gunners learn the nomenclature of parts.

##### *Class Organization*

6-23. One assistant trainer is assigned for each group if possible; otherwise, assistant trainers are placed where they can supervise assigned groups.

##### *Sequence of Training*

6-24. The trainer presents a brief history of the machine guns. He stresses the combat role it has played and the mission it is assigned. He emphasizes the purpose, scope, and importance of the instruction to be presented. He gives a brief description of the operation, general data, and exterior nomenclature of the machine gun. Assistant trainers should clear and disassemble the machine gun as the trainer explains the procedures. The gunners then practice until they become skilled in disassembly and can demonstrate this task to standards to either the trainer or assistant trainers. This practice often encourages the gunners to practice during free time and develops their individual skill and initiative.

#### **Task 2 (071-025-0001), Perform Operator Maintenance on the Machine Gun**

6-25. The subtasks are inspect, clean, and lubricate.

##### *Equipment Needed*

6-26. The trainer needs one cleaning rod and one dummy round for each machine gun, bore cleaner, (one cleaning reamer, one combination regulator scraper, one combination scraper and extractor tool), lubricating oil, patches, and rags. The trainer displays all the available cleaning materials, lubricants, and rust preventatives.

##### *Class Organization*

6-27. One assistant trainer is assigned for each group if possible; otherwise, the assistant trainers are placed where they can supervise assigned groups.

***Sequence of Training***

6-28. The trainer emphasizes meticulous cleaning, lubrication, inspection, and preventive maintenance to ensure performance. The care and cleaning period is used to further the gunner's knowledge of the nomenclature and skill in disassembly. The trainer emphasizes inspection, care, and preventive maintenance during combat conditions, which is the final test of the weapon maintenance program. Practical work is conducted. The trainer points out the differences in care and cleaning following a CBRN attack. He emphasizes the importance of frequent inspection as a means of ensuring proper maintenance of the machine guns.

**Task 3 (071-312-4025), Assemble the Machine Gun**

***Equipment Needed***

6-29. A table is needed for placement of the machine gun so that the Soldiers may better see the removal of the parts. Nomenclature charts or mats are material aids in explaining mechanical training, and they help the gunners to learn the nomenclature of parts.

***Class Organization***

6-30. One assistant trainer is assigned for each group if possible; otherwise, assistant trainers are placed where they can supervise assigned groups.

***Sequence of Training***

6-31. Assistant trainers should assemble the machine gun as the trainer explains the procedures. The gunners practice until they become proficient in assembly and can demonstrate this task to standards to either the trainer or assistant trainer.

**Task 4 (071-312-4026), Explain the Operation of the Machine Gun**

***Equipment Needed***

6-32. One machine gun placed on a table; one belt of six dummy rounds (5.56-mm or 7.62-mm linked), and a cleaning rod for each gunner.

***Class Organization***

6-33. One assistant trainer is assigned for each group if possible; otherwise, assistant trainers are placed where they can supervise assigned groups.

***Sequence of Training***

6-34. The trainer explains and the assistant trainer demonstrates loading, unloading, and clearing the machine gun. The trainer stresses the safety factors involved. The assistant trainer demonstrates letting the bolt go forward when the barrel is out of the machine gun. (Damage could be done to the chamber or the face of the bolt if the barrel is left in.)

### **Task 5 (071-312-3026), Explain the Functioning of the Machine Gun**

#### ***Equipment Needed***

6-35. One machine gun for each gunner as in previous mechanical training instruction. Graphic training aids are useful if the class is about platoon size. Otherwise, GTAs may be made available for study and discussion during breaks (*see also* Appendix F).

#### ***Class Organization***

6-36. One assistant trainer is assigned for each group if possible; otherwise, assistant trainers are placed where they can supervise assigned groups.

#### ***Sequence of Training***

6-37. Functioning is divided into eight steps—feeding, chambering, locking, firing, unlocking, extracting, ejecting, and cocking. The assistant trainer duplicates each demonstration on the machine gun with each group. Functioning is taught by seeing how the parts work, rather than by memorizing the text. The trainer tests retention of the training by asking questions concerning the steps of functioning.

### **Task 6 (071-312-3029), Explain Malfunction, Stoppage, Immediate Action, and Remedial Action**

#### ***Equipment Needed***

6-38. A table is needed for placement of the machine gun so that the Soldiers may better see the removal of parts. Nomenclature charts or mats are material aids in explaining mechanical training, and they help the gunners learn the nomenclature of parts.

#### ***Class Organization***

6-39. One assistant trainer is assigned for each group if possible; otherwise, assistant trainers are placed where they can supervise assigned groups.

#### ***Sequence of Training***

6-40. Malfunction and stoppages charts may be used as a guide in presenting instruction. These charts may be available from the local Training Support Center or the trainer can use tables of the appropriate chapters for the machine gun. The trainer stresses precision in detecting the cause and reducing stoppages. As the gunners progress, the trainer has them concentrate on speed in applying immediate action and other methods of reducing a stoppage. He stresses safety precautions in connection with a hangfire or cook off.

### **Task 7 (071-312-3030), Explain the Procedures for Sight Adjustments and Mechanical Zero**

#### ***Equipment Needed***

6-41. A table is needed for placement of the machine gun so that the Soldiers may better see the removal of parts. Nomenclature charts or mats are material aids in explaining mechanical training, and they help the gunners learn the nomenclature of parts, plus tripod. (Front sight adjustment tool for the M240B.)



***Class Organization***

6-42. One assistant trainer is assigned for each group if possible; otherwise, assistant trainers are placed where they can supervise assigned groups.

***Sequence of Training***

6-43. Assistant trainers demonstrate, while trainers describe the proper techniques for mechanically zeroing the machine gun. The trainer then describes sight adjustments. The trainer emphasizes the number of clicks in relation to the targets for M240B only.

**Task 8 (071-020-0006), Explain the M122 or M122A1 Tripod with Appropriate Mounting Equipment**

***Equipment Needed***

6-44. One machine gun mounted on an M122 or M122A1 tripod complete with appropriate mounting equipment placed on a table. GTAs and film strips, if available.

***Class Organization***

6-45. One assistant trainer is assigned for each group if possible; otherwise, assistant trainers are placed where they can supervise assigned groups.

***Sequence of Training***

6-46. The assistant trainers demonstrate, while the trainers describe the general nomenclature, data, functioning, and operation of the tripod with the appropriate mounting equipment.

**Task 9 (071-020-0006), Place the Machine Gun Into Operation on the M122 or M122A1 Tripod with Appropriate Mounting Equipment Using Crew Exercises**

***Equipment Needed***

6-47. Basic TOE and individual equipment.

***Class Organization***

6-48. Gunners are divided into three-man crews. To aid control and supervision, equipment is aligned with engineer tape or wire with the gunners in files behind the equipment.

***Sequence of Training***

6-49. Assistant trainers demonstrate, while trainers explain how to place the machine gun into operation on the tripod with the appropriate mounting equipment. The crew drill is the first step in developing teamwork. Precision is required for each crewmember. Crewmembers practice their duties with precision. Speed is increased as precision is attained. In advanced training, speed drills create interest and stimulate competition, while developing teamwork and testing individual crew performance. A well-trained crew can place the machine gun into action or take it out of action in 25 seconds.

**Task 10 (071-312-3025), Demonstrate Fundamentals of Marksmanship**

***Equipment Needed***

6-50. One machine gun and a basic machine gun target for each firing lane on a range of suitable training area equipped with a prone and fighting position.

***Class Organization***

6-51. The maximum number of required gunners is on the firing line or suitable training area.

***Sequence of Training***

6-52. The trainer conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control).

**Task 11 (071-312-3026), Demonstrate Fundamentals of Firing Positions**

***Equipment Needed***

6-53. One machine gun and a basic machine gun target for each firing lane on a range of suitable training area equipped with a prone and fighting position.

***Class Organization***

6-54. The maximum number of required gunners is on the firing line or suitable training area.

***Sequence of Training***

6-55. The trainer conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control).

**Task 12 (071-312-3027), Demonstrate Fundamentals of Traverse and Search**

***Equipment Needed***

6-56. One machine gun and a basic machine gun target for each firing lane on a range of suitable training area equipped with a prone and fighting position.

***Class Organization***

6-57. The maximum number of required gunners is on the firing line or suitable training area.

***Sequence of Training***

6-58. The trainer conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control).

### **Task 13 (071-312-3031), Demonstrate Fundamentals of Engaging Night, CBRN, and Moving Targets**

#### ***Equipment Needed***

6-59. One machine gun, one night vision sight, one protective mask with gloves for each gunner, and a basic machine gun target for each firing lane on a range of suitable training area equipped with a prone and fighting position.

#### ***Class Organization***

6-60. The maximum number of required gunners is on the firing line or suitable training area.

#### ***Sequence of Training***

6-61. The trainer conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control).

### **Task 14 (071-025-0007), Demonstrate Fire Commands**

#### ***Equipment Needed***

6-62. One machine gun and a basic machine gun target for each firing lane on a range of suitable training area equipped with a prone and fighting position. GTAs and film strips, if available.

#### ***Class Organization***

6-63. The maximum number of required gunners is on the firing line or suitable training area.

#### ***Sequence of Training***

6-64. The trainer conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control), plus, the trainer gives the fire commands. (*See also* Chapter 5.)

### **Task 15 (071-025-0007), Execute Dry-Fire Exercises**

#### ***Equipment Needed***

6-65. One machine gun and a basic machine gun target for each firing lane on a range of suitable training area equipped with a prone and fighting position.

#### ***Class Organization***

6-66. The maximum number of required gunners is on the firing line or suitable training area.

#### ***Sequence of Training***

6-67. The *trainer* conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control), plus, the trainer give the fire commands. (*See also* Chapter 4.)

## PHASE II, BASIC GUNNERY TRAINING

6-68. The information learned in this phase is essential to the development of the trainer who is to conduct the 10-meter firing, day transition firing, day CBRN firing, and night transition instructional firing for the machine gun. The trainer must be qualified or certified on Phase I before moving to Phase II.

### Task 16 ( 071-312-3031), Conduct 10-Meter Firing

#### *Equipment Needed*

6-69. One machine gun and basic machine gun target (10-meter) for each firing lane; stopwatches; patches; and cleaning rods. Sound equipment is desirable during firing.

#### *Class Organization*

6-70. The maximum number of required gunners is on the firing line with the remainder receiving concurrent instruction in the rear training area.

#### *Sequence of Training*

6-71. The unit is assembled, given instructions, and briefed on the training that will be conducted while they are on the range. The trainer conducts conference, demonstration, and practical work on emplacing the machine gun on the firing lane. He places emphasis on preparation of the machine gun for firing, including safety checks. The interval between the two portions of the control command should be sufficient to permit the execution of the command and to allow the assistant gunner to perform his duties. Assistant gunners are required to perform their duties quickly and precisely. During practice, the trainer must ensure that the gunner is in the proper position before he is permitted to shoot. The OIC controls all firing. If space permits, all personnel are placed on the firing line. After the briefing, they are organized into firing orders and moved to firing lanes. Lanes are conducted IAW local range policies. Firing is conducted as described in Chapter 4. Concurrent training stations:

- Mechanical training.
- Care and cleaning.
- Any other machine gun subjects in which additional training is needed.

### Task 17 (071-312-3031), Conduct Daytime Transition Fire on the Multipurpose Machine Gun Range

#### *Equipment Needed*

6-72. Requires one machine gun for each firing lane, single and double E-type silhouette targets, and cleaning rods. Sound equipment is desirable during firing.

#### *Class Organization*

6-73. Preferably, one gunner and one assistant gunner for each firing lane. Personnel not required in the operation of the range should receive concurrent training in rear area.

#### *Sequence of Training*

6-74. The unit is assembled, given instructions, and briefed on the training that will be conducted while they are on the range. Before the conference and demonstration of firing, the trainer briefly reviews range

estimation and techniques of adjustment. He also explains the characteristics of machine gun fire and their effect on field targets. The machine guns are zeroed at a known distance on the transition range. The gunner receiving the instruction should do the zeroing. The lane NCO requires the gunner to be in the correct position before letting him fire. The assist gunner helps the gunner in locating the targets and aids him in hitting the targets. The acting safety NCO may assist the assist gunner in locating the targets, but he is not permitted to aid in range estimation or fire adjustment. After the gunners complete this exercise, the gunner and assist gunner rotates duties. After completion of both gunner and assist gunner, the next gun team moves up. The OIC controls all firing. If space permits, all personnel are placed on the firing line. After the briefing, they are organized into firing orders and moved to firing lanes. Lanes are conducted IAW local range policies. Firing is conducted as described in Chapter 4. Concurrent training stations:

- Mechanical training.
- Care and cleaning.
- Any other machine gun subjects in which additional training is needed.

### **Task 18 (071-010-0006), Demonstrate Fundamentals of Engaging CBRN Targets**

#### ***Equipment Needed***

6-75. One machine gun, protective mask and gloves for every gunner, and a basic machine gun target (10-meter) for each firing lane on a range of suitable training area equipped with a prone and fighting position.

#### ***Class Organization***

6-76. The maximum number of required teams is on the firing line or suitable training area.

#### ***Sequence of Training***

6-77. The unit is assembled, given instructions, and briefed on the training that will be conducted while they are on the range. The trainer conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control) while wearing the protective mask and gloves. (Same as Task 16.) After the briefing, they are organized into firing orders and moved to firing lanes. Lanes are conducted IAW local range policies. Firing is conducted as described in Chapter 4, Firing Tables I or IV. Concurrent training stations, using sand tables, charts, diagrams, or terrain, are set up to review rapid reloading techniques while wearing a protective mask and gloves:

- Mechanical training.
- Care and cleaning.
- Any other machine gun subjects in which additional training is needed.

### **Task 19 (071-025-0007), Conduct CBRN Familiarization Transition Fire.**

#### ***Equipment Needed***

6-78. Requires protective mask and gloves, one machine gun, and appropriate ammunition for each firing lane, single and double E-type silhouette targets, and cleaning rods. Sound equipment is desirable during firing.

### *Class Organization*

6-79. Preferably, one gunner and one assistant gunner for each firing lane. Personnel not required in the operation of the range should receive concurrent training in rear area.

### *Sequence of Training*

6-80. The unit is assembled, given instructions and briefed on the training that will be conducted while they are on the range. The trainer conducts conference, demonstration, and practical work on the fundamentals of marksmanship (steady position, aim, breath control, trigger control) while wearing the protective mask and gloves. (Same as Task 16.) After the briefing, they are organized into firing orders and moved to firing lanes. Lanes are conducted IAW local range policies. Firing is conducted as described in Chapter 4, Firing Tables II or V. Concurrent training stations, using sand tables, charts, diagrams, or terrain, are set up to review rapid reloading techniques while wearing a protective mask and gloves:

- Mechanical training.
- Care and cleaning.
- Any other machine gun subjects in which additional training is needed.

## **Task 20 (071-010-0001), Conduct Nighttime Transition Fire.**

### *Equipment Needed*

6-81. One machine gun for each firing lane with appropriate night vision sight, and appropriate ammunition for each firing lane, single and double E-type silhouette targets, and cleaning rods. Sound equipment is desirable during firing.

### *Class Organization*

6-82. The firing area should have seating for the entire group during conferences. After the conference, the group is divided into small groups for practical work under the control of the assistant trainers. The OIC controls all firing. If space permits, all personnel are placed on the firing line. Requirements for the various exercises should be simple and progressive. If possible, the trainer selects terrain for the subject; otherwise, he applies the subject to the terrain.

### *Sequence of Training*

6-83. The unit is assembled, given instructions, and briefed on the training that will be conducted while they are on the range. Before the conference and demonstration, the trainer conducts the preparatory exercises of mounting the night vision sight and seating, boresighting, and zeroing procedures for the sight. He should also review and discuss range estimation, techniques of fire, adjustment, and characteristics of the machine gun fire. The machine gun should be zeroed to the sight using the night fire procedures in Chapter 4, Firing Tables III or VI. The acting safety NCO for each lane requires the gunner to be in the correct position before letting him fire. The OIC controls all firing. If space permits, all personnel are placed on the firing line. At the completion of the exercise, the next gunner moves up. After the briefing, they are organized into firing orders and moved to firing lanes. Lanes are conducted IAW local range policies. Firing is conducted as described in Chapter 4, Firing Tables III or VI. Concurrent training stations:

- Mechanical training.
- Care and cleaning.
- Any other machine gun subjects in which additional training is needed.

**PHASE III, ADVANCED GUNNERY TRAINING**

6-84. This training phase enables the trainer to develop his advanced skills. (*See also* Chapter 5.)

**Task 21 (071-025-0007), Conduct Day Assault Fire*****Equipment Needed***

6-85. One machine gun and appropriate ammunition for each firing lane.

***Class Organization***

6-86. The multipurpose machine gun transition range is used if the installation has one. If need be, the lanes are modified so that the gunner has a trail of at least 150 meters in front of the weapon position. The training area should have seating for the entire group during conferences. After the conferences, the group is divided into firing orders. If the group is large, two firing orders are placed on the firing line and all other personnel go to the concurrent training area for practical work under the control of the assistant gunners. The OIC controls all firing. If the group is small, all personnel go to the firing line at once. Requirements for the various exercises should be simple and progressive. If possible, the trainer selects terrain for the subject; otherwise, he applies the subject to the terrain.

***Sequence of Training***

6-87. The unit is assembled, given instructions, and briefed on the training that will be conducted while they are on the range. After the briefing, they are organized into firing orders and moved to firing lanes. Lanes are conducted IAW local range policies. Firing is conducted as described in Chapter 5. Concurrent training stations, using sand tables, charts, diagrams, or terrain, are set up to review rapid reloading techniques. The OIC controls all firing. If space permits, all personnel are placed on the firing line.

- Underarm-firing position.
- Hip-firing position.
- Rapid reloading techniques.
- Any other machine gun subjects in which additional training is needed.

**Task 22 (071-025-0009), Conduct CBRN Assault Fire With the Machine Gun*****Equipment Needed***

6-88. Requires protective mask and gloves, one machine gun, and appropriate ammunition for each firing lane.

***Class Organization***

6-89. The maximum number of required gunners is on the firing line with the remainder receiving concurrent instruction in the rear training area.

***Sequence of Training***

6-90. The unit is assembled, given instructions, and briefed on the training that will be conducted while they are on the range. After the briefing, they are organized into firing orders and moved to firing lanes. Lanes are conducted IAW local range policies. Firing is conducted as described in Chapter 5. Concurrent

training stations, using sand tables, charts, diagrams, or terrain, are set up to review rapid reloading techniques while wearing a protective mask and gloves:

- Underarm-firing position while wearing a protective mask and gloves.
- Hip-firing position while wearing a protective mask and gloves.
- Rapid reloading techniques while wearing a protective mask and gloves.
- Any other machine gun subjects in which additional training is needed.

## **TRAINER CERTIFICATION PROGRAM**

6-91. The certification program standardizes procedures for certifying and sustaining the proficiency of trainers. Their technical expertise must be continuously refreshed and updated, and leaders must manage it closely. One of the goals of the program is for the trainer to know the training mission.

### **TRAINING BASE**

6-92. The training base can expect the same personnel changes as any other organization. Soldiers assigned as machine gun trainers have varying experience and knowledge of training procedures and methods. Therefore, the trainer certification program must address these variables. As a minimum, formal records document the trainer's progress in the certification program. All machine gun trainers must complete the three phases of machine gun training, and they must update their training quarterly.

### **CERTIFICATION PROGRAM OUTLINE**

6-93. All trainers must attend, then conduct, all phases of the train-the-trainer program. Certified trainers have demonstrated the ability to train Soldiers, to diagnose and correct problems, and to achieve standards. Those who fail to attend or fail any phase of the diagnostic examination will be assigned to subsequent training. The personnel designated to present instruction must complete the following phases of the program in the order given:

#### **Program Orientation**

6-94. In order for leaders to certify trainers, the trainers must visit training sites and ranges and demonstrate an understanding of—

- The certification program concept.
- The unit's marksmanship training outline and strategy.
- Issued reference materials and instructions for when to use which.

#### **Preliminary Gunnery**

6-95. During Phase II, the trainer must demonstrate his mastery of the fundamentals of marksmanship. He should complete within two weeks after completing Phase I. Leaders should review the following fundamentals. They record and maintain the results of this review on a trainer's progression sheet IAW the unit SOP:

- Characteristics.
- Capabilities.
- Disassembly.
- Cleaning, lubrication, and inspection.
- Assembly.
- Range determination and estimation.



- Classes of fire.
- Application of fire.
- Fire commands.
- Loading.
- Unloading.
- Immediate actions.
- Sight manipulations.
- Traverse and search.

### **Basic Gunnery**

6-96. During this phase, the trainer must first qualify with the machine gun, then he must set up and conduct firing on the various ranges. He must brief leaders, explaining the targets as well as zeroing and scoring procedures. He explains the purpose of transition firing, field-zero procedures, range layout, and the conduct of training on the transition range. This briefing validates that he has the knowledge necessary to conduct training. Leaders add the results of this interview to the trainer's progression sheet.

### **Advanced Gunnery**

6-97. This is the final test of the trainer's ability to train. He must set up a range and train at least one person. If ammunition is available, he conducts a firing exercise. If ammunition is not available, he is judged based on the quality of training.

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## Appendix A

# Employment

Despite their Post-Civil War development, modern machine guns did not show their full potential in battle until World War I. Although the machine gun has changed, its role has not. In battle, the mission of machine guns is to deliver fires when and where the leader wants them, both in offense and defense. Machine guns rarely have independent missions. Instead, they provide the unit with the accurate, heavy fires needed to accomplish the mission. This appendix discusses the employment of three machine guns: the M249 light machine gun and the M60 and M240B general-purpose machine guns.

### TACTICAL ORGANIZATION

A-1. The accomplishment of the mission demands an efficient machine gun crew who can fulfill all assigned missions. Each leader considers the mission and organizes machine guns to deliver firepower and fire support to any area or point needed to accomplish the assigned mission. Such organization takes time to achieve and reduces the flexibility of the unit.

### MACHINE GUN IN THE ATTACK

A-2. The potential increase of air and ground attacks on the unit demands every possible precaution for maximum security while on the move. Where this situation exists, the machine gun crew must be thoroughly trained in the hasty delivery of antiaircraft fire and of counterfires against enemy ground forces. The distribution of the machine guns in the formation is critical. The machine gun crew is constantly on the alert, particularly at halts, ready to deliver fire as soon as possible. If the leader expects a halt to exceed a brief period, he carefully chooses machine gun positions to avoid unduly tiring the machine gun crew. If he expects the halt to extend for a long period, he can have the machine gun crew take up positions in support of the unit. They cover the direction from which he expects enemy activity as well as the direction the unit came from. He selects positions that permit the delivery of fire in the most probable direction of attack, such as into valleys, draws, ridges, and spurs. He chooses positions that offer obstructed fire.

- Successful offensive operations result from the employment of fire and maneuver. Each is essential and greatly depends upon the other. Without the support of covering fires, maneuvering in the presence of enemy fire can result in disastrous losses. Covering fires, especially those that provide fire superiority, allow maneuvering in the offense. However, fire superiority alone rarely wins battles. The primary objective of the offense is to advance, occupy, and hold the enemy position.
- The machine gun delivers an accurate, high-volume rate of fire on large areas in a brief time. It is a great power to have on any offensive operation. When accurately placed on the enemy position, machine gun fires secure the essential element of fire superiority for the duration of the firing. Troops advancing in the attack should take full advantage of this period to maneuver to a favorable position from which to facilitate the last push against the enemy. In addition to casualties, machine gun fire destroys the enemy's confidence and neutralizes his [actions in the?] defense.

- The early entry of machine guns in the offense is, with rare exceptions, highly desirable. Their continued action up to the moment of the assault enhances the probability of success. One desirable feature for employment of machine guns in the offense requires a proper handling of the ammunition for each machine gun. The other feature is to determine the actions of the machine gun crew to handle their weapon on the battlefield in order to deliver fire with the objective to support the maneuver unit at the time it is needed, regardless of physical difficulties encountered
- The machine guns seldom accompany the maneuver element. The gun's primary mission is to provide covering fire. The machine guns are only employed with the maneuver element when the area or zone of action assigned to the assault or company is too narrow to permit proper control of the guns. The machine guns are then moved with the unit and readied to employ on order from the leader and in the direction needing the supporting fire.
- Where the area or zone of action is too wide to allow proper coverage by the machine guns, the unit is assigned additional machine guns or personnel from within the battalion to permit the unit to accomplish its assigned mission. The machine guns are assigned a zone or a sector to cover and they move with the maneuver element.
- Under certain terrain conditions and for proper control, the machine guns move with the unit and are assigned a zone or sector to cover.
- When machine guns move with the unit undertaking the assault, the unit brings its machine guns to provide additional firepower. These weapons are fired either from the bipod or in an assault mode, from the hip or underarm position. They target enemy automatic weapons anywhere on the unit's objective. Once the enemy's automatic weapons have been destroyed, or if none remain, the gunners distribute their fire over their assigned zone or sector. In terms of engagement ranges, the machine gun in the assault engages within 300 meters of its target and frequently at point blank ranges.

### **MACHINE GUN IN A BASE-OF-FIRE ELEMENT**

A-3. Machine guns organic to the company can help battalion machine guns lay the base of fire. In this case, the leader positions and controls the fires of all machine guns in the element. Machine gun targets include key enemy weapons or groups of enemy targets, either on the objective or attempting to reinforce or counterattack. In terms of engagement ranges, machine guns in the base-of-fire element may find themselves firing at targets within 800 meters of the target. These ranges are simply a practical average. The nature of the terrain and desire to achieve some standoff, leads the leader to the correct tactical positioning of the base-of-fire element.

### **MACHINE GUN IN THE DEFENSE**

A-4. Machine gun fire is distributed in width and depth in a defensive position. The leader can use machine guns to subject the enemy to increasingly devastating fire from the initial phases of his attack, and to neutralize any partial successes the enemy might attain by delivering intense fires in support of counterattacks. The machine gun's tremendous firepower is what enables the unit to hold ground. This is what makes them the backbone or framework of the defense.

- The units' defense centers around the platoon's machine guns. The platoon leader sites the rifle squad to protect the machine guns against the assault of a dismounted enemy formation. The machine gun provides the requisite range and volume of fire to cover the squad front in the defense.
- The primary requirement of a suitable machine gun position in the defense is that the machine gun be able to accomplish its specific missions. Secondly, the position should be accessible and afford cover and concealment. Machine guns are sited to protect the front, flanks, and rear of occupied portions of the defensive position, and to be mutually supporting. Attacking troops usually seek easily traveled ground that provides cover from fire. This is not to say that

they will avoid marshes, rough grounds, wooded areas, or any other type of terrain. Every machine gun should have three positions: primary, alternate, and supplementary. All of these positions should be chosen by the leader to ensure his sector is covered and that the machine guns are protected on their flanks.

- The leader sites his machine gun to cover the entire sector or to overlap sectors with the other machine gun. The engagement range of a leader's weapon may extend from the last 300 meters where the enemy begins his assault to point-blank range. Machine gun targets include enemy automatic weapons and command and control elements.

## **MACHINE GUN ON A SECURITY MISSION**

A-5. Security includes all command measures to protect against surprise, observation, and annoyance by the enemy. The principal security measures against ground forces include employment of security patrols and detachments covering the front flanks and rear of the units' most vulnerable areas. The composition and strength of these detachments depends on the size of the main body, its mission, and the nature of the opposition expected. The presence of machine guns with security detachments augments their firepower to effectively delay, attack, and defend, by virtue of their inherent firepower. When the machine guns are used as part of the security detachments in battalion trains or larger, the number of machine guns in such a detachment varies according to the situation. The main mission of the machine gun is to protect and defend through both defensive and offensive missions. For defense, the unit's main mission is to position the machine guns throughout the assigned area. For offense, the second mission, after a successful delay against an enemy attack, the unit expands its security outpost as needed to prevent another enemy attack.

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## Appendix B

### 10-Meter Bore Light and 25-Meter Target Offsets

This appendix provides the 10-meter and 25-meter target offsets for the M249 and M240B weapons mounted with iron sight, optics, MILES, or aiming lasers. A blank reproducible 10-meter target offset is provided along with a table and an example of every weapon configuration. The M16A2 300-meter zero target is used for 25-meter zeroing with all weapon configurations.

#### 10-METER TARGET OFFSET

B-1. To mark the proper 10-meter target offset, the gunner must do the following:

- Find the correct template for your weapon configuration.
- Count the number of squares starting from center of the bore light circle on the offset to the desired point of aim. Each template also provides you with a number formula for the proper offset, for example, (L2.0, U2.4): Starting from the center of the bore light circle (0.0, 0.0) move LEFT 2 squares and UP 2.4 squares.
- Place the appropriate symbol or mark (Figure B-1).

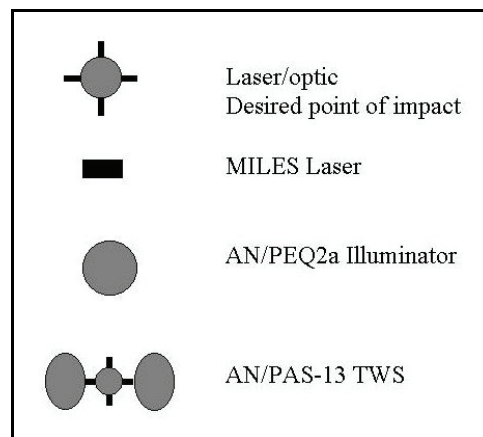


Figure B-1. 10-meter target offset symbols.

#### 25-METER TARGET OFFSET

B-2. To mark the proper 25-meter target offset do the following:

- Use only M16A2 300-meter zero targets.
- Find the correct target template for your weapon configuration.
- Count the number of squares starting from the center of the 300-meter zeroing silhouette.
- Mark the designated strike point by drawing a small circle at the appropriate number of squares from the center of the 300-meter zeroing silhouette.
- Draw a 4-centimeter square. Keep the designated strike point center mass.

## **TARGET**

B-3. Figure B-2 shows an example completed DA Form 7476-R, *10-Meter Offset Target*. A blank copy is included at the back of this manual for reproduction on 8 1/2" x 11" paper. The quick reference card (Figure B-3, also at the back of the manual) is printed on the back of the target. The form may also be downloaded <http://www.army.mil/usapa/eforms/index.html>. The blank target can also be laminated and reused.



**10-METER BORESIGHT OFFSET TARGET**

For use of this form, see FM 3-22.68; the proponent agency is TRADOC.  
See back of this form for quick reference to possible weapon configurations.

**LASER BORE LIGHT**

EXAMPLE

1. Use the correct offset for the weapon, sight, and location configured.
2. Stabilize the weapon and the offset.
3. Zero the bore light while it is inside the barrel of the weapon.
4. Align the laser of the bore light with the dot on the 10-meter offset.
5. Align the MILES laser with the MILES rectangle on the 10-meter offset (if applicable).
6. Adjust the aiming laser until it centers on the crosshair.
7. Center the optic aim point on the crosshair. Adjust the optic until the bore light laser aligns with the dot on the 10-meter offset.
8. Confirm that all devices still align to their aiming mark.

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Figure B-2. Example completed DA Form 7476-R, front.

QUICK REFERENCE - POSSIBLE WEAPON CONFIGURATIONS						
WPN	ACCESSORY	MOUNT	RANGE ZEROED TO	ZERO TARGET OFFSET	BORESIGHT TARGET OFFSET	MILES OFFSET
M249	IRON SIGHTS	NA	400m	NA	TBD	1.9L/0.5U
M249	MGO	IFTC RAIL	400m	TBD	0.0/7.9U	1.9L/0.5U
M249	MGO	TWS BRACKET	400m	TBD	0.0/2.15U	1.9L/0.5U
M249	AN/PAQ-4C	TWS BRACKET TOP	400m	0.5R/1.5U	1.85L/7.7U	1.9L/0.5U
M249	AN/PAQ-4C	AN/PVS-4 BRACKET	400m	2.5R/1.5D	4.1L/6.1U	1.9L/0.5U
M249	AN/PAQ-4C	INSIGHT RAIL GRABBER WITH IFTC	400m	TBD	1.75L/4.69U	1.9L/0.5U
M249	AN/PAQ-4C	PICATINNY RAIL GRABBER WITH IFTC	400m	1.75R/0.0	1.75L/5.39U	1.9L/0.5U
M249	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	400m	5.9R/9.6D	5.9R/4.0D	1.9L/0.5U
M249	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	400m	6.0R/13.3D	6.0R/8.3D	1.9L/0.5U
M249	AN/PAQ-4C	PICATINNY RAIL GRABBER WITH ALL SPACER FORWARD RAILS RIGHT	400m	7.7R/9.6D	7.7R/4.0D	1.9L/0.5U
M249	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	400m	7.6R/13.3D	7.6R/8.3D	1.9L/0.5U
M249	AN/PEQ-2A	TWS BRACKET TOP	400m	1.8L/2.7D	1.8R/7.95U	1.9L/0.5U
M249	AN/PEQ-2A	AN/PVS-4 BRACKET WITH SPACER	400m	5.0R/4.0D	0.45L/6.5U	1.9L/0.5U
M249	AN/PEQ-2A	INSIGHT RAIL GRABBER WITH IFTC	400m	2.0L/1.5U	1.95R/4.79U	1.9L/0.5U
M249	AN/PEQ-2A	PICATINNY RAIL GRABBER WITH IFTC	400m	2.0L/0.5D	1.95R/6.49U	1.9L/0.5U
M249	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	400m	6.1R/13.2D	6.1R/7.6D	1.9L/0.5U
M249	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	400m	6.0R/9.4D	6.0R/4.4D	1.9L/0.5U
M249	AN/PEQ-2A	PICATINNY RAIL GRABBER WITH ALL SPACER FORWARD RAILS RIGHT	400m	7.8R/13.2D	7.8R/7.6D	1.9L/0.5U
M249	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	400m	7.6R/9.4D	7.6R/4.4D	1.9L/0.5U
M249	AN/PVS-4	IFTC TOP WITH SPACER	400m	0.0/4.3D	0.0/10.0U	1.9L/0.5U
M249	AN/PVS-4	AN/PVS-4 BRACKET	400m	2.5R/4.9D	2.25L/11.25U	1.9L/0.5U
M249	AN/PAS-13	IFTC TOP	400m	0.0/2.75D	0.0/8.6U	1.9L/0.5U
M249	AN/PAS-13	TWS BRACKET	400m	0.0/5.5D	0.0/10.05U	1.9L/0.5U
M240B	IRON SIGHTS	NA	500m	TBD	TBD	1.9L/0.5U
M240B	MGO	FEED TRAY COVER RAIL	500m	NA	0.0/0.0	5.0R/4.1D
M240B	AN/PAQ-4C	PICATINNY RAIL GRABBER TOP	500m	1.75R/2.2D	1.5L/3.5U	5.0R/4.1D
M240B	AN/PEQ-2A	INSIGHT RAIL GRABBER TOP	500m	2.0R/1.5D	1.7R/3.71U	5.0R/4.1D
M240B	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	500m	6.2R/16.8D	6.2R/8.1D	5.0R/4.1D
M240B	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	500m	7.9R/16.8D	7.9R/8.1D	5.0R/4.1D
M240B	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	500m	6.2R/12.8D	6.2R/4.1D	5.0R/4.1D
M240B	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	500m	7.9R/12.8D	7.9R/4.1D	5.0R/4.1D
M240B	AN/PVS-4	FEED TRAY COVER RAIL PICATINNY RAIL GRABBER WITH SPACER	500m	0.0/6.2D	0.0/6.0U	5.0R/4.1D
M240B	AN/PAS-13	FEED TRAY COVER	500m	0.0/2.3U	0.0/8.0U	5.0R/4.1D

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Figure B-3. Quick reference card from back of DA Form 7476-R.

## Appendix C

# M192 Lightweight Ground Mount

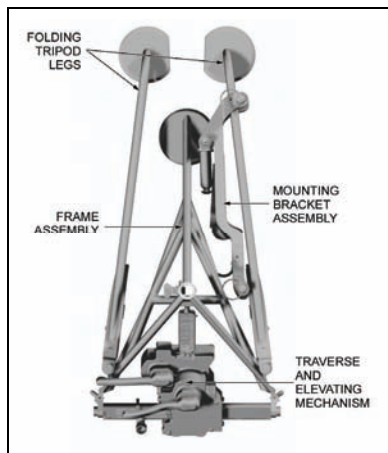
This appendix describes the defensive M192 lightweight ground mount (LWGM) as well how to place it into operation. It also discusses the traversing and elevating (T&E) mechanism, methods for reading the scales, and range card data.

## DESCRIPTION

C-1. The M192 LWGM is designed as a defensive ground mount for the M240B machine gun and the M249 squad automatic weapon (SAW, in the machine gun role). Table C-1 shows the M192 LWGM. This tripod's lightness, and its new T&E levers, allow the Soldier to set up the weapon and acquire targets quickly. The M192 has a frame assembly, mounting bracket assembly, legs, and a T&E mechanism (Figure C-1).

Weight	11.49 lb
Length Stowed Extended	24.00 in 31.75 in
Height	10.20 in
Width	11.50 in
Elevation Free Gun With T&E	375 mils 235 mils
Depression Free Gun With T&E	500 mils 275 mils
Traverse Free Gun With T&E	360 degrees 900 mils

**Table C-1. M192 lightweight ground mount.**



**Figure C-1. M192 lightweight ground mount.**

C-2. The M192 LWGM is easily transported in any of the following:

- M240B spare barrel bag (NSN 1005-01-470-3006).
- ALICE pack (NSN 8465-01-019-9103).
- MOLLE (machine gun) (NSN 8405-01-459-6580).
  - Air pack (NSN 1670-01-413-7836).
  - Pier 2 (NSN 1670-01-415-0035).
  - Slide mount (NSN 1670-01-414-2757).
- Modified 1950 jump bag (NSN 8465-00-261-4995).

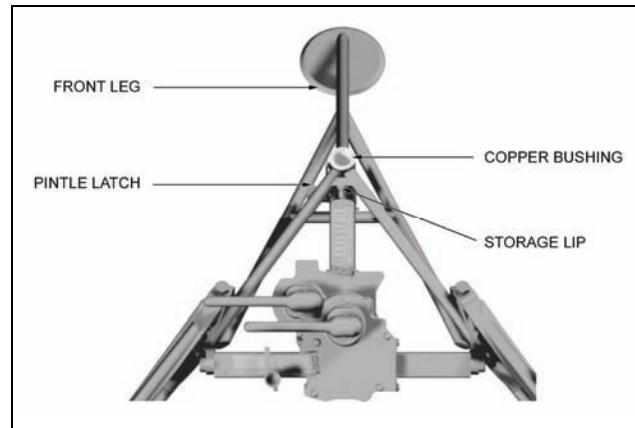
C-3. The M192 has two folding rear legs connected to the frame. During setup, you fold the rear legs backward and lock them. For stowage, you unlock them and fold them forward (Figure C-2).



**Figure C-2. Rear-folding legs.**

C-4. The integrated front leg supports the weight of the weapon. This leg also contains a tapered, brass-bushing sleeve with a lock-pintle insert and a lock in the brass bushing. You will use these to attach the mounting bracket pintle to the tripod. The front leg also includes a quick-release so you can remove the mount quickly and easily. Just behind the brass bushing is a storage lip. This lip keeps the T&E stowed in the right position while the mount is in the carrying configuration (Figure C-3).





**Figure C-3. Frame assembly.**

C-5. The traversing and elevating (T&E) mechanism consists of the following (Figure C-4):

### **Bars and Scales**

C-6. The M192 has a 530-mil range of elevation and a 900-mil traverse.

#### ***Elevation Bar and Scale***

C-7. The elevation bar lets you elevate the gun 235 mils and depress it 375, in 10 mil increments, for a total elevation range of 530 mils.

#### ***Traverse Bar and Scale***

C-8. The traverse bar and mounting bracket assembly support the rear of the weapon. The traverse scale numbering begins with 0 on the far right, and increases to 900 mils at the left extreme.

### **Minor Scales**

C-9. For a complete reading, use the T&E minor scales with the T&E bar scales. Between 0 and 9 degrees, each minor scale is divided into single mils.

### **Adjustment Levers**

C-10. Push or pull these levers for bold adjustments, or push them up or down for fine adjustments.

- *Elevation Lever.* Use this to depress or elevate the gun.
- *Traverse Lever.* Use this to traverse the gun left or right.

### **Limit Stop**

C-11. This lets you set a right limit to keep the gun from traversing outside of your sector of fire.

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**Note:** You can make bold diagonal adjustments by using the working traversing and elevating levers at the same time.

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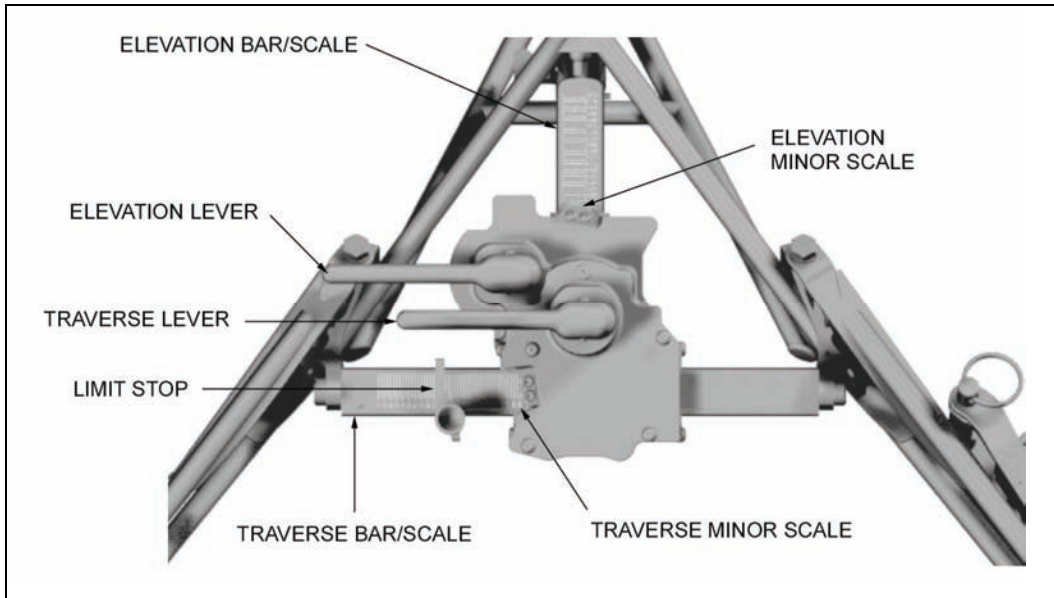


Figure C-4. Traverse and elevation mechanism.

C-12. The mounting bracket has a pintle, a built-in brass deflector (for the M240B machine gun), two mounting pins, and a quick release (Figure C-5). Use the mounting pins (one at each end of the mounting bracket assembly) to attach the weapon. To stow or carry the weapon, use the pins to attach the mounting bracket to the outside of the right rear leg.

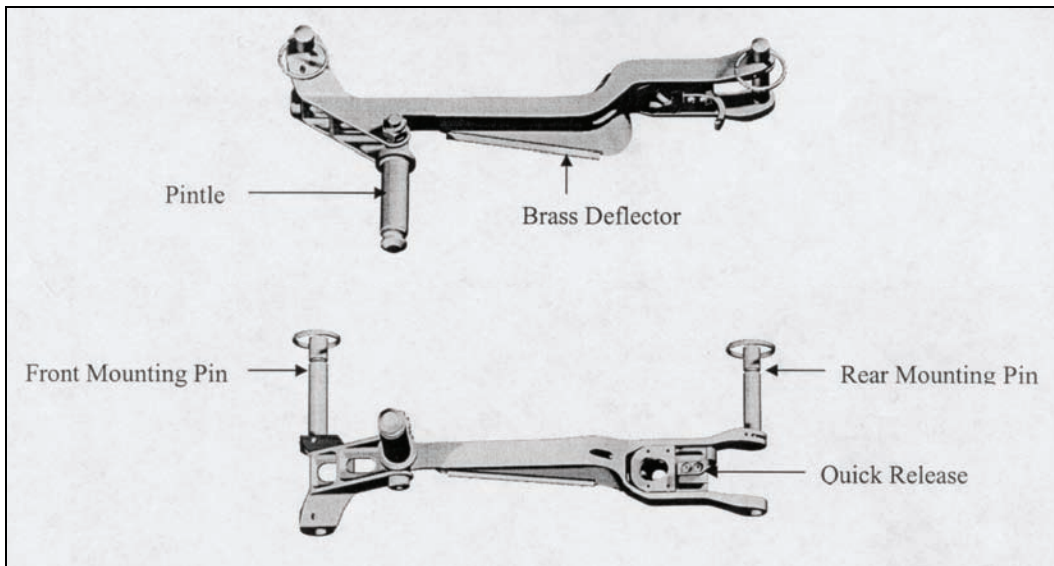


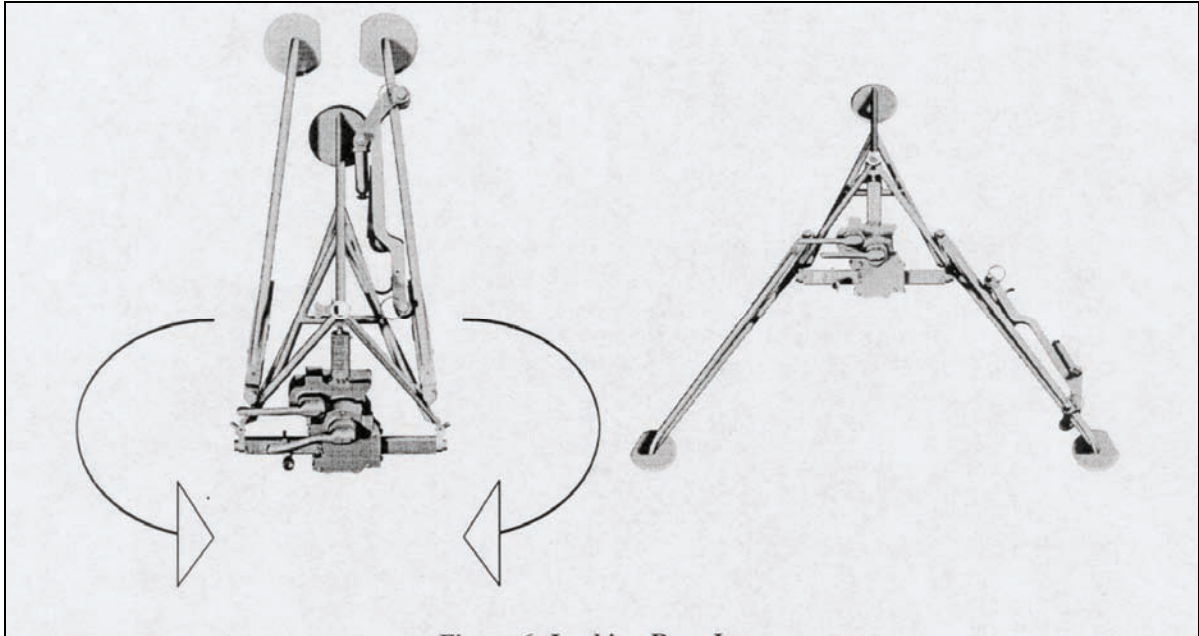
Figure C-5. Mounting bracket.

## PLACEMENT INTO OPERATION

C-13. The Soldier can employ the weapon more quickly with the light, user-friendly M192 than he can with the M122 tripod. This paragraph covers placing both the M240B machine gun and the M249 SAW into action. Continued practice is critical to lethality and survivability.

**STEP 1**

C-14. With the LWGM in a carrying configuration and with the front leg of the ground mount facing away from your body, grasp the back legs and fold them backward one at the time or together. Make sure you lock them in place (Figure C-6).



**Figure C-6. Locking of the rear legs.**

**STEP 2**

C-15. With the ground mount securely on the ground, pull outward on the elevation lever with your left hand. Use your right to pull the elevation bar downward about halfway. This removes the upper part of the elevation bar from its carrying location. Once you lower the elevation bar, simply rotate the T&E mechanism to the vertical position (Figure C-7).

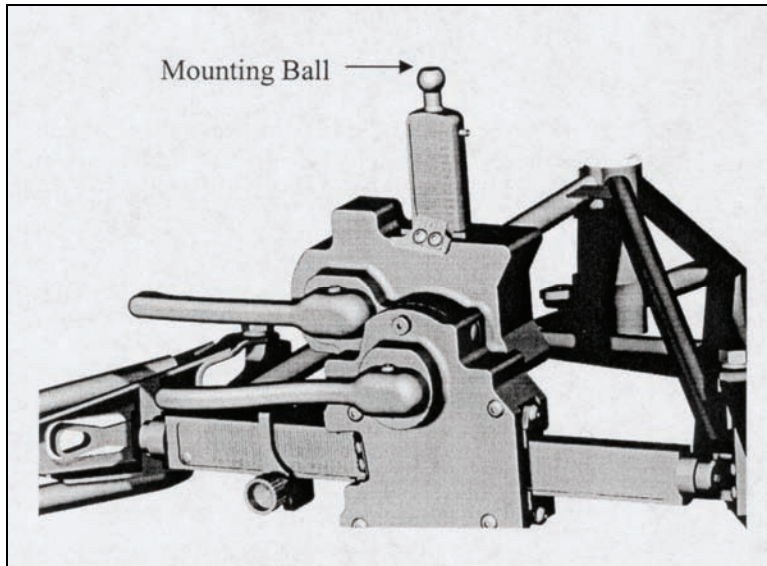


Figure C-7. Traversing and elevating mechanism in vertical position.

### STEP 3

C-16. Pull the pins from the mounting bracket on the right rear leg, and then remove the mounting bracket from rear leg. Holding on to the mounting bracket, rotate the pintle downward until it is perpendicular to the mounting bracket (Figure C-8).

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*Note:* For quicker employment, such as during tactical operations, you can mount the bracket on the weapon while moving.

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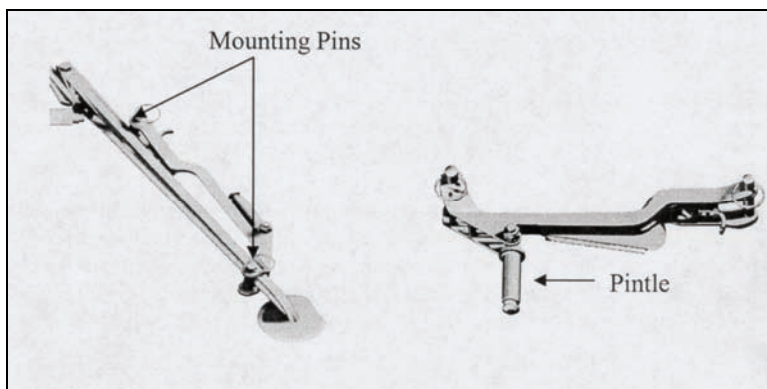


Figure C-8. Removal of the mounting bracket.

### STEP 4

C-17. While holding the mounting bracket, insert the pintle into the brass bushing (on top of the frame assembly). Pull up on the mounting bracket to ensure that it is locked in place. Lower the rear of the bracket to align the mounting ball (on top of the elevation bar) with the ball socket on the mounting bracket. Lock in place (Figure C-9).



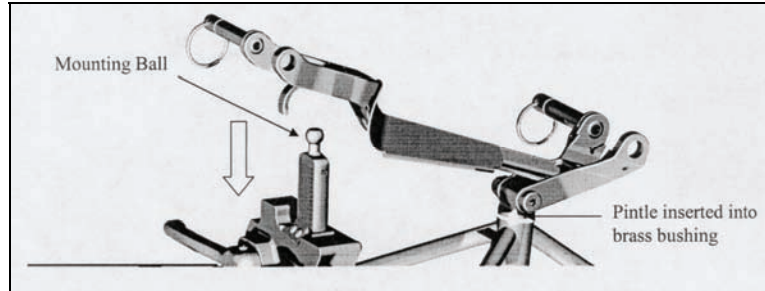


Figure C-9. Installation of the mounting bracket.

## STEP 5

C-18. Before mounting the M240B on the LWGM, fold and lock the bipod legs *to the rear*. Otherwise, they will rotate down and keep you from depressing the gun. Before mounting the M249 SAW on the LWGM, fold the bipod legs *to the front*. Then, to mount the weapon, hold the machine gun at a slight downward angle, and slide the gun into the front yoke to align the gun's front mounting hole with the front mounting pin on the mounting bracket. Push in the front mounting pin to secure the gun. Then, lower the rear of the gun and line up the gun's rear mounting hole with the rear mounting pin on the mounting bracket, and push in that pin (Figure C-10).

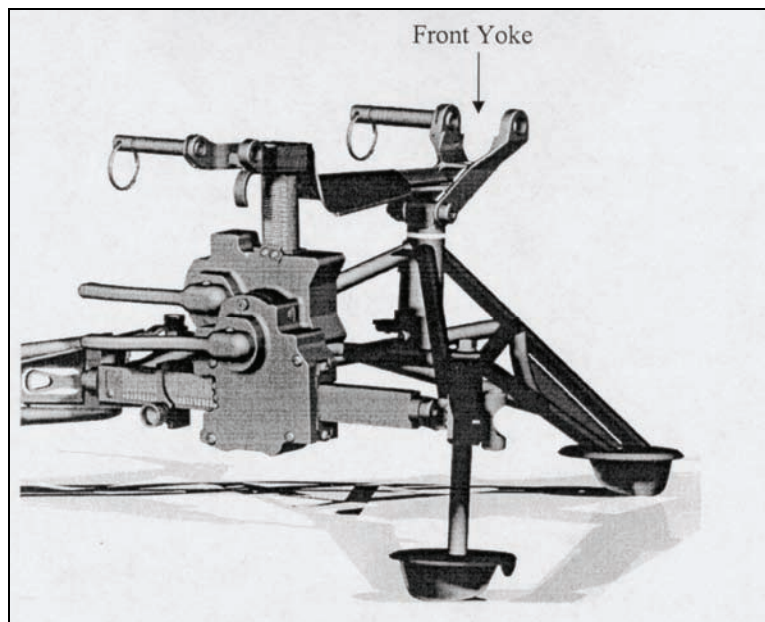


Figure C-10. Mounting of the M240B or M249 machine gun.

## ADJUSTMENTS

C-19. Three types of adjustments can be made with the M192 LWGM.

### FREE GUN

C-20. To free the gun from the limitations of the T&E so you can move the gun anyway you like, to include a full 360 degrees of traverse (round and round, if needed)--

- Pull back on the quick release, which is located under the rear of the mounting bracket.
- Raise the rear of the weapon to separate the mounting bracket from the T&E.
- Rotate the T&E forward to keep it out of the way of the gun.

### **BOLD ADJUSTMENTS**

C-21. This allows for bold and rapid movement of the weapon with the T&E attached. To make either bold elevation or windage adjustments to the machine gun, use your left hand to pull or push the elevation or traverse lever, and then push or pull the gun in the desired direction. Before firing, release the lever(s) you used. To move the gun diagonally, pull the elevation lever and push the traversing lever at the same time, and move the gun in the desired direction.

### **FINE ADJUSTMENTS**

C-22. You can adjust the gun in 1- or 5-mil increments by rotating the elevation or traversing lever up or down. One full rotation of either moves the barrel 5 mils up or down, or left or right. Rotating either lever just halfway up or down (a quarter of a rotation) moves the barrel about a mil at the time.

### **SCALES**

C-23. The T&E has a flat-surface scale for elevation and traverse. The major scales are divided into 10-mil increments. The minor scale is divided into 1-mil increments (only the even numbers are marked). To read the number of mils of elevation or traverse, place the gun on the target. Note the location of the minor scale (on either the elevation or traverse bar scale) relative to the major scale. Read the number of mils where the major scale line intersects the minor scale (Figure C-11). For example, find the 400-mil line. The next line is 410 mils, followed by 420 mils. The minor scale is numbered from 0 to 9 in 1-mil increments, with every other line marked with an even number. To get the number of the mils, find the line where the minor scale intersects the major scale. In Figure C-11, the minor scale intersects the major scale at the 430-mil line. The line on the minor scale in which the 430-mil line intersects is the 4-mil line. Add 430 to 4 mils to get the final reading of 434 mils. Both the traversing and elevating mil reading are done in the same manner.

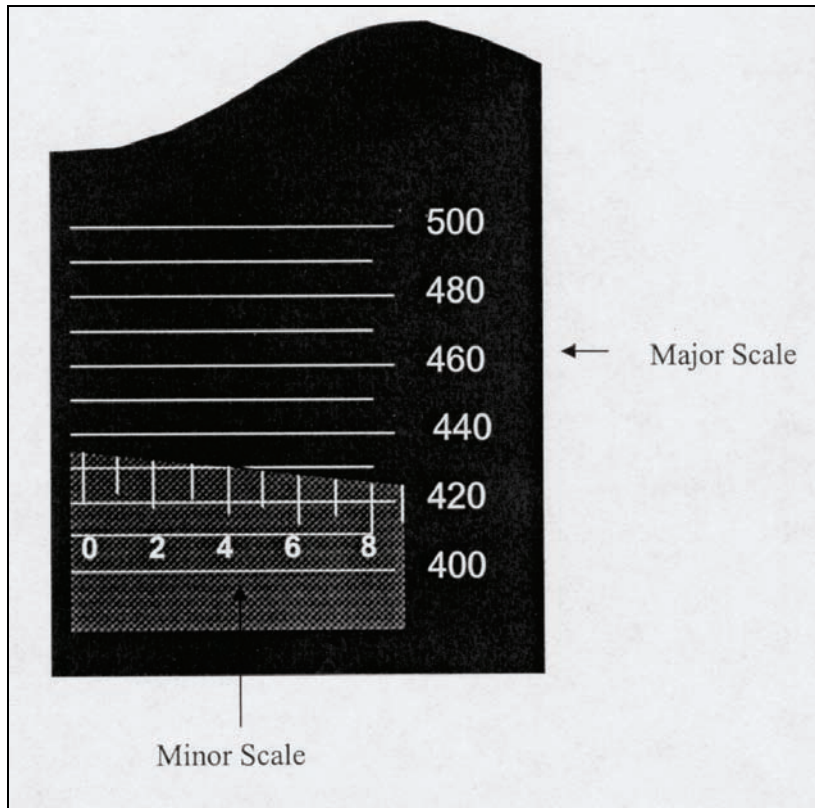


Figure C-11. Major and minor scales.

## LIMIT STOP

C-24. The unique metal limit stops on the M192 LWGM (Figure C-12) allow the gunner to set left and right limits, ensuring fire only in the assigned sector. This is especially useful when visibility is limited. Tightening the limit stop places the device at an angle. The angle prevents the limit stop from moving and its knob from loosening. Remove the angle to loosen the knob and release the limit stop. To remove the angle, push in on the bottom and pull out on the top of the limit stop at the same time. With your other hand, loosen the knob. Or, just traverse the T&E left until it hits the limit stop, then loosen the knob. Then, traverse to the right limit, slide the limit stop until it contacts the T&E, then retighten the knob.

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*Note:* Loosen and tighten the limit stop by hand only. Avoid using tools.

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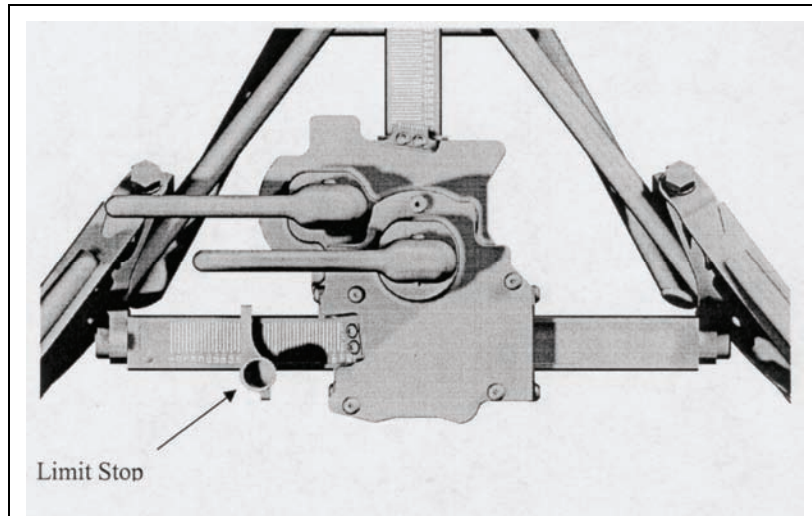


Figure C-12. Limit stop.

### RANGE CARD

C-25. The new features on the M192 T&E mechanism and the addition of a limit stop mandate changes to the data section of the range card.

- When entering data from the T&E, record exactly what you read from the major and minor scales, without plus or minus signs, and without writing whether the mils are left or right.
- For example, if you read a direction of 100 mils from the traversing bar scale, then record 100 mils. Do the same for elevation.
- Record everything else in the data section the same as you normally do. If you are using limit stops to set your right limit, then record the target number, and describe it in the Remarks block (Figure C-13).

DATA SECTION					
POSITION IDENTIFICATION				DATE	
Gun No. 1				01/01/06	
WEAPON			EACH CIRCLE EQUALS		
M249 (MG Role)			100 Meters		
METERS					
NO.	DIRECTION/ DEFLECTION	ELEVATION	RANGE	AMMO	DESCRIPTION
1	100 mils	400 mils	500 m		FPL
2	450 mils	350 mils	600 m		Left limit
3	295 mils	350 mils	550 m		Road junction
REMARKS: Limit stop set target No. 1, FPL					

DA Form 5517-R, Feb 1986

Figure C-13. Range card data.

## REMOVAL FROM ACTION

C-26. If weapon is mounted on the LWGM--

- Clear the weapon, disengage the front and rear mounting pins from the mounting bracket assembly, and remove the weapon. Release the mounting bracket trigger release and raise the rear of the mounting bracket.
- With your left thumb depressing the pintle latch release, remove the bracket from the pintle socket. Rotate the pintle until it is flat against the bracket.
- Install the mounting bracket on the outside of the right rear leg of the tripod, with the trigger release facing the front of the mount (or the pintle facing the rear of the mount).
- Align the front of the bracket with the attaching tube, and rotate the rear yoke over the leg. Engage the pins.
- Place and lock the limit stop to the far left. Position the T&E to the center of the traversing bar, and rotate the T&E mechanism forward until it aligns with the stowage lip.
- Pull out on the elevation lever while pushing up on the bottom of the bar with your thumb. Apply pressure until the T&E mechanism seats under the stowage lip.
- Ensure that the mounting ball comes in complete contact with the frame assembly. This will prevent the T&E from moving.

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## Appendix D

# Firing Tables at a Glance

This appendix provides a quick reference to the firing tables for machine gun marksmanship training, in the machine gun and automatic rifle roles.

<b>FIRING TABLE I -- ALL WEAPONS, BASIC (10-METER) FIRE Prone or Fighting Position, Tripod, Practice and Qualification, Machine Gun Role</b>					
<b>TASK</b>	<b>TIME</b>	<b>ROUNDS</b>		<b>GUNNER TARGETS (PASTERS)</b>	<b>TYPE FIRE</b>
		<b>QTY</b>	<b>TYPE</b>		
1	<i>No limit</i>	12	<i>Ball</i>	A1 and A2	12 single rounds (zero)
2	<i>No limit</i>	28	<i>Ball</i>	A3 and A4	5- to 7-round burst for each paster
3	<i>No limit</i>	35	<i>Ball</i>	A5 and A6	5- to 7-round burst for each paster, traverse and search
4	<i>No limit</i>	56	<i>Ball</i>	A7 and A8	5- to 7-round burst for each paster
*5	45 sec	56	<i>Ball</i>	B7 and B8	5- to 7-round burst for each paster
*6	30 sec	35	<i>Ball</i>	B5 and B6	5- to 7-round burst for each paster
<p><b>NOTES:</b> The gunner fires pasters on sections A and B, and the assistant gunner fires on Sections C and D.</p> <p>* Qualification task.</p>					

Appendix D

FIRING TABLE II -- ALL WEAPONS						
Tripod Transition Fire, Prone or Fighting Position, Practice and Qualification, Machine Gun Role						
TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No limit	28	4:1 <sup>b</sup>	NA	500	Fixed, 5- to 7-round burst (field zero)
2 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	400	Fixed, 5- to 7-round burst
3 <sup>a</sup>	15 sec	14		Double E	500	Fixed, 5- to 7-round burst
4 <sup>a</sup>	20 sec	14	4:1 <sup>b</sup>	Double E	600	Fixed, 5- to 7-round burst
5 <sup>a</sup>	30 sec	14	4:1 <sup>b</sup>	Double E	800	Fixed <i>and area</i> , 5- to 7-round burst
6 <sup>a</sup>	30 sec	28	4:1 <sup>b</sup>	Single E Double E	400 600	Fixed, 5- to 7-round burst
7 <sup>a</sup>	45 sec	28	4:1 <sup>b</sup>	Double E Double E	700 800	Fixed <i>and area</i> , 5- to 7-round burst
8 <sup>a</sup>	45 sec	42	4:1 <sup>b</sup>	Single E Double E Double E	400 500 600	Fixed, 5- to 7-round burst

**NOTES:** The unit commander determines the firing position.

<sup>a</sup> Qualification task.

<sup>b</sup> Ball to tracer ratio (mix), that is, 4 ball rds are loaded for every 1 tracer round loaded.



FIRING TABLE III -- ALL WEAPONS Transition Fire, Limited Visibility, Machine Gun Role						
TASK	TIME	ROUNDS		TARGET	RANGE (M)	TYPE FIRE
		QTY	TYPE			
1	No limit	6	4:1 <sup>b</sup>	25-Meter Zero	10	6 single rounds
2	No limit	18	4:1 <sup>b</sup>	25-Meter Zero	10	18 single rounds
3	No limit	28	4:1 <sup>b</sup>	Double E	500	28 single rounds
4 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	200	14 single rounds
5 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	400	Fixed, 5- to 7-round burst
6 <sup>a</sup>	10 sec	14	4:1 <sup>b</sup>	Single E	100	Fixed, 5- to 7-round burst
7 <sup>a</sup>	15 sec	14	4:1 <sup>b</sup>	Single E	300	Fixed, 5- to 7-round burst
8 <sup>a</sup>	25 sec	28	4:1 <sup>b</sup>	Single E Single E	200 400	Fixed, 5- to 7-round burst Fixed, 5- to 7-round burst
9 <sup>a</sup>	25 sec	28	4:1 <sup>b</sup>	Single E Single E	100 300	Fixed, 5- to 7-round burst Fixed, 5- to 7-round burst
10 <sup>a</sup>	30 sec	42	4:1 <sup>b</sup>	Single E Single E Single E	100 200 400	Fixed, 5- to 7-round burst

**NOTES:** Unit commander determines position.  
<sup>a</sup> Qualification task.  
<sup>b</sup> Four ball rounds to one tracer round mix.

FIRING TABLE	ROUNDS (ALL WEAPONS)	
	QTY	TYPE
Table I, Practice	131	Ball
Table I, Record	91	X4:1
Table II, Practice	182	X4:1
Table II, Record	154	X4:1
Table III, Practice	52	X4:1
Table III, Record	154	X4:1

Appendix D

FIRING TABLE I -- M249 BASIC 10-METER FIRE Prone or Fighting Position, Bipod Supported, Practice and Qualification, Automatic Rifle Role					
TASK	TIME	ROUNDS		TARGET	TYPE FIRE
		QTY	TYPE		
1	No limit	12	Ball/tracer	Pasters A1 and A2	3 single-round shot groups
2	No limit	6	4:1	Pasters A3 and A4	Fixed, 3-round burst each paster
3 <sup>a</sup>	No limit	15	4:1	Pasters A5 through A6	Fixed, 3-round burst each paster
4	No limit	24	4:1	Pasters A7 through A8	Fixed, 3-round burst each paster
5 <sup>b</sup>	20	12	4:1	Pasters B1 through B4	Fixed, 3-round burst each paster
6 <sup>ab</sup>	40	24	4:1	Pasters B7 through B8	Fixed, 3-round burst each paster
7 <sup>b</sup>	40	15	4:1	Pasters B5 through B6	Fixed, 3-round burst each paster

**NOTE:** The gunner fires pasters on sections A and B, and the assistant gunner fires on sections C and D.

<sup>a</sup> Protective mask and gloves required, at a minimum.

<sup>b</sup> Qualification task.

FIRING TABLE II -- M249 TRANSITION FIRE Limited Visibility, Automatic Rifle Role						
TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No Limit	12	4:1	Single E	300	Fixed, 3-round burst (field zero)
2	5sec	6	4:1	Single E	200	Fixed, 3-round burst
3	10sec	6	4:1	Double E	400	Fixed, 3-round burst
4 <sup>*</sup>	10sec	6	4:1	Single E	100	Fixed, 3-round burst
5 <sup>*</sup>	15sec	6	4:1	Single E	300	Fixed, 3-round burst
6 <sup>*</sup>	20sec	12	4:1	Single E Single E	100 300	Fixed, 3-round burst
7	20sec	12	4:1 4:1	Single E Double E	200 400	Fixed, 3-round burst
8	25sec	18	4:1 4:1 4:1	Single E Single E Double E	100 200 400	Fixed, 3-round burst

**NOTES:**

- The unit commander determines the firing position.
- Boresighting requires 12 rounds, and seating the device requires 6 rounds.

\* Qualification task.

<b>FIRING TABLE III -- M249 TRANSITION FIRE</b> <b>Limited Visibility, Prone or Fighting Position, Bipod Supported</b> <b>Practice and Instructional, Automatic Rifle Role</b>						
TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No Limit	12	4:1	Single E	25	Fixed, 3-round burst (zero)
2	No Limit	6	4:1	Single E	200	Fixed, 3-round burst
3	No Limit	6	4:1	Double E	400	Fixed, 3-round burst
4	No Limit	6	4:1	Single E	100	Fixed, 3-round burst
5	No Limit	6	4:1	Single E	300	Fixed, 3-round burst
6	No Limit	6	4:1	Single E	100	Fixed, 3-round burst

**NOTES:**

1. The unit commander determines the firing position.
2. Boresighting requires 12 rounds, and seating the device requires 6 rounds.

<b>FIRING TABLE I -- ADVANCED GUNNERY</b> <b>Machine Gun Role</b>							
TASK	FIRING POSITION	RANGE (M)	TIME	TOTAL ROUNDS PER PERSON	TARGET	AMMO	TYPE FIRE
1	Field Zero	500		20	Single E-type	4:1	Zeroing round bursts
2*	Bipod-Supported Position	100 200 250 300 400	60 sec	50	Single E-type	4:1	5-round bursts
3	Bipod-Supported Position	250 300 400 500 600	120 sec	50	Double E-type	4:1	5-round bursts
4*	Bipod-Supported Position	300 600	120 sec	20	Linear single E-type, 1 meter apart	4:1	5-round bursts

\* Fired while wearing at least the protective mask and gloves.

**Appendix D**

<b>FIRING TABLE II -- ADVANCED GUNNERY</b> <b>Machine Gun Role</b>							
<b>TASK</b>	<b>FIRING POSITION</b>	<b>RANGE (M)</b>	<b>TIME</b>	<b>TOTAL ROUNDS PER PERSON</b>	<b>TARGET</b>	<b>AMMO</b>	<b>TYPE FIRE</b>
1	Dry Fire Walk-Through	NA	NA	NA	NA	NA	NA
2	Hip-Firing Position	25	5 sec	10	Single E-type silhouette	4:1	5-round bursts
3	Underarm-Firing Position	50 25	5 sec ea tgt	20	Single E-type silhouette	4:1	5-round bursts
4	Underarm or Hip-Firing Position	25 50 75	5 sec ea tgt	30	Single E-type silhouette	4:1	5-round bursts

FIRING TABLE I -- ADVANCED CREW GUNNERY Day and <i>Dismounted</i> Night Phases					
ACTION	CONDITIONS	STANDARDS	AMMO	TIME	T/P/U
1. Set up a support-by-fire position with two machine gun crews.	Given an OBJ with 4 to 7 personnel targets and 1 light vehicle at a distance of 600 meters	Kill vehicle, kill 1 to 2 personnel, suppress the OBJ	120 rds per gun	32 sec	
2. Conduct Hasty Defense or Repel Counterattack on the OBJ with two machine gun crews.	Given 10 to 14 personnel and 2 light vehicles at a distance of 600 to 800 meters	Destroy 2 vehicles, kill 5 to 7 personnel, suppress area	300 rds per gun	2 min	
3. Break Contact and move to alternate fighting position with two machine gun crews.	Given 7 to 10 personnel and 1 light vehicle at a distance of 400 meters	Kill vehicle, kill 3 to 6 personnel, suppress area	160 rds per gun	1 min 15 sec	
4. Break Contact with two machine gun crews.	Given 7 to 10 personnel and 1 light wheeled vehicle at a distance of 800 meters	Disable or destroy vehicle, kill 3 to 6 personnel, suppress enemy	160 rds per gun	1 min 25 sec	
<p>NBC fire should be conducted during the hasty defense.</p> <p>Building facades, suicide bombers, and COBs should be used to vary the conditions in some engagements.</p> <p>Smoke should be used in moving from the SBF position to the OBJ.</p> <p>Day and Night 740 rds each for a total of 1,480 rounds.</p> <p><b>EXERCISE SCORING</b></p> <p>Fully Trained (T) = Satisfactory on 4 of 4 actions.</p> <p>Need Practice (P) = Satisfactory on 3 actions.</p> <p>Untrained (U) = Unsatisfactory on 2 or fewer actions.</p> <p>Night vision devices as prescribed by unit commander.</p>					

FIRING TABLE II -- ADVANCED CREW GUNNERY Day and <i>Mounted</i> Night Phases					
ACTION	CONDITION	STANDARDS	AMMO	TIME	T/P/U
1. Conduct movement to contact. Engage stationary targets from two moving vehicles.	Given 4 to 7 personnel with RPGs and small arms between 300 and 400 meters	Kill 2 to 3 personnel	60 rds per gun	30 sec	
2. Conduct a hasty defense. Engage stationary targets from two stationary vehicles.	Given 4 to 7 personnel and a light wheeled vehicle between 400 and 600 meters	Kill vehicle, kill 2 to 3 personnel, suppress area	120 rds per gun	21 sec	
3. Break contact. Move to alt position. Engage moving targets from two stationary vehicles.	Given 5 to 7 personnel and 1 to 2 light vehicles between 400 and 600 meters	Kill 3 to 4 personnel, kill 1 vehicle, suppress area	200 rds per gun	21 sec	
4. Break contact. Engage stationary targets from two stationary vehicles.	Given 10 to 15 personnel and 2 light wheeled vehicles between 600 and 800 meters	Kill 5 to 10 personnel, kill 2 vehicles, suppress area	300 rds per gun	34 sec	
<p>NBC fire should be conducted during the hasty defense.</p> <p>Building facades, suicide bombers, and COBs should be used to vary the conditions in some engagements.</p> <p>Smoke should be used in moving from the SBF position to the OBJ.</p> <p>Day and night, 680 rounds each for a total of 1,360 rounds</p> <p><b>EXERCISE SCORING</b></p> <p>Fully Trained (T) = Satisfactory on 4 of 4 actions</p> <p>Need Practice (P) = Satisfactory on 3 actions</p> <p>Untrained (U) = Unsatisfactory on 2 or fewer actions</p> <p>Night vision devices as prescribed by unit commander</p>					

FIRING TABLE III -- M249 Dismounted, Day and Night Phases														
ACTION	CONDITION	STANDARDS	AMMO	TIME	TPU									
1. Set up a support-by-fire position with two machine gun crews.	Given an objective with 4 to 7 personnel targets and 1 light vehicle at 600 meters	<ul style="list-style-type: none"> <li>• Kill vehicle</li> <li>• Kill 1 to 2 personnel</li> <li>• Suppress the objective</li> </ul>	120 rounds per gun	32 sec										
2. Conduct hasty defense or repel a counterattack on the objective with two machine gun crews.	Given 10 to 14 personnel and 2 light vehicles between 600 and 800 meters	<ul style="list-style-type: none"> <li>• Destroy 2 vehicles</li> <li>• Kill 5 to 7 personnel</li> <li>• Suppress area</li> </ul>	300 rounds per gun	2 min										
3. Break contact and move to alternate fighting position with two machine gun crews.	Given 7 to 10 personnel and 1 light vehicle at 400 meters	<ul style="list-style-type: none"> <li>• Kill vehicle</li> <li>• Kill 3 to 6 personnel</li> <li>• Suppress area</li> </ul>	160 rounds per gun	1 min 15 sec										
4. Break contact with two machine gun crews.	Given 7 to 10 personnel and 1 light wheeled vehicle at 800 meters	<ul style="list-style-type: none"> <li>• Disable or destroy vehicle</li> <li>• Kill 3 to 6 personnel</li> <li>• Suppress the enemy</li> </ul>	160 rounds per gun	1 min 25 sec										
<p>During the hasty defense, trainers conduct CBRN fire using building facades, suicide bombers, and COBs to vary the conditions in some of the engagements. Use smoke only while moving from the SBF position to the objective. Day and night, 740 rounds each for a total of 1,480 rounds.</p> <p><b>EXERCISE SCORING</b></p> <table> <tr> <td>Fully trained</td> <td>T</td> <td>Satisfactory on 4 of 4 actions</td> </tr> <tr> <td>Needs practice</td> <td>P</td> <td>Satisfactory on 3 actions</td> </tr> <tr> <td>Untrained</td> <td>U</td> <td>Unsatisfactory on 2 or fewer actions</td> </tr> </table> <p>Night vision devices are used as prescribed by unit Commander.</p>						Fully trained	T	Satisfactory on 4 of 4 actions	Needs practice	P	Satisfactory on 3 actions	Untrained	U	Unsatisfactory on 2 or fewer actions
Fully trained	T	Satisfactory on 4 of 4 actions												
Needs practice	P	Satisfactory on 3 actions												
Untrained	U	Unsatisfactory on 2 or fewer actions												

**Appendix D**

<b>FIRING TABLE IV -- M240B Mounted, Day and Night Phases</b>														
<b>ACTION</b>	<b>CONDITION</b>	<b>STANDARDS</b>	<b>AMMO</b>	<b>TIME</b>	<b>TPU</b>									
1. Conduct movement to contact. Engage stationary targets from two moving vehicles	Given 4 to 7 personnel with RPGs and small arms between 300 and 400 meters	Kill 2 to 3 personnel	60 rounds per gun	30 sec										
2. Conduct hasty defense. Engage stationary targets from 2 stationary vehicles.	Given 4 to 7 personnel and 1 light wheeled vehicle between 400 and 600 meters	Kill vehicle Kill 2 to 3 personnel Suppress area	120 rounds per gun	21 sec										
3. Break contact and move to alternate position. Engage moving targets from 2 stationary vehicles.	Given 5 to 7 personnel and 1 or 2 light vehicles between 400 and 600 meters	Kill 3 to 4 personnel Kill 1 vehicle Suppress area	200 rounds per gun	21 sec										
4. Break contact. Engage stationary targets from 2 stationary vehicles.	Given 10 to 15 personnel and 2 light wheeled vehicles between 600 and 800 meters	Kill 5 to 10 personnel Kill 2 vehicles Suppress area	300 rounds per gun	34 sec										
<p>During the hasty defense, trainers conduct CBRN fire using building facades, suicide bombers, and COBs to vary the conditions in some of the engagements. Use smoke while moving from the SBF position to the objective. Day and night, 680 rounds each for a total of 1,360 rounds.</p> <p><b>EXERCISE SCORING</b></p> <table> <tr> <td>Fully trained</td> <td>T</td> <td>Satisfactory on 4 of 4 actions</td> </tr> <tr> <td>Needs practice</td> <td>P</td> <td>Satisfactory on 3 actions</td> </tr> <tr> <td>Untrained</td> <td>U</td> <td>Unsatisfactory on 2 or fewer actions</td> </tr> </table> <p>Night vision devices are used as prescribed by unit Commander.</p>						Fully trained	T	Satisfactory on 4 of 4 actions	Needs practice	P	Satisfactory on 3 actions	Untrained	U	Unsatisfactory on 2 or fewer actions
Fully trained	T	Satisfactory on 4 of 4 actions												
Needs practice	P	Satisfactory on 3 actions												
Untrained	U	Unsatisfactory on 2 or fewer actions												



## Appendix E

# Unit Training Program

This appendix provides guidance for conducting unit training as part of preliminary marksmanship training for each machine gun. The training program prepares the unit for war by enabling leaders and Soldiers to develop and sustain proficiency in machine gun tasks. It does this by integrating individual training and evaluation with battle drills and other collective tasks.

### FOCUS

E-1. An effective unit training program focuses on three battlefield variables: nature of the target (moving or stationary, single or multiple); nature of the firer (stationary or moving); and conditions (full or limited visibility, with or without protective mask, day or night).

### STRUCTURE

E-2. This proposed training program is subdivided into the following periods:

- Introduction.
- Preliminary marksmanship training and dry fire.
- Proficiency (performance) examination.
- 10-meter zero practice and qualification.
- Transition range, field zero, and practice fire.
- Transition range qualification fire.
- Night zero and instructional fire.
- Night qualification fire.

### PERIODS

E-3. After a brief description of the machine gun, Soldiers receive the following instruction:

#### PERIOD 1--INTRODUCTION

DISASSEMBLY AND ASSEMBLY	TIME ALLOWED	
	HRS	MIN
Disassembly.		25
Operator maintenance:		
Inspection		10
Cleaning		10
Lubrication		10
Assembly		25

**Appendix E**

Disassembly and assembly (practice exercise--optional)		50
SUBTOTAL (including practice exercise):	2	10
<b>CHARACTERISTICS OF FIRE</b>	<b>TIME ALLOWED</b>	
	<b>HRS</b>	<b>MIN</b>
Burst fire		15
Trajectory and beaten zone		15
Engagements of targets:		
Point		10
Area		10
SUBTOTAL:		50
TOTAL:	3	0

**PERIOD 2--PRELIMINARY MARKSMANSHIP TRAINING AND DRY FIRE**

E-4. After a brief description of the training to be conducted, Soldiers receive the following instructions on the bipod, tripod, and mounting equipment:

<b>TECHNIQUES OF FIRE</b>	<b>TIME ALLOWED</b>	
	<b>HRS</b>	<b>MIN</b>
Position and grip, aiming, trigger manipulation, and T&E manipulation.		40
Loading ammunition.		15
Reducing stoppages and clearing the weapon.		5
SUBTOTAL:	1	10
<b>DRY-FIRE PRACTICE</b>	<b>TIME ALLOWED</b>	
	<b>HRS</b>	<b>MIN</b>
Aiming and firing sequence.		30
Sight setting and sight changes.		30
Zeroing procedures.	1	
SUBTOTAL:	2	
TOTAL:	3	10

**PERIOD 3--PROFICIENCY (PERFORMANCE) EXAMINATION**

E-5. During this period, leaders use the proficiency examination to test and evaluate tasks learned during Periods 1 and 2.

PROFICIENCY EXAMINATION (PERFORMANCE)	TIME ALLOWED	
	HRS	MIN
TOTAL:	1	

**PERIOD 4--10-METER ZERO PRACTICE AND QUALIFICATION**

INSTRUCTIONAL SUBPERIODS	TIME ALLOWED	
	HRS	MIN
Preliminary marksmanship training including the aiming, sight picture, trigger control, bipod and tripod positions, and T&E manipulation.	1	
Function checks, loading, immediate action, clearing, and range safety.		15
Introduction to 10-meter fire (includes zeroing, practicing, and qualifying on the 10-meter target, and scoring the target).		15
Zero firing.	1	
Practice day Table I.	1	
Qualification day Table I.	1	
TOTAL:	4	30

**PERIOD 5—TRANSITION RANGE, FIELD ZERO, AND PRACTICE FIRE**

TRANSITION RANGE PRACTICE FIRE	TIME ALLOWED	
	HRS	MIN
Introduction to field firing (includes the transition range organization and operation).		15
Fire standard qualification course for practice (IAW with procedures in Chapter 4).	3	45
TOTAL:	4	

**PERIOD 6—TRANSITION RANGE QUALIFICATION FIRE**

E-6. Soldiers fire the standard qualification course for record IAW procedures in Chapter 4.

TRANSITION RANGE QUALIFICATION FIRE	TIME ALLOWED	
	HRS	MIN
TOTAL:	4	

**PERIOD 7—NIGHT ZERO, INSTRUCTIONAL FIRE, AND NIGHT QUALIFICATION FIRE**

E-7. Soldiers receive instruction on mounting, placing the night vision device into operation, boresighting, and zeroing the device once it is seated. They fire the standard night course as Period 4, except a night vision device is mounted on the weapon.

NIGHT ZERO, INSTRUCTIONAL FIRE, NIGHT QUALIFICATION FIRE	TIME ALLOWED	
	HRS	MIN
TOTAL:	4	

**HOURS**

E-8. The unit training program takes just under a full day (23 hours and 40 minutes total):

SUMMARY OF HOURS	TIME ALLOWED	
	HRS	MIN
Period 1	3	
Period 2	3	10
Period 3	1	
Period 4	4	30
Period 5	4	
Period 6	4	
Period 7	4	
TOTAL:	23	40

**AMMUNITION**

E-9. This paragraph lists the ammunition required for the unit training program. Leaders should check STRAC requirements in DA Pamphlet 350-38 for more complete or current information.

**M249 MACHINE GUN**

E-10. See Table E-1.

TABLE	ROUNDS	TYPE
I Practice	185	Ball
I Record	91	Ball
II Practice	182	4:1
II Record	154	4:1
III Practice	371	4:1
III Record	154	4:1

**Table E-1. Ammunition requirements for the M249.**

**M60 AND M240B MACHINE GUNS**

E-11. See Table E-2.

<b>TABLE</b>	<b>ROUNDS</b>	<b>TYPE</b>
I Practice	231	Ball
I Record	117	Ball
II Practice	236	4:1
II Record	200	4:1
III Instructional	460	4:1
III Record	200	4:1

**Table E-2. Ammunition requirements for the M60 and M240B.**

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## Appendix F

# Training Aids and Devices

Training aids and devices must be included in a marksmanship program. This appendix lists those that units can make from materials most units have on-hand.

### TRAINING DEVICES AND EXERCISES

F-1. The marksmanship training devices in this appendix are available to aid in sustainment training when used with the appropriate training strategies. These devices are beneficial when ammunition is limited for training or practice. Some training devices are complex and costly, but others are relatively simple and cheap to make. Devices and aids can be used alone or in combination. Individuals or squads can sustain or practice basic marksmanship skills and fundamentals with devices and aids.

### FIRST SIGHTING AND AIMING EXERCISE

F-2. The purpose of the first sighting and aiming exercise is to teach the correct alignment of the sights on a target.

#### EQUIPMENT NEEDED

- 1 sighting bar, complete, for each machine gun crew.
- 1 sighting target 1x2x48 inches. The sighting target is secured 5 1/2 inches from one end (it should be moveable). The eyepiece is secured on the other end. The peep sight is secured 20 1/2 inches from the sighting target and 22 inches from the eyepiece (Figure F-1).

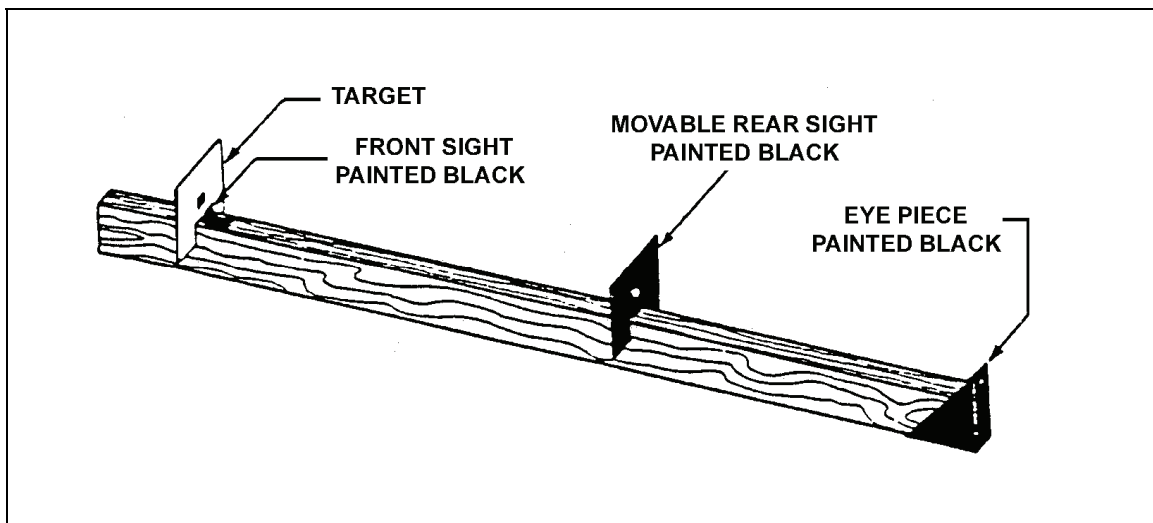


Figure F-1. Sighting bar.

## CONDUCT

F-3. The instructor shows a sighting bar to the machine gun crews, points out its parts, and explains its use as follows:

- The sighting bar is used to assist in detecting small errors and in explaining them to the crews undergoing instruction.
- The front and rear sights on the sighting bar represent enlarged machine gun sights.
- The gunner looks through the eyepiece in such a position that he sees the sights in exactly the same alignment as the instructor does. Although there is no eyepiece on the machine gun, the use of an eyepiece on the sighting bar assists the gunners in learning how to align the sights properly when using the machine gun.
- The attachment of the removable target to the end of the sighting bar provides a simple method of readily aligning the sights on the target.
- Using a blackboard or a chart, the instructor explains and illustrates the correct sight alignment.
- A gunner from each crew adjusts the sights of the sighting bar and movable target to correctly align the sights on the target.

## SECOND SIGHTING AND AIMING EXERCISE

F-4. The purpose of the second sighting and aiming exercise is to apply the preceding lesson to actual alignment of the machine gun sights on a target 25 meters away.

### EQUIPMENT NEEDED

- 1 machine gun.
- 1 basic machine gun target at 25 meters, with the reverse (blank) side showing.
- 1 sighting target, 1x1x24 inches and a 3-inch square piece of wood painted black with a small 1/4-inch hole in the center (Figure F-2).

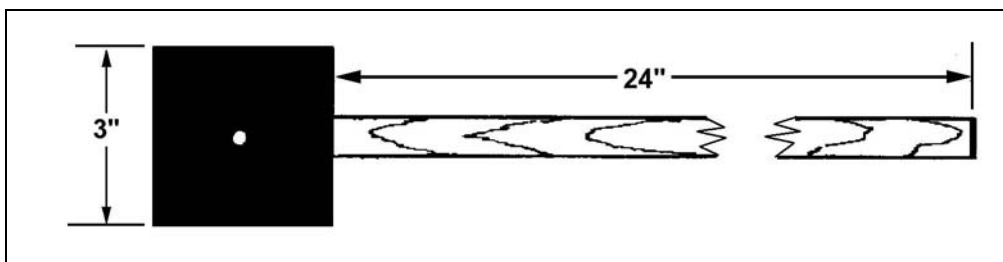


Figure F-2. Sighting target.

## CONDUCT

F-5. The instructor takes a normal position behind the machine gun, keeping his body and hands clear of the gun so that the eye is in the correct position for aiming.

- The gunner takes a position near enough to observe the instructor.
- The assistant gunner stands near the instructor to transmit signals to the ammunition bearer.
- The ammunition bearer is provided with the 3-inch sighting target and is posted as the marker at the blank target, which is 25 meters away from the gun.



- The instructor, through improvising signals transmitted through the signalman, directs the marker to move the sighting target until it correctly aligns with the sights, and then commands: HOLD.
- The marker complies, holding the sighting target in place on the blank target. The gunner and assistant gunner then look through the sights.
- The instructor explains that, in aiming, the gunner's eye should first focus on the target, to ensure that he is aiming at the proper target. His eye then focuses on the top of the front sight, to ensure that the line-of-sight established passes through the center of the peep sight and over the top of the center of the front sight.
- After the gunner and assistant gunner look through the sight, the instructor directs the marker (ammunition bearer) to move the sighting target out of alignment. He then requires the gunner to direct the marker to move the sighting target until it is in correct alignment with the sights.
- The instructor checks the alignment made by the gunner and points out any errors. When the instructor believes the gunner is proficient, the assistant gunner begins his exercise.

### **THIRD SIGHTING AND AIMING EXERCISE**

F-6. The purpose of the third sighting and aiming exercise is to show the importance of uniform and correct aiming and to instill in the gunners a sense of exactness. This exercise can be used to check the consistency of the aiming and placement of a three-round shot group in a dry-fire environment.

#### **EQUIPMENT NEEDED**

- 1 machine gun.
- 1 basic machine gun target at 25 meters, with the reverse (blank) side showing.
- 1 sighting target (1x1x24 inches), a 3-inch square piece of wood painted black, and a small 1/4-inch hole in the center) (Figure F-2).

#### **CONDUCT**

F-7. The instructor takes a normal position behind the machine gun, keeping his body and hands clear of the gun so that the eye is in the correct position for aiming.

- The gunner takes a position near the instructor to observe.
- The assistant gunner stands near the instructor to transmit signals to the ammunition bearer.
- The ammunition bearer is provided with a 3-inch sighting target and is posted as the marker at the blank target, which is 25 meters away from the gun.
- The instructor, improvising signals, transmits through the signalman to direct the marker to move the sighting target until it is in correct alignment with the sights and then commands: MARK.
- The marker complies, holding the sighting target in place on the blank target. The marker marks the position by inserting the tip of a pencil through the 1/4-inch hole in the center of the target. The marker marks the first dot 1, the second dot 2, and the third dot three, ensuring that the marker moves the target after every mark. All three dots should fit inside a 4-cm circle.
- The instructor explains that, in aiming, the gunner's eye should first be focused on the target to ascertain that he is aiming at the proper target. His eye is then focused on the top of the front sight to ensure the line of sighting established is a line through the center of the peep sight and over the top of the center of the front sight.
- The gunner and assistant gunner, without touching the gun, repeat the operation until three dots have been made and numbered.
- The instructor now explains the errors noted in the three sight alignments and the probable shape of the shot group formed by joining the three dots. Repeat as many times as needed until

the gunner and assistant gunner can put seven rounds inside a 4-cm circle. The grader marks the first dot with a number 1, the second with a number 2 and the third with a number 3. He makes sure the grader moves the target after every mark. When the instructor believes the gunner is proficient, the assistant gunner begins his exercise.

- The marker traces the three dots on a sheet of paper and connects them with lines. He writes the gunner’s name at the bottom of the sheet and gives the paper to the squad leader.

## MACHINE GUN T&E MANIPULATION DRILLS

F-8. The purpose of these exercises is to teach and instill confidence in the gunner in properly using his T&E. These exercises are conducted on a 25-meter line.

### EQUIPMENT NEEDED

- 1 machine gun.
- 1 sheet of plywood (4x8 feet). Paint the plywood white with black ruled lines of 1/8-inch width horizontally and vertically. The horizontal lines are 2 inches apart, starting 1 inch from the top and the bottom. The vertical lines are 3 inches apart, with 1 inch on either side.

### ACTIONS

- **Label** the horizontal lines starting from the top with 1, 3 and so on skipping every other line.
- **Label** the vertical lines along the middle horizontal line starting at the left; for example, A, B, C and so on (Figure F-3).
- When using the night vision sight, **cut out** a 4-cm-square circle from every four squares across and down. The squares or circles can be cut in any order the unit leader desires.
- **Set up** the machine 25 meters away from the target.
- **Center** the machine gun on the target.

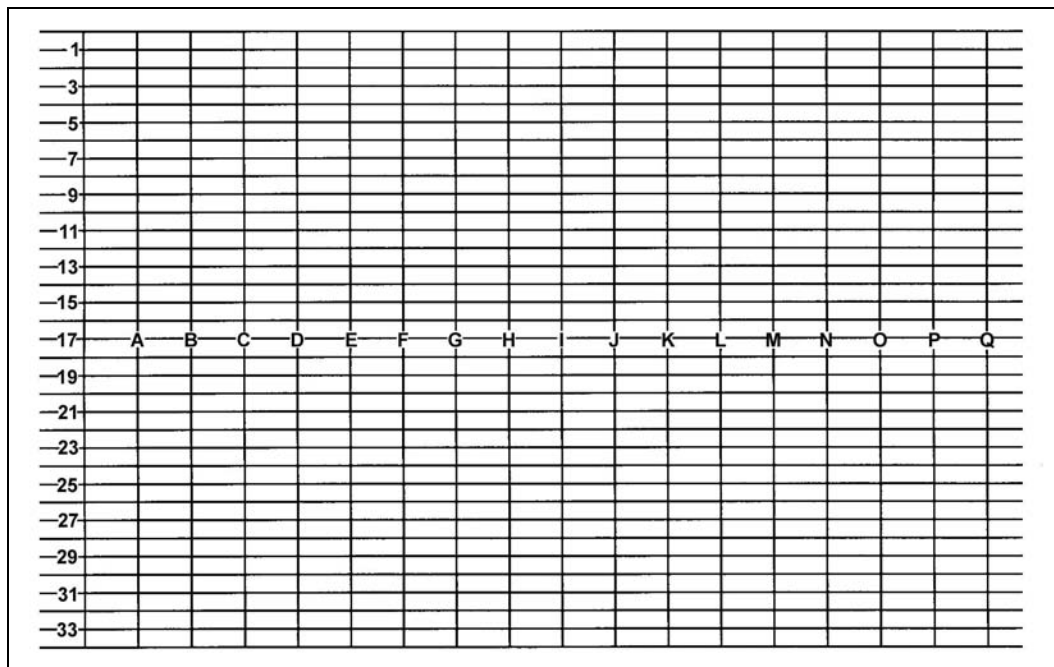


Figure F-3. Manipulator for T&E drills.

## CONDUCT

F-9. The gunner is given the command to aim at vertical line B and horizontal line 4. The next command is RIGHT 150 mils; ADD 50 mils. The instructor then asks the gunner where he is aiming. The gunner lays on the horizontal line 15 and vertical line O. The next command is, LEFT 100 mils; ADD 10 mils. The instructor asks the gunner where he is aiming now.

## QUESTIONS

F-10. The leader or instructor can have as many of these types of questions set up, until he feels the gunner is proficient at this task.

## TRAVERSE AND SEARCH EXERCISE

F-11. The purpose of the traverse and search exercise is to teach the gunner how to aim and point on a silhouette target and maintain that aim while the target is moving.

## EQUIPMENT NEEDED

- 1 machine gun.
- 1 basic machine gun target at 25 meters, with the reverse (blank) side showing.
- 1 wooden marking silhouette measuring 1 inch by 0.5 inch by 22 inches.
- 1 F-type silhouette (reduced by half its size) measuring 7.5 by 3.75 inches (Chapter 4).

## CONDUCT

F-12. The instructor shows the target to the machine gun crews. He points out its parts and explains its use as follows:

- The gunner takes a normal position behind the machine gun. The gunner is required to aim at a prescribed point on the silhouette target and to maintain that aim during the uniform movement of the target.
- The assistant gunner takes a normal position next to the gunner. The assistant gunner assists the gunner in maintaining the point of aim.
- The ammunition bearer is located 25 meters away behind the basic machine gun target with the target. The bearer moves the target back and fourth, up and down in any direction he wants. The movement should be consistent and not uniform, so that the gunner and assistant gunner can get proper training. The speed that the ammunition bearer moves depends on the instructor.

F-13. The instructor watches the gunner and determines if the gunner or assistant gunner is properly doing the exercise by telling the ammunition bearer to stop and hold. He informs the gunner or assistant gunner to stand.

F-14. The instructor positions himself behind the gun and looks through the sights to see where the gunner or assistant gunner was aiming. The instructor now explains the errors noted. When the instructor believes the gunner is proficient, the assistant gunner begins his exercise.

## ENGAGEMENT SKILLS TRAINER

F-15. The engagement skills trainer (EST) 2000 (Figure F-4) is a home station, indoor, multipurpose, multilane, small arms simulator. The EST augments and substitutes individual, crew, and static-squad collective training. Using projected imagery and laser-light technologies, the EST 2000 provides weaponry that simulates the same physical, functional, operational characteristics, and capabilities of service

weapons. Weaponry for the EST 2000 includes the M16A2 rifle, M4 carbine, M9 pistol, M249 automatic rifle/light machine gun, M60, M240B and M2 machine guns, MK 19 grenade machine gun, M136 AT4, M1200 shotgun, and M203 grenade launcher.

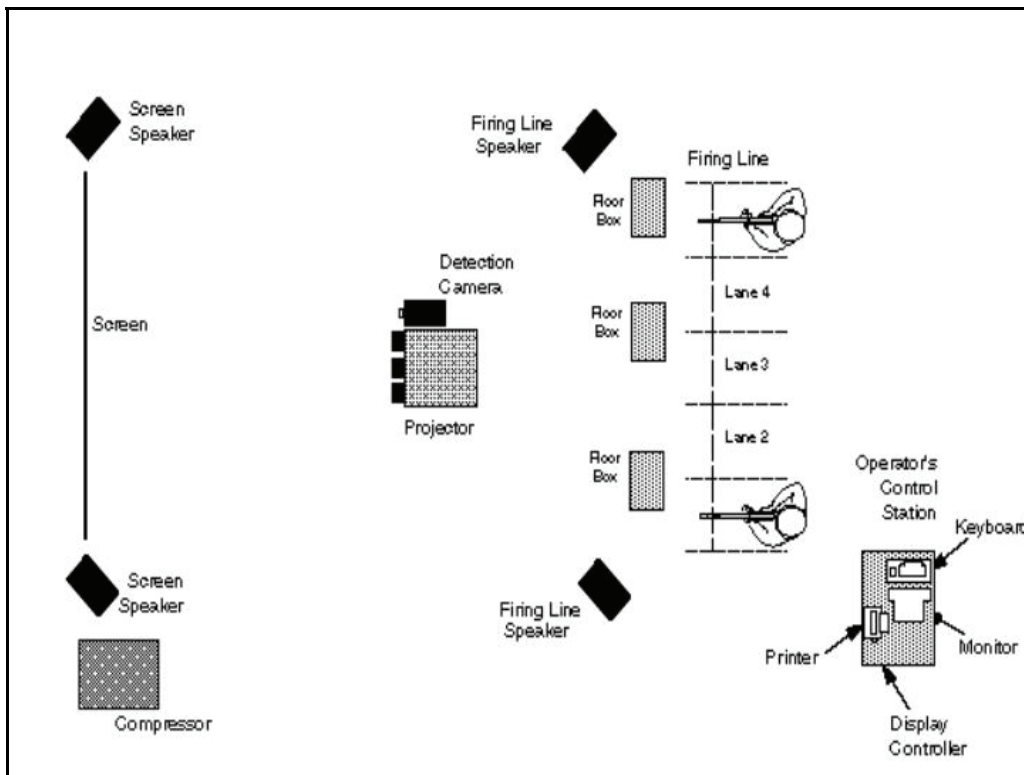


Figure F-4. EST 2000.

F-16. The EST 2000 is a modular system with an operational size of 35 feet by 35 feet by 8 feet high for a 10-lane system. Training programs include standard Army courses of fire, “shoot-don’t shoot” decision training, and static-squad or element collective defensive training for infantry, scouts, engineers, military police, and CS or CSS. Basis of issue is one 15-lane EST 2,000 for each OSUT or BCT battalion supporting Initial Entry Training (IET) and one 10-lane EST 2,000 for each brigade-size element for Active and Reserve Component units for sustainment training. Tables F-1, F-2, and F-3 show the capabilities and limitations for each training program.

<b>MARKSMANSHIP TRAINING PROGRAM</b>	
209 marksmanship exercises, from zeroing through record-fire courses.	
<b>Capabilities</b>	<b>Limitations</b>
Train and sustain M16A2 rifle skills.	No qualification. No weather effects.
Train and sustain M4 carbine skills.	No qualification. No weather effects.
Train and sustain shotgun skills.	No qualification. No nonlethal munitions training.
Train and sustain M9 pistol skills.	No qualification. No weather effects.
Train and sustain light MG skills.	No maneuver training.
Train and sustain AR skills.	No maneuver training.
Train and sustain MMG skills.	No maneuver training.
Train and sustain M2 HB MG skills.	No maneuver training.
Train and sustain M203 GL skills.	No maneuver training. No nonlethal munitions.
Train and sustain MK 19 grenade MG skills.	No maneuver training.
Train antiarmor weapons employment.	No maneuver training.

**Table F-1. Marksmanship training capabilities and limitations.**

<b>COLLECTIVE TRAINING PROGRAM</b>	
178 squad tactical exercises against varying enemy targets, in terrain that varies from woodlands, desert, urban, and mountains that are typical of terrain found throughout the world.	
<b>Capabilities</b>	<b>Limitations</b>
Train and sustain defensive operations.	No offensive operations.
Train and sustain overwatch operations.	Nontactical interaction.
Train and sustain passage of lines.	Overwatch only.
Train and sustain ambush operations.	Limited eye points. Restricted interaction with on-screen CGI forces.
<b>Note:</b> No effects of weather and firing position distances under squad leader and fire-team leader control.	

**Table F-2. Collective training capabilities and limitations.**

<b>“SHOOT-DON’T SHOOT” TRAINING PROGRAM</b>	
Forty “shoot-don’t shoot” judgment exercises.	
<b>Capabilities</b>	<b>Limitations</b>
Train and test rules of engagement.	No shoot back. No nonlethal training mode.
Train target selection under stress.	No shoot back.
Train target engagement under stress.	No shoot back.
Train verbal skills to de-escalate.	No direct adversary reactions.

**Table F-3. “Shoot-don’t shoot” training capabilities and limitations.**

F-17. The EST trains many skills, but it is not intended to replace live qualification or MILES force-on-force tactical training. Its many capabilities are clearly definable, but its limitations preclude total elimination of training ammunition resources. Training on the EST is planned to save ammunition resources, both at the assistant gunner and secondary firer positions, and in peripheral training exercises such as protective mask and night-fire small-arms training. The EST 2000 enhances moving target training exercises. Sometimes shortages of range facilities or environmentally safe range resources prevent training in night, moving, and protective mask. The EST 2000 is the only three-mode training device capable of conducting realistic range operations while sustaining STRAC standards for individual weapons training, sustaining collective tactical skills and training, and sustaining judgment engagements for the peace-keeping role of today’s forces.

## Appendix G

# Proficiency (Performance) Examination

A proficiency examination determines if a Soldier can perform all the tasks taught in the dry-fire training. This Appendix is a guide for administering the examination to gunners.

### DRY-FIRE PROFICIENCY EXAMINATION

G-1. The examination is a practical nonfiring exercise given during the last period of instruction on the machine gun before range firing. It may be held indoors if there are available facilities. The Soldier must demonstrate that he can perform the following tasks:

- General disassembly and assembly.
- Placement of direction and elevation readings on the T&E mechanism.
- Immediate action.
- Field zeroing.
- Engagement of a linear and a deep target.

### CONDUCT OF THE EXAMINATION

G-2. Leaders can use the following schedule or modify it to fit their unit's training:

- Orientation, instructions, breakdown, and movement—15 minutes.
- Five stations—30 minutes each.
- Two breaks—10 minutes each.
- Four movement periods—5 minutes each.
- Total time—3 hours, 25 minutes.

### STATION 1, PERFORM GENERAL DISASSEMBLY AND ASSEMBLY

G-3. This station normally has 11 setups. Each has one tripod-mounted machine gun with cover raised, bolt forward, and safety on "F." The gun is placed on a mat to keep the parts clean. Read the following:

*"DURING THIS PERIOD, YOU WILL BE ORGANIZED INTO THREE GROUPS AND REQUIRED TO DISASSEMBLE AND ASSEMBLE THE MACHINE GUN. FOR EVERY TWO GUNNERS, WE PROVIDE ONE MACHINE GUN AND ONE GRADER. EACH GROUP WILL HAVE EIGHT MINUTES TO COMPLETE GENERAL DISASSEMBLY AND ASSEMBLY.*

*"IF YOU HAVE ANY TROUBLE, RAISE YOUR HAND AND THE GRADER WILL HELP YOU.*

*"THE OTHER TWO GROUPS WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TO THE WORKING AREA. THEY WILL TURN AROUND ONLY WE CALL THEM."*

G-4. Prepare a scoresheet ahead of time based on the example format shown in Figure G-1. Use this to grade individual performance. As each group completes this station, each grader should assemble the Soldiers he graded and give them a thorough critique (6 minutes).

<b>CHECKLIST/EXAMPLE SCORESHEET FORMAT</b>		<b>GO</b>	<b>NO GO</b>
<b>STATION 1, GENERAL DISASSEMBLY AND ASSEMBLY</b>			
1.	Cleared the machine gun as prescribed.		
2.	Disassembled the machine gun as prescribed for that machine gun. a. Removed the buttstock and buffer assemblies. b. Removed the driving spring rod assembly. c. Removed the bolt and operating rod assemblies. (Kept bolt and operating rod together.) d. Removed the trigger housing assembly e. Removed the cover assembly. f. Removed the feed tray. g. Removed the barrel assembly and heat shield. h. Removed the handguard from the receiver.		
3.	Assembled the machine gun as prescribed for that machine gun. a. Replaced the handguard on the receiver. b. Replaced the barrel assembly with the heat shield. c. Replaced the cover assembly and feed tray. d. Replaced the trigger assembly. e. Replaced the bolt and operating rod assembly. f. Replaced the driving spring rod assembly. g. Replaced the buttstock, pulled the bolt to the rear, closed the cover, and pulled the trigger.		
4.	Completed task in 8 minutes.		

Figure G-1. Example format for Station 1 scoresheet.

## STATION 2, PLACE DIRECTION AND ELEVATION READINGS ON THE T&E MECHANISM

G-5. This station normally has 11 setups. Each has one tripod-mounted machine gun complete with pintle and platform group and traversing-and-elevating mechanism. For the first direction reading, the grader should ensure that the traversing slide is an even 5-mil graduation on the traversing bar. The gunner is required to place 1 to 4 mils on the traversing handwheel; for example, L242. This requires the gunner to center the traversing mechanism before he can place the next direction reading on it. The second direction reading should be in the opposite direction; for example, R240. The second elevation reading should also be a major change: +50/32 to -50/17. Read the following:

*"DURING THIS PERIOD, YOU WILL BE ORGANIZED INTO THREE GROUPS AND REQUIRED TO PLACE TWO SETS OF READINGS ON THE TRIPOD-MOUNTED MACHINE GUN. A GRADER WILL CHECK YOUR FIRST SET OF READINGS BEFORE YOU PLACE THE SECOND SET ON THE TRIPOD-MOUNT MACHINE GUN. YOU WILL BE ALLOWED EIGHT MINUTES AT THIS STATION. IF YOU HAVE ANY TROUBLE, RAISE YOUR HAND AND THE GRADER WILL ASSIST YOU. THE TWO GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARDS THE WORK AREA UNTIL THEY ARE CALLED."*



G-6. Prepare a scoresheet ahead of time based on the example format shown in Figure G-2. Use this to grade individual performance. As each group completes this station, each grader should assemble the Soldiers he graded and give them a thorough critique (6 minutes).

<b>CHECKLIST/EXAMPLE SCORESHEET FORMAT</b>		<b>GO</b>	<b>NO GO</b>
<b>STATION 2, PLACE DIRECTION AND ELEVATION READINGS ON THE T&amp;E MECHANISM</b>			
1.	Placed first set of readings on the T&E mechanism. a. Centered the traversing handwheel. b. Placed direction reading on T&E mechanism. c. Placed elevation reading on T&E mechanism.		
2.	Placed second set of readings on T&E mechanism. a. Placed directing reading on T&E mechanism. b. Placed elevation reading on T&E mechanism.		
3.	Completed task in 8 minutes.		

Figure G-2. Example format for Station 2 scoresheet.

### STATION 3, PERFORM IMMEDIATE ACTION

G-7. This station normally has six setups. Each has a cleaning rod and a bipod-mounted machine gun with bolt forward, cover closed, and safety on “F” position. The grader should ask the individual to perform immediate action as he would if a round were in the chamber and would not fire providing the barrel was not hot enough to cause a cookoff. Read the following:

*“DURING THIS PERIOD, YOU WILL BE ORGANIZED INTO FIVE GROUPS AND REQUIRED TO GO THROUGH THE STEPS OF IMMEDIATE ACTION AND REMEDIAL ACTION WITH THE MACHINE GUN. YOU WILL BE ALLOWED FIVE MINUTES. IF YOU HAVE ANY TROUBLE, RAISE YOUR HAND AND A GRADER WILL ASSIST YOU. THE GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARDS THE WORK AREA UNTIL THEY ARE CALLED.”*

G-8. Prepare a scoresheet ahead of time based on the example format shown in Figure G-3. Use this to grade individual performance. As each group completes this station, each grader should assemble the Soldiers he graded and give them a thorough critique (5 minutes).

CHECKLIST/EXAMPLE SCORESHEET FORMAT STATION 3, PERFORM IMMEDIATE ACTION		GO	NO GO
1.	Pulled the cocking handle to the rear.		
2.	Observed a round, cartridge or linked being extracted from the machine gun.		
3.	Returned cocking handle to the forward position.		
4.	Attempted to fire the machine gun.		
5.	If the machine gun did not fire, pulled the cocking handle to the rear, locking the bolt assembly to the rear.		
6.	Placed the safety on "S" and returned the cocking handle to the forward position.		
7.	When machine gun was hot, kept it pointed downrange, waited 15 minutes, then performed remedial action. When machine gun was cold, performed remedial action.		
8.	Completed the task in 5 minutes.		

Figure G-3. Example format for Station 3 scoresheet.

## STATION 4, PERFORM FIELD ZEROING

G-9. This station normally has six setups. Each has a bipod-mounted machine gun and tools. The grader tells each individual the range (500 meters) to the target and has him simulate the firing of a 7-round burst (M249) or 9-round burst (M60/M240B). The grader then tells the individual what corrections for deflection and elevation (in meters) are needed to hit the target. The gunner is then graded on his actions. Read the following:

*"DURING THIS PERIOD, YOU WILL BE ORGANIZED INTO FIVE GROUPS AND REQUIRED TO GO THROUGH THE STEPS OF FIELD ZEROING. YOU WILL BE ALLOWED FIVE MINUTES TO PERFORM AND EXPLAIN YOUR ACTIONS TO THE GRADER. IF YOU HAVE ANY PROBLEM, ASK YOUR GRADER. THE GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH THEIR BACKS TOWARDS THE WORK AREA UNTIL THEY ARE CALLED."*

G-10. Prepare a scoresheet ahead of time based on the example format shown in Figure G-4. Use this to grade individual performance. As each group completes this station, each grader should assemble the Soldiers he graded and give them a thorough critique (5 minutes).

<b>CHECKLIST/EXAMPLE SCORESHEET FORMAT</b> STATION 4, PERFORM FIELD ZEROING		<b>GO</b>	<b>NO GO</b>
1.	Placed the range setting on 500 meters.		
2.	Made corrections for deflection.		
3.	Made corrections for elevation.		
4.	Simulated firing the second burst and hitting the target.		
5.	Completed task in 5 minutes.		

Figure G-4. Example format for Station 4 scoresheet.

### STATION 5, ENGAGE A LINEAR AND A DEEP TARGET

G-11. This station normally has six setups. Each should have a punchboard-type training aid or a blackboard and chalk. The individual is required to show his point of initial lay, direction of manipulation, and extent of manipulation for a linear (single machine gun) and a deep target (pair of machine guns). The individual is also asked what rate of fire he would use to engage these targets if the rate were not stated in the fire command. Read the following:

*"DURING THIS PERIOD, YOU WILL BE ORGANIZED INTO FIVE GROUPS AND REQUIRED TO EXPLAIN HOW TO ENGAGE DIFFERENT TARGETS WITH THE MACHINE GUN EMPLOYED SINGLY AND IN PAIRS. YOU WILL BE ALLOWED FIVE MINUTES FOR SIMULATED ENGAGEMENT OF TWO TYPES OF TARGETS. IF YOU HAVE ANY QUESTIONS, ASK YOUR GRADER. THE GROUPS NOT BEING TESTED WILL REMAIN TO THE REAR OF THE STATION WITH BACKS TOWARDS THE WORK AREA UNTIL THEY ARE CALLED."*

G-12. Prepare a scoresheet ahead of time based on the example format shown in Figure G-5. Use this to grade individual performance. As each group completes this station, each grader should assemble the Soldiers he graded and give them a thorough critique (5 minutes).

<b>CHECKLIST/EXAMPLE SCORESHEET FORMAT</b> STATION 5, ENGAGE A LINEAR AND A DEEP TARGET		<b>GO</b>	<b>NO GO</b>
1.	Engaged a linear target (single machine gun). a. Used initial point of aim. b. Manipulated T&E mechanism. c. Used sustained rate of fire.		
2.	Engaged a deep target (pair of machine guns). a. Used initial point of aim. b. Manipulated T&E mechanism. c. Used sustained rate of fire.		
3.	Completed task in 5 minutes.		

Figure G-5. Example format for Station 5 scoresheet.

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## Appendix H

# Aerial Defense

This appendix describes the use of machine guns in an air defense role, including the concept and two techniques for applying lead. Also discussed are the rules of engagement and firing positions.

### PASSIVE AND ACTIVE MEASURES

H-1. A unit can take passive and active measures to defend itself against enemy air attack. Although volume fire is the key, there is a need to coordinate fires.

H-2. *Passive measures* are those that help the unit identify enemy aircraft before the aircraft locates the unit, make the unit difficult to locate, and make the unit less vulnerable when attacked. The unit must develop and practice camouflage as a passive measure. Concealment from the air must be considered when selecting routes, transportation means, or defensive positions. The use of air guards is important to give the unit time to react. Air guards should cover interlocking sectors of visible airspace.

H-3. *Active measures* for appropriate reactions to an air attack should be prescribed in unit SOPs. Each of the two techniques for applying lead is based on delivering a heavy volume of fire ahead of the target. The idea is to have every Soldier in the unit engage the target. To achieve volume fire, Soldiers armed with machine guns should fire at the cyclic rate.

H-4. If an aircraft is attacking his position, the Soldier sees the aircraft in a head-on or diving view. To engage this aircraft, the Soldier would fire slightly above the nose of the aircraft. Adjacent positions would see the aircraft in a crossing view. To engage the aircraft, these units would have to apply a proper lead. The method of applying lead depends on the technique used.

### Football-Field Technique

H-5. When engaging high-performance aircraft (those flying in excess of 200 mph), gunners should apply a one-football-field lead in front of the target and fire at the rapid rate until the target passes through the tracer stream. If the target is a low-performance aircraft, such as a helicopter, with a speed of 200 mph or less, gunners should apply half a football-field lead in front of the target, firing the cyclic rate. With all Soldiers firing, a curtain of fire is formed because of slight differences in each Soldier's estimate of the distance and lead.

### Reference-Point Technique

H-6. The unit leader designates terrain features as reference points. Upon spotting enemy aircraft, the leader commands, ENEMY AIR, REFERENCE POINT 1. At this time, the gunner points his weapon at reference point 1, elevates the weapon to about 45 degrees above the ground, and fires on command. Once he sights the target, he can make minor adjustments to align his fire on the target.

## **USE OF TRACERS**

H-7. When planning for air defense, the leader should consider the use of tracers so that the gunner can observe the tracer stream and better align his fire on the target. A unit may engage an attacking aircraft without command. If an aircraft is not attacking, the unit may not fire on it unless ordered to do so.

## **FIRING POSITION**

H-8. When firing the machine gun in an air defense role, the gunner should fire from a protected position, if possible. When not in a fighting position, he must position the weapon so that he has some type of support. In an emergency, another Soldier can provide a firing support.

## Appendix I

# Range Safety

This appendix recommends safety precautions for the ranges described in this manual, but it does not replace AR 385-63 or local regulations. Range safety requirements vary because of the varied requirements of the courses of fire.

### SAFETY PRECAUTIONS

- I-1. The following safety precautions must be observed during all marksmanship training:
- Display a red flag (red light for night firing) at the entrance to the range or in some other prominent location on the range during firing.
  - Always assume that weapons are loaded until you have thoroughly examined them and found them to contain no ammunition and barrel is clear.
  - Mark firing limits with red-and-white-striped poles that are visible to all firers.
  - Never place obstructions in the muzzles of weapons about to be fired.
  - Keep all weapons in a prescribed area and proper safeguards when not in use.
  - Do not permit smoking near ammunition, explosives, or flammables.
  - Wear hearing-protection devices during firing.

### RANGE PROCEDURES

- I-2. The range can be a dangerous place, especially if safety procedures are not followed. Everyone must stay alert and adhere to the following precautions:

#### BEFORE FIRING

- Close all prescribed roadblocks and barriers, and post necessary guards.
- Check all weapons to ensure that they are clear of ammunition and obstructions, and that the cover and feed mechanism assemblies are *up* to show they are cleared.
- Brief all personnel on the firing limits of the range and firing lanes.
- Obtain range clearance from the installation range-control office.
- Check the downrange area before firing to ensure that all personnel and equipment are clear of the area.
- Keep a complete first-aid kit on the range.
- Locate medical personnel on or near the range where they can be contacted quickly.
- Have all weapons checked by an officer or noncommissioned officer to ensure that they are operational.
- Do not handle weapons except on command from the tower operator or the officer in charge.
- Draw ammunition and issue it only on command of the officer in charge. When two or more lots of ammunition are used for firing, the officer in charge must ensure that the lots are separated and properly marked so that identification can be made by lot numbers in case of an accident or malfunction.
- Protect all ammunition from the direct rays of the sun.

- Do not allow anyone to move forward of the firing line without permission of the tower operator, safety officer, or officer in charge.

### **DURING DAY FIRING**

- Immediately order CEASE FIRE if an unsafe condition is noted during firing. Do not resume firing until directed to by the officer in charge.
- During firing, all personnel on the range must be aware of the danger in moving forward of the firing line to score their targets. Before the firing line is clear and anyone is allowed forward, the officer in charge or the safety officer will clear all weapons.
- The safety officer or NCO inspects each weapon that was fired on the firing line by making sure the bolt is locked to the rear and the safety is on. He makes sure each barrel is clear by running a cleaning rod through the barrel until he can see the end of the rod in the receiver. He performs the safety check.

### **DURING NIGHT FIRING**

- To ensure all personnel and equipment are clear of the downrange area before firing, ask over the PA three times, pausing each time to wait for a response, "*Is anyone downrange*"?
- In addition to using a red flag, place a blinking red light at the entrance to the range or at some other prominent location.
- Mount two red lights on the striped poles marking the right and left limits of fire. They must be visible to all firers.
- Prohibit anyone from leaving his position until told to do so by the officer in charge.

### **AFTER FIRING**

- Have safety personnel inspect all weapons to ensure that they are clear, and check to determine if the Soldiers have any brass, links, or live ammunition.
- When weapons have been cleared, keep them in a prescribed area with the bolt locked to the rear and the weapon on safe.



## Appendix J

# Advanced Optics and Lasers

Sophisticated systems increase the night firing accuracy of all crew-served machine guns. They mainly enhance the gunner's ability to engage targets effectively at 1,000 meters or more.

The Army has an established, day and night, advanced marksmanship program. This program has training strategies and proposed qualification standards. However, this appendix implements new night qualification standards that complement current Army training strategies. Commanders should follow these training strategies and enforce these new qualification standards the best they can.

Before starting a night marksmanship program, Soldiers must qualify on their assigned weapons in daylight.

Although at first some of the courses of fire might seem redundant or inappropriate, numerous tests have shown that these training strategies work. If the commanders implement this training strategy, the qualification standards are achievable.

This appendix describes the following, and provides guidelines for mounting, boresighting, and zeroing these devices:

- Two laser systems (AN/PAQ-4C and AN/PEQ-2A).
- One thermal sight (AN/PAS-13).
- One telescope (M145 MGO).

### SECTION I. BORESIGHTING AND ZEROING PROCEDURES

This section discusses boresighting and zeroing procedures for all four devices.

#### BORE LIGHT

J-1. The bore light is a visible laser that the gunner aligns with the barrel of the designated weapon. The bore light provides an accurate way to zero weapons to most aided-vision equipment without ammunition. The gunner invests time and effort to ensure a precise boresight, which saves time and ammunition. All four of the devices discussed in this Appendix can be zeroed to all three crew-served weapons in this manual using the bore light. After boresighting with optics, the gunner must zero the weapon at 25 meters. The precise boresighting possible using a laser lets the Soldier directly engage targets without zeroing at 25 meters.

#### INTENT

J-2. The gunner aligns the bore of the weapon to the optic, laser, or iron sight he is firing. This reduces or eliminates the time and ammunition currently required to zero with live rounds.

### SPECIAL INSTRUCTIONS

- *Zero* the bore light.
- *Use* only the 10-meter offsets approved by Picatinny Arsenal.
- *Use* the appropriate 10-meter offset for each weapon configuration.
- *Boresight* 10 meters from the end of the barrel.
- *Stabilize* the weapon and offset to ensure an accurate boresight.
- *Install* filters for aiming lasers to reduce blooming.

### OBSERVABLES

- *Confirm* that the bore light spins on itself when zeroed at 10 meters.
- *Boresight* with the official and appropriate offsets only.
- *Keep* the weapon and offset still during the boresighting.
- *Center* the bore light on the offset circle.
- *Orient* aiming device on the center of the offset crosshair.

#### WARNING

To avoid permanent vision damage --

- **Avoid staring into a visible laser beam, either with the naked eye or through a lens (binoculars, sight, or telescope).**
- **Avoid pointing a visible laser beam at a mirror-like surface, reflecting it back into your eyes.**
- **Avoid shining a visible laser beam into someone else's eyes.**

#### WARNING

**Before using the bore light, clear the weapon and put it on SAFE, and lock the bolt forward.**

J-3. The gunner avoids loosening the bore light from the mandrel when rotating it to zero by ensuring that the mandrel is turning counterclockwise (from his point of view).

## CONCEPT OF BORESIGHTING

J-4. Boresighting is a simple procedure that can save time and ammunition only if the gunner follows the procedures outlined in this section. Then, using a 10-meter offset, he boresights the weapon with any optic, laser, or iron sight that he is assigned to fire. He does this by simply ensuring that the visible laser of the bore light aligns with the barrel. He then does this by zeroing the bore light to the weapon, then places the visible laser of the bore light in a designated spot on the 10-meter offset. Once he completes this procedure, he moves the aiming point of the aiming device to the crosshair on the 10-meter offset. This completes the boresighting of the weapon system. The gunner is ready to engage targets or conduct a 25-meter zero. Using optics and the bore light, such as the MGO, TWS, and PVS-4, will put the gunner "on paper" at 25 meters, thus reducing time and ammunition wasted trying to locate rounds during the 25-meter zeroing. With lasers, the bore light lets the gunner boresight and then engage targets, eliminating the 25-meter zeroing procedures altogether.

## PROCEDURES FOR ZEROING BORE LIGHT TO WEAPON

J-5. Before boresighting the weapon system, the gunner zeroes the bore light to the weapon. He takes a flashlight and shines it through the barrel of the weapon. At 10 meters, he marks where the flashlight shines. Then, without moving the weapon, the gunner fires one round. The spot where the round impacts and the spot where the flashlight shines should be the same. Likewise, when the gunner zeroes the bore light to the weapon, he aligns the visible laser with the barrel of the weapon, which would then hit the same spot the flashlight did.

### WARNING

#### LASER

**Do not overadjust the laser at Soldiers.**

## STABILITY

J-6. The gunner must stabilize the weapon on a tripod or bipod, at least. However, it need not be perfectly level in order to boresight. If he has already zeroed the bore light, then he skips to the boresighting procedures. Attach the 5.56-mm or 7.62-mm mandrel to the bore light. Insert the mandrel into the muzzle of the weapon. The bore light is seated properly when no further travel of the mandrel into the muzzle is permitted and the mandrel spins freely. The gunner stabilizes the weapon so that it will not move. The commands of *Start Point* and *Half Turn* ensure clear communication between the Soldier by the weapon and the Soldier by the offset.

## 10 METERS

J-7. The gunner can measure 10 meters using the 10-meter cord that comes with the bore light or simply pace off eleven paces.

## ZEROING MARK

J-8. The zeroing mark (Figure J-1) is nothing more than a small dot drawn on a piece of paper, tree bark, or the bore light reference point on the 10-meter offset.

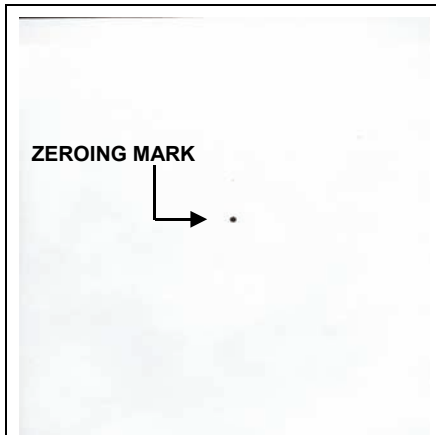


Figure J-1. Example of a zeroing mark.

### START POINT

J-9. The gunner rotates the bore light counterclockwise until the battery compartment is facing upward and the adjusters are on the bottom. This position of the bore light and the direction in which the visible laser is pointing form the start point (Figure J-2).

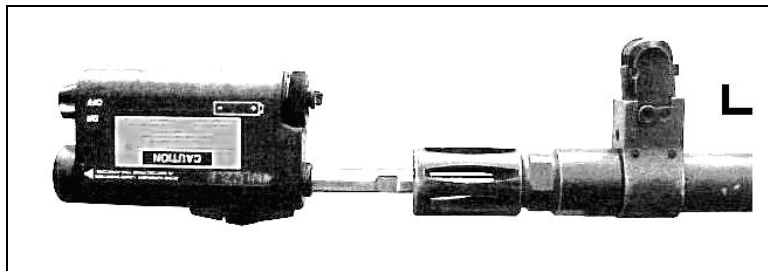


Figure J-2. Bore light in the start-point position.

### HALF TURN

J-10. The gunner rotates the bore light counterclockwise until the battery compartment is down and the adjusters are on top. This technique allows for easy access to the adjusters and helps with communication and stabilization of the weapon while conducting the boresighting procedures. This position of the bore light and the direction where the visible laser is pointing is called the "half-turn position" (Figure J-3).



Figure J-3. Bore light in the half-turn position.

## REFERENCE POINT

J-11. The reference point is about halfway between the *start point* and the *half-turn point* (Figure J-4).

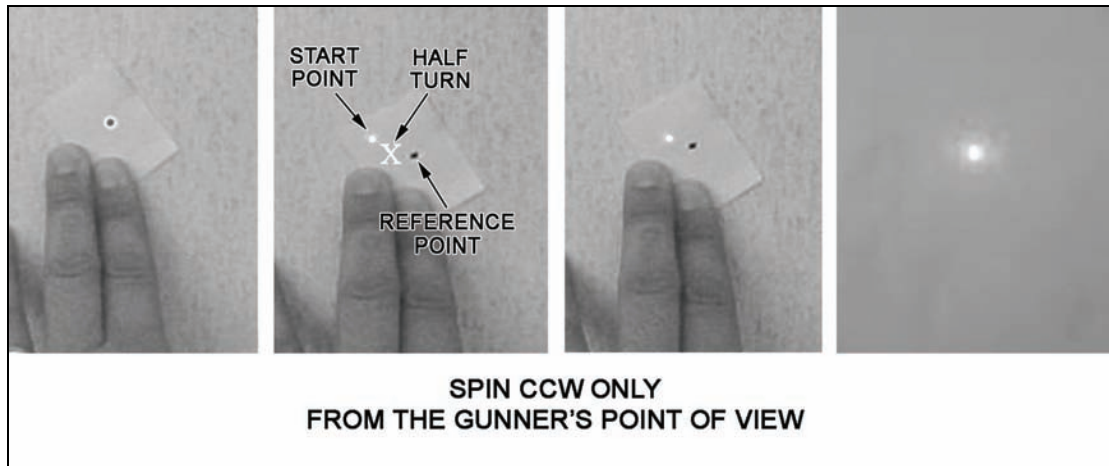


Figure J-4. Example start point, half-turn point, and reference point.

## PROCEDURES FOR BORESIGHTING

J-12. The gunner turns the bore light on and spins it until it is in the *start point* position. He gets a zeroing mark and puts a dot on it. He places the zeroing mark about 10 meters from the end of the barrel so that the visible laser strikes the zeroing mark. He slowly rotates the bore light 360 degrees, while watching the visible laser made by the bore light. If the visible laser stops on the zeroing mark, the bore light is zeroed to the weapon. If the bore light does not stop on the zeroing mark, then he must adjust elevation and windage on the bore light. From the *start point*, he realigns the zeroing mark with the visible laser and rotates the bore light 180 degrees into the *half-turn position*. Then identifies the *reference point*. Using the adjusters on the bore light moves the visible laser to the reference point. The gunner rotates the bore light back to the *start point*; and he moves the zeroing mark to the visible laser. If he cannot locate the visible laser once he has spun the bore light into the *half-turn position*, he starts this procedure again at 2 meters instead of 10 meters. Once he adjusts the visible laser to the *reference point* at 2 meters, he starts the procedure again at 10 meters. He repeats these steps until the visible laser spins on itself.

## BORESIGHT TARGET OFFSET

J-13. The 10-meter boresight offset grids are 1-centimeter squares, unlike the 25-meter zero targets. Stability of the weapon is crucial in boresighting, during which the gunner moves the bolt to the forward position. He avoids canting the weapon left or right during this process. Two Soldiers (a firer and a target holder) are needed to properly boresight a weapon.

## FIRER

J-14. The gunner's primary duty is to zero the bore light and make all adjustments on the aided-vision device being used.

## TARGET HOLDER

J-15. The target holder secures the 10-meter boresight target straight up and down 10 meters from the bore light and directs the firer in making the necessary adjustments to the aiming device. The target holder *must* wear night vision goggles when boresighting infrared aiming lasers.

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*Note:* Weapon stability is crucial; orientation is irrelevant.

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## SECTION II. AN/PAQ-4C AIMING LIGHT

This section focuses on the AN/PAQ-4 aiming light, which projects an infrared laser beam invisible to the naked eye but visible through night vision devices. This aiming light works with the AN/PVS-7B/C/D goggles and AN/PVS-14. The AN/PAQ-4C mounts on various weapons with mounting brackets and adapters.

### DESCRIPTION AND DATA

J-16. The gunner activates the AN/PAQ-4 aiming light (Figure J-5) by rotating the ON/OFF switch lever or the button on the optional cable switch. Either switch connects power from two AA batteries to an internal electronic circuit, which produces the infrared laser. Internal lenses focus the infrared light into a narrow beam. Rotating the mechanical adjusters with click detents controls the direction of the beam. The gunner uses these adjusters to zero the aiming light to the weapon. Once zeroed to the weapon, the aiming light projects the beam along the line of fire of the weapon. The optical baffle prevents off-axis viewing of the aiming light beam by the enemy.

Optics	100 percent parallax free, anti-reflective coated lens system.
Length (sight)	14 centimeters (5.5 inches)
Weight	164 grams (5.78 ounces)
Height	3 centimeters (1.2 inches)
Width	6.5 centimeters (2.5 inches)
Range	Beyond 600 meters. (Actual range depends on light level and night vision device used for observation.)
Battery life	100 hours of operating (on) time for AA batteries in temperatures above 0 degrees Centigrade (32 degrees Fahrenheit). 36 hours of operating time below 0 degrees Centigrade (32 degrees Fahrenheit).

**Table J-1. Data for the AN/PAQ-4.**

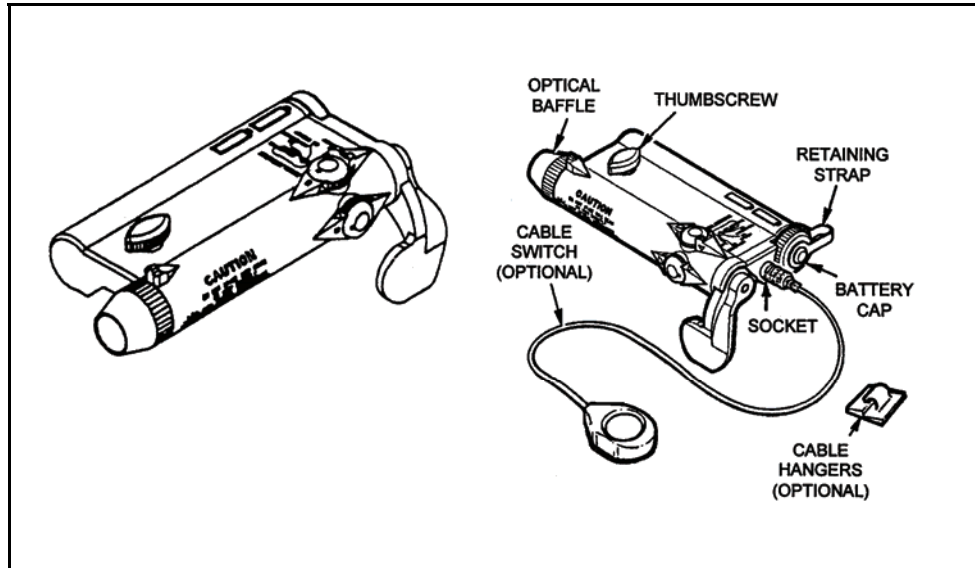


Figure J-5. AN/PAQ-4 aiming light.

## M249 MACHINE GUN

J-17. This paragraph discusses mounting and dismounting procedures for the M249 machine gun.

### MOUNTING PROCEDURES

J-18. The gunner uses the AN/PVS-4 mounting bracket when mounting the AN/PAQ-4 on the M249 machine gun.

#### CAUTION

##### ALIGNMENT FOR MOUNTING

When mounting an AN/PAQ-4 to the mounting bracket, ensure that the screw hole in the AN/PAQ-4 is lined up with and sits right up against the bracket screw. Otherwise, the screw will strip the threads in the screw hole.

- **Install** the AN/PVS-4 mounting bracket by first placing the mounting bracket on top of the feed cover mechanism assembly so that the two forked ends are secured around the headless pins.
- **Remove** the screw cover behind the rear sight assembly.
- **Screw** in the bracket knob until tight.
- **Install** the bracket adapter (Figure J-6).

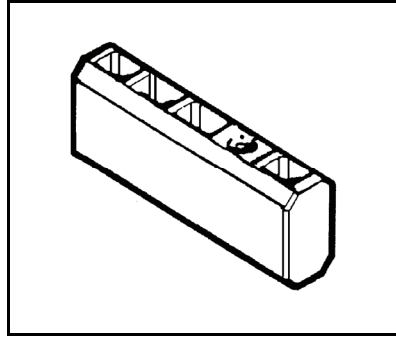


Figure J-6. Bracket adapter.

- *Attach* the AN/PAQ-4 on the bracket adapter (Figure J-7).

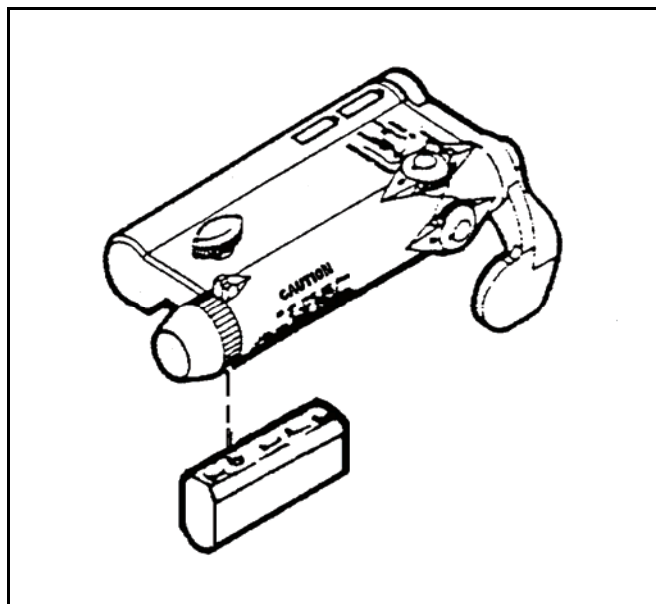


Figure J-7. Attachment of bracket adapter to aiming light.

- *Attach* the AN/PAQ-4 to the AN/PVS-4 mounting bracket by first positioning the AN/PAQ-4 on top of the bracket so the spacer of the AN/PAQ-4 is aligned with the mounting knob of the bracket.
- *Turn* the mounting knob clockwise until the AN/PAQ-4 is tight.

**WARNING**

**Remove batteries before storing the AN/PAQ-4.**

**DISMOUNTING PROCEDURES**

- *Detach* the AN/PAQ-4 from the AN/PVS-4 mounting bracket.
- *Turn* the mounting knob counterclockwise until the AN/PAQ-4 is loose.



- **Remove** the AN/PAQ-4 and spacer from the bracket.
- **Remove** the spacer from the AN/PAQ-4.
- **Remove** the AN/PVS-4 mounting bracket.
- **Unscrew** the bracket knob until the rear of the bracket is loose.
- **Replace** the screw cover behind the rear sight assembly.
- **Remove** the two forked ends from the headless pins.
- **Lift up** on the mounting bracket to remove it from the feed cover mechanism assembly.

## M60 MACHINE GUN

J-19. This paragraph discusses mounting and dismounting procedures for the M60 machine gun.

### MOUNTING PROCEDURES

J-20. The gunner uses the AN/PVS-4 mounting bracket when mounting the AN/PAQ-4 on the M60 machine gun.

#### CAUTION

##### ALIGNMENT FOR MOUNTING

When mounting an AN/PAQ-4 to the mounting bracket, ensure that the screw hole in the AN/PAQ-4 is lined up with and sits right up against the bracket screw. Otherwise, the screw will strip the threads in the screw hole.

- On the M60 machine gun bracket (Figure J-8), **remove** the M60 hinge pin latch and hinge pin from the over assembly by pressing on the latch (open end of pin) with an empty cartridge case.
- **Separate** the latch and pin.
- **Place** the pin, latch in the aiming guides on the left side of the mounting bracket, and press together.
- **Position** the mounting bracket assembly on top of the machine gun cover so that the holes in the front of the bracket align with the cover assembly pinholes.
- **Insert** the longer hinge pin supplied with the bracket through the bracket and cover assembly, and secure it by inserting the hinge pin latch.
- **Loosen** the wing nuts on both leg clamps.
- **Position** the clamps under the cover assembly. Secure the mounting bracket by tightening the wing nuts firmly. Place the split washer is placed next to the wing nut and the flat washer is placed next to the bracket.

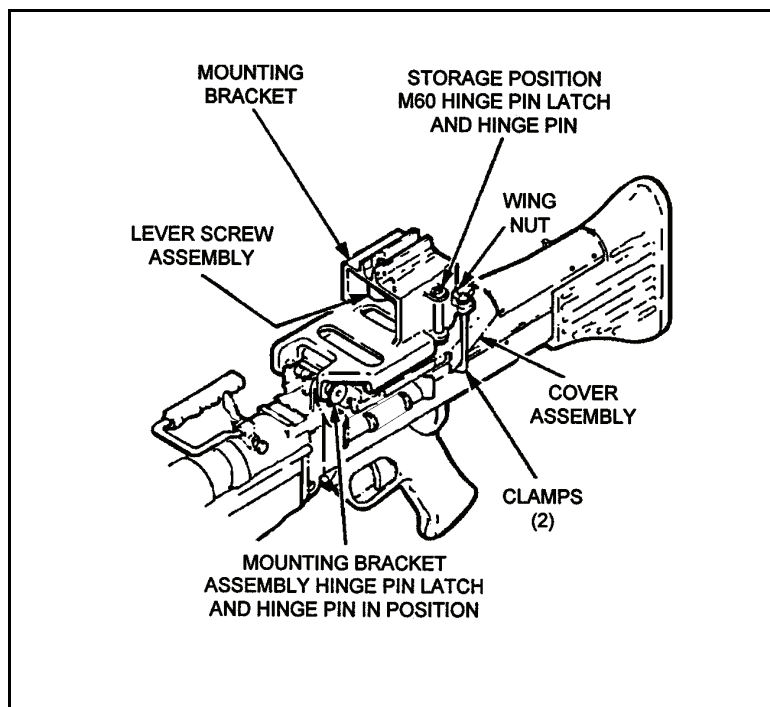


Figure J-8. Installation of M60 mounting bracket.

- Install the sight on the M60 mounting bracket assembly by positioning it in the groove on top of the bracket so that the scribe line on the bracket is aligned with the scribe line on the sight-mounting adapter. Tighten the lever screw assembly to secure the sight to the bracket. Use an empty cartridge case placed over the lever arm to increase leverage as you tighten the screw.

### DISMOUNTING PROCEDURES

- **Unscrew** the lever screw assembly by turning it counterclockwise and remove the AN/PAQ-4 from the mounting bracket.
- **Use** an empty cartridge case placed over the lever arm for increased leverage, if necessary.
- **Loosen** the wing nuts on both leg clamps.
- **Push down** on the longer hinge pin latch with an empty cartridge case, and then remove the hinge pin and latch.
- **Remove** the mounting bracket from the machine gun.
- **Remove** the M60 hinge pin and latch from the left side of the bracket by pushing on the hinge pin latch and pulling out the hinge pin.
- **Replace** the M60 hinge pin and latch.
- **Remove** the batteries when storing the sight.

## M240B MACHINE GUN

J-21. This paragraph discusses mounting and dismounting procedures for the M240B machine gun.

### MOUNTING PROCEDURES

J-22. Before zeroing and qualifying with the AN/PAQ-4, the gunner must mount the sight onto his weapon. The M240B machine gun has a rail mount already attached to the cover assembly.

- **Install** the sight on the M240B rail mount by loosening the mounting knob located on the left side.
- **Position** the sight in a slot on the rail mount. Any slot can be used as long as the mount does not hang over the edge of the rail.
- **Hand tighten** the knob (clockwise) on the mount until a clicking noise is heard (two clicks).
- **Place** the sight in the same slot after zeroing to ensure that the sight retains its zero.

### WARNING

**Remove batteries before storing the AN/PAQ-4.**

### DISMOUNTING PROCEDURES

J-23. The gunner must loosen the mounting knob on the left side of the bracket, then lift up on the sight to remove it from the M240B machine gun.

- **Adjust** the bore light, if necessary.
- **Move** the target to a distance of 2 meters.
- **Mark** the location of the laser dot.
- **Slowly rotate** the bore light one-half turn. Note the new location of the laser dot.
- **Adjust** the windage and elevation until the laser dot moves halfway back to its original location. Continue the procedure until the laser dot remains stationary (or spins upon itself within 1 centimeter) when the bore light is rotated.
- **Move** the target to a distance of 10 meters and recheck the boresight.
- **Boresight** the AN/PAQ-4 to the weapon.
- **Select** the target (boresight offset) for the appropriate weapon and the AN/PAQ-4.
- **Position** the weapon so the bore light strikes the small dot on the boresight target.
- **Zero** the AN/PAQ-4 by turning both windage and elevation knobs (for the pointer and illuminator) fully clockwise until they stop.
- **Rotate** counterclockwise three turns.
- **Align** the white dot on the adjuster with the center of the front adjuster flange (Figure J-9).

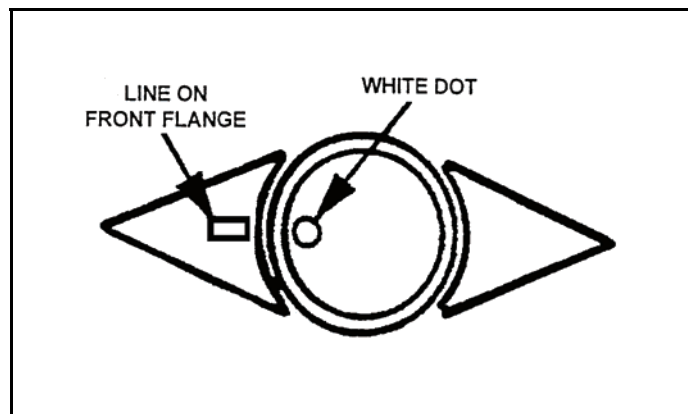


Figure J-9. Adjuster alignment.

## PROCEDURES FOR BORESIGHTING AND ZEROING

J-24. The gunner uses the following procedures are used to boresight and zero the M249, M60, and M240B machine guns using the AN/PAQ-4C aiming light:

### BORESIGHT

J-25. The gunner checks the alignment of the bore light.

- **Place** the appropriate mandrel with the bore light attached in the muzzle of the weapon.
- **Turn on** the bore light so that the laser dot strikes the target (offset) 10 meters away.
- **Slowly rotate** the bore light one-half turn (180 degrees) while watching the dot made by the laser on the target area.
  - If the dot remains stationary, the laser is boresighted. Go to step 3, and use the appropriate boresight target for the weapon you are boresighting.
  - If the dot rotates in a circle, adjust the windage, elevation, or both until the dot remains stationary or rotates on itself no more than 1 cm. Go to step 2.

### 25-METER ZERO

J-26. The gunner chooses the appropriate offset from TM 11-5855-309-12&P, and draws it on the 25-meter zero target. He follows the procedures above and zeroes the weapon with the AN/PAQ-4. He fires three rounds (one at a time) before triangulating the shot group. Once the weapon is zeroed on the 25-meter zero range, the gunner follows the procedures outlined below for field zeroing to obtain an accurate zero.

### FIELD ZERO

J-27. If the adjustment screws are turned too far, they will break. If the laser is side-mounted, the elevation and windage knobs will switch roles.

- **Assume** a good prone bipod-supported position.
- **Fire** a seven-round burst at the target. Note the burst pattern on the ground in relation to the target.
- **Correct** for windage (if rounds impact right or left of the target). Note that each click of the windage knob sight moves the group on the target mil (1/2 mil equals 6 inches at 300 meters or 10 inches at 500 meters).
- **Correct** for elevation (if rounds impact over or short of the target).
- After making corrections on the sight, **fire** a confirming burst.
- If you fail to hit the target with the confirming burst, **repeat** these procedures.
- **Treat** each subsequent burst as if it were the initial burst.
- **Prepare** the sight for field zeroing.
- **Check** the sight. The preferred range is 300 meters.

## TRAINING STRATEGIES

J-28. Two training strategies have been devised to train Soldiers adequately in the use of the infrared aiming laser devices. The *night initial* training strategy is used for Soldiers who have little or no previous experience with night vision goggles or with units beginning a night training program. The *night sustainment* training strategy is for Soldiers who are familiar with night vision goggles and with units who have already implemented a night training program. The night initial training strategy is conducted over a two- to three-day time frame and consists of the following:

### DAY 1

#### Night Vision Goggles Training With Terrain Walk When Firing Aiming Lasers

J-29. Soldiers receive in-depth instruction on the proper use and fit of night vision goggles, to include characteristics and capabilities, maintenance, and mounting procedures. At night, Soldiers conduct a terrain walk to become more familiar with and build confidence using the night vision goggles.

#### Aiming Device Training

J-30. Soldiers receive familiarization training on the aiming device. This training covers operation and characteristics, maintenance procedures, and mounting procedures.

#### Fundamentals of Firing

J-31. This training covers body position, foxhole, and prone. Soldiers review and practice firing positions and fundamentals of marksmanship and any changes that occur when using this aiming device.

### DAY 2 TO 3

#### Weapon and Equipment

J-32. The trainer inspects the weapon and aiming device to ensure the aiming device is mounted securely to the weapon. A review of clearing or misfire procedures is important. The Soldiers may use dummy rounds to practice correcting malfunctions with their eyes closed or during limited visibility.

#### Boresight Aiming Device to Weapon

J-33. Each Soldier boresights the weapon and aiming device at a range of 10 meters. If a bore light is unavailable, then he zeroes and sights the weapon at 25 meters using the specified zeroing procedure for that combination of weapon and sight. For course of fire, he uses Firing Table II, tripod transition fire, all weapons, which describes the aiming laser and the AN/PVS-4 firing table. MGO and TWS fire the day qualification table. Gunners using the MGO and TWS fire the day qualification table.

### FIELD FIRE I

J-34. Perform dry-fire exercise without ammunition:

- **Assume** a stable, prone firing position.
- **Fire** the weapon, maintaining sight alignment and sight picture.
- **Pull** the trigger correctly by pulling straight to the rear and releasing the trigger.

- **Pull** the trigger straight to the rear and say to yourself, “*Fire a burst of seven.*” After the word “*seven,*” **release** the trigger.
- **Apply** correct traversing and searching techniques. *Traversing* means moving the muzzle of the weapon to the left or to the right to distribute fire laterally. *Searching* means moving the muzzle of the weapon up or down to distribute fire in depth. To change the elevation, **move** your elbows closer or farther apart.
  - For minor traversing changes, **shift** your shoulder slightly to the right or left.
  - For major traversing changes, **move** your elbows and align your body directly behind the weapon.
- The following targets are used for Field Fire I:
  - 200-meter target single E-type silhouettes.
  - 300-meter target single E-type silhouettes.
  - 400-meter target double E-type silhouettes.
  - 500-meter target double E-type silhouettes.
  - 200-meter single E-type and 500-meter double E-type silhouettes.
  - 300-meter single E-type and 400-meter double E-type silhouettes.
  - 200-meter single E-type silhouettes.
  - 400-meter double E-type silhouettes.
  - 600-meter double E-type silhouettes.

### FIELD FIRE II

J-35. The gunner performs a timed, dry-fire exercise on a transition range. This familiarizes him with acquiring targets on a timed exercise. It also gives the Soldier and the point safety the time to make any corrections on-sight, or to correct body position and grip before the qualification table.

- **Assume** a stable, prone firing position.
- **Fire** the weapon, maintaining sight alignment and sight picture.
- **Pull** the trigger straight to the rear and say to yourself, “*Fire a burst of seven.*” After the word “*seven,*” **release** the trigger.
- **Apply** correct traversing and searching techniques. *To traverse, move* the muzzle of the weapon to the left or to the right to distribute fire laterally. *To search, move* the muzzle of the weapon up or down to distribute fire in depth.
  - For minor traversing changes, shift your shoulder slightly to the right or left.
  - For major traversing changes, move your elbows and align your body directly behind the weapon.

J-36. To make changes in elevation, move your elbows closer or farther apart. The following targets are used for Field Fire II:

- 200-meter target single E-type silhouettes (15 seconds).
- 300-meter target single E-type silhouettes (20 seconds).
- 400-meter target double E-type silhouettes (25 seconds).
- 500-meter target double E-type silhouettes (30 seconds).
- 200-meter single E-type silhouettes (40 seconds).
- 500-meter double E-type silhouettes (40 seconds).
- 300-meter single E-type silhouettes (35 seconds).
- 400-meter double E-type silhouettes (35 seconds).
- 200-meter single E-type silhouettes (50 seconds).

- 400-meter double E-type silhouettes (50 seconds).
- 600-meter double E-type silhouettes (50 seconds).

## NIGHT RECORD QUALIFICATION

J-37. The gunner uses ammunition on the live-fire exercises. This exercise measures his ability to engage targets during a timed exercise.

### M249

J-38. 154 rounds of A064 4:1 mix 5.56-mm linked.

### M60 and M240B

J-39. 154 rounds of A131 4:1 mix 7.62-mm linked.

## Steps

- **Assume** a stable, prone firing position.
- **Fire** the weapon maintaining sight alignment and sight picture.
- **Pull** the trigger straight to the rear and say to yourself, “*Fire a burst of seven.*” After the word “*seven,*” **release** the trigger.
- **Apply** correct traversing and searching techniques. *Traversing* means moving the muzzle of the weapon to the left or to the right to distribute fire laterally. *Searching* means moving the muzzle of the weapon up or down to distribute fire in depth. To make changes in elevation move the elbows closer or farther apart.
  - For minor traversing changes, shift the shoulder slightly to the right or left.
  - For major traversing changes, move the elbows and align the body directly behind the weapon.
- **Use** observation and adjustment of fire. Observe machine gun fire by noting the strike of the projectiles in the target area. When firing the bipod-mounted gun, adjust fire by changing body position.
- **Apply** the adjusted aiming point method. The adjusted aiming point method is a means of rapidly and accurately adjusting fires without making sight adjustment. If the initial burst misses the target, select a new aiming point on the ground. The aiming point should be the same distance from the target as the initial burst’s center of impact. The following targets are used for night record qualification with the AN/PVS-4 and the aiming lasers. TWS and MGO will fire the day record fire table:
  - 200-meter target single E-type silhouettes (10 seconds).
  - 300-meter target single E-type silhouettes (15 seconds).
  - 400-meter target double E-type silhouettes (15 seconds).
  - 500-meter target double E-type silhouettes (25 seconds).
  - 200-meter single E-type silhouettes (35 seconds).
  - 500-meter double E-type silhouettes (35 seconds).
  - 300-meter single E-type silhouettes (30 seconds).
  - 400-meter double E-type silhouettes (30 seconds).
  - 200-meter single E-type silhouettes (45 seconds).

- 400-meter double E-type silhouettes (45 seconds).
- 600-meter double E-type silhouettes (45 seconds).

## SECTION III. AN/PEQ-2A TARGET POINTER, ILLUMINATOR, AIMING LIGHT

The AN/PEQ-2A (Figure J-10) target pointer/illuminator/aiming light (TPIAL) is a Class IIIB laser that emits a highly collimated beam of infrared light for precise aiming of the weapon as well as a separate infrared illuminating beam with adjustable focus. A safety block is provided for training purposes (blue side), which limits the operator from selecting the high power modes (black side).

### DESCRIPTION

J-40. This paragraph describes the AN/PEQ-2A, its accessories (Figure J-11), and installation and operation procedures. The TPIAL projects an infrared laser beam that cannot be seen with the eye but can be seen with night vision devices. This target pointer/illuminator/aiming light projects a much wider infrared illuminating beam from an integral illuminator than did its predecessor. The TPIAL works with night vision goggles and mounts on various weapons with mounting brackets and adapters. Leaders use the AN/PEQ-2A in the hand-held mode to illuminate and designate targets.

### DATA

- Weight: 7.5 ounce (with 2 AA batteries)
- Length: 16.26 centimeters (6.4 inches)
- Width: 7.12 centimeters (2.8 inches)
- Height: 3.05 centimeters (1.2 inches)
- Range:
  - 600 meters in low power (eye safe)
  - 2,000 meters in high power (non-eye safe)
- Output Power:
  - Aiming laser 25 milliwatts (+/- 10 percent)
  - Illuminator 30 milliwatts (+50, -20 percent)
- Beam Divergence:
  - Aiming laser 5 meter radius
  - Illuminator 1.0 to 115 meter radius
- Batteries: Two 1.5-volt AA batteries

### COMPONENTS

- J-41. See Figure J-10.
- TPIAL assembly with safety block.
  - Rail.
  - Neck cord.
  - Textile bag.
  - Cable switch, 12-inch, membrane.
  - Operator's manual.



- Batteries 1.5V AA.
- Strap, retention.
- Cable Switch, 20-inch, button.
- Bracket Adapter.
- Training extender (Army only).
- M4/M16A2 bracket assembly.

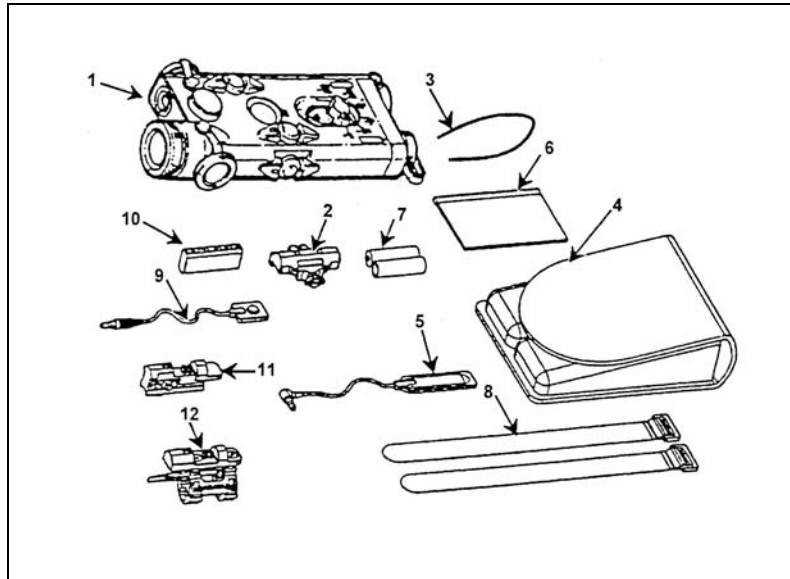


Figure J-10. AN/PEQ-2A with accessories.

## OPERATION

J-42. This paragraph describes how to operate the AN/PEQ-2A, to include battery installation, safety block installation, the button switch, the cable switch, the mode switch, and boresight adjusters.

## BATTERY INSTALLATION

J-43. The gunner unscrews the battery caps and installs two AA batteries (Figure J-11). He orients the batteries as indicated by the markings on the AN/PEQ-2A body.

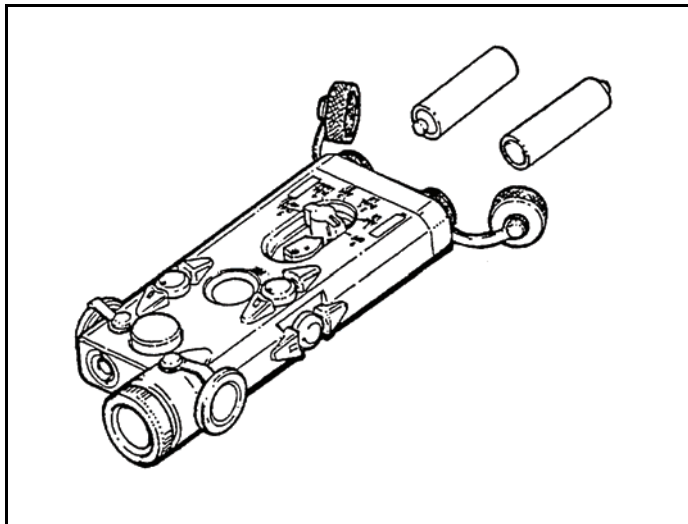


Figure J-11. AN/PEQ-2A battery installation.

**SAFETY BLOCK INSTALLATION**

J-44. The safety block (Figure J-12) installed in the training mode (blue side up) prevents the operator from accessing the non-eye-safe modes (AIM HI, DUAL LO/HI, DUAL HI/HI). He uses a .050 allen wrench to unscrew the block from the body and reinstall it in the tactical mode (black side up).

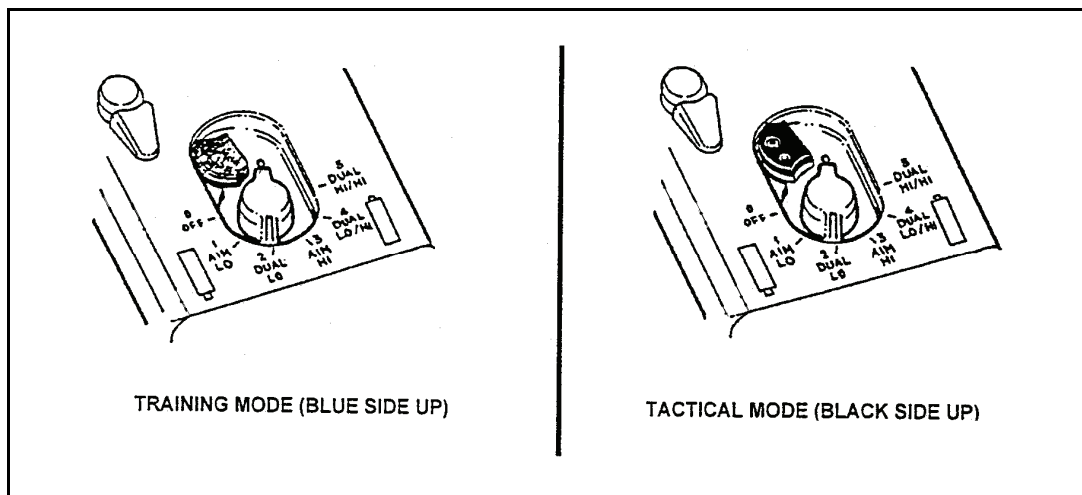


Figure J-12. Safety block installation.

**MODE SELECTOR**

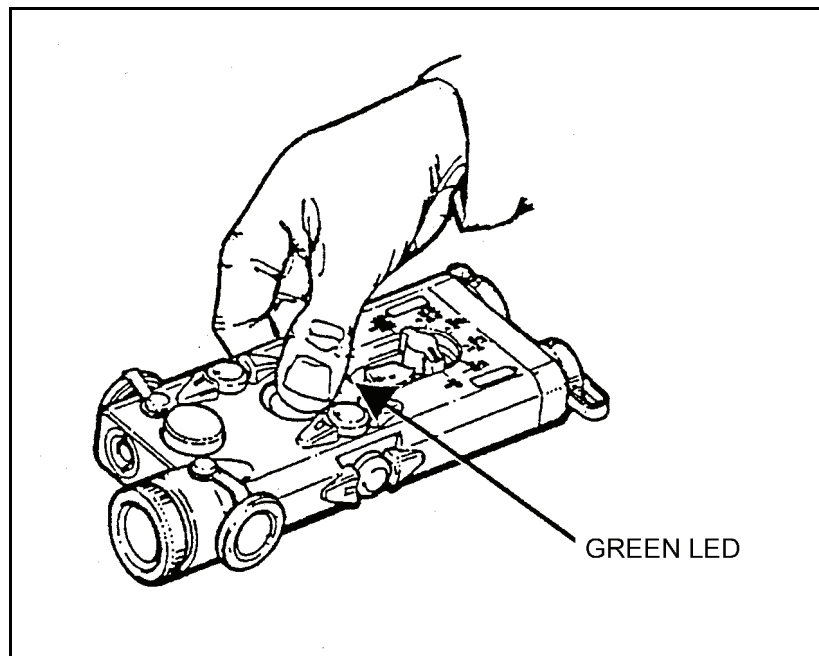
J-45. The gunner uses the mode selector to set the mode in which the AN/PEQ-2A operates when he depresses the cable-switch button or the push button. The mode selector has six positions (Table J-2).

KNOB POSITION		OPERATION
0	OFF	The AN/PEQ-2A does not operate.
1	AIM LO	The aiming beam operates at low power.
2	DUAL LO	The aiming beam operates at low power and the illuminating beam operates at low power.
3	AIM HI	The aiming beam operates at high power.
4	DUAL LO/HI	The aiming beam operates at low power and the illuminating beam operates at full power.
5	DUAL HI/HI	The aiming beam operates at high power and the illuminating beam operates at full power.

**Table J-2. Mode selector positions.**

## BUTTON SWITCH

J-46. The gunner uses the button switch (Figure J-13) when the AN/PEQ-2A is hand-held. Pressing the button switch places the AN/PEQ-2A in the operational mode on the mode selector. When the gunner releases the button, the AN/PEQ-2A turns off. A green LED is incorporated into the body of the AN/PEQ-2A to indicate that the AN/PEQ-2A is ON. Whenever the AN/PEQ-2A is activated, the green LED lights and stays lit until the unit is turned OFF. If the gunner wants continuous operation of the AN/PEQ-2A, he presses the button switch twice in rapid succession to latch it to ON. The AN/PEQ-2A stays on until the gunner presses the push button a third time.



**Figure J-13. Operation of the button switch.**

### CABLE SWITCH

J-47. The gunner uses the cable switch (Figure J-14) when the AN/PEQ-2A is mounted on a weapon. The switch plugs into the back of the AN/PEQ-2A assembly. Pressing the button or pad at the end of the cable switch causes the AN/PEQ-2A to turn on in the operational mode selected by the mode select switch. When the gunner releases the button, the AN/PEQ-2A turns off. If continuous operation of the AN/PEQ-2A is desired, the gunner presses the cable switch twice in rapid succession to latch the AN/PEQ-2A to ON. The AN/PEQ-2A stays on until the gunner presses the push button a third time. When the cable switch plug is installed in the AN/PEQ-2A, it automatically locks into place. To remove the switch, the gunner pulls back on the plug sleeve and pulls the plug out. HE MUST NOT TRY TO REMOVE THE PLUG BY PULLING ON THE CABLE.

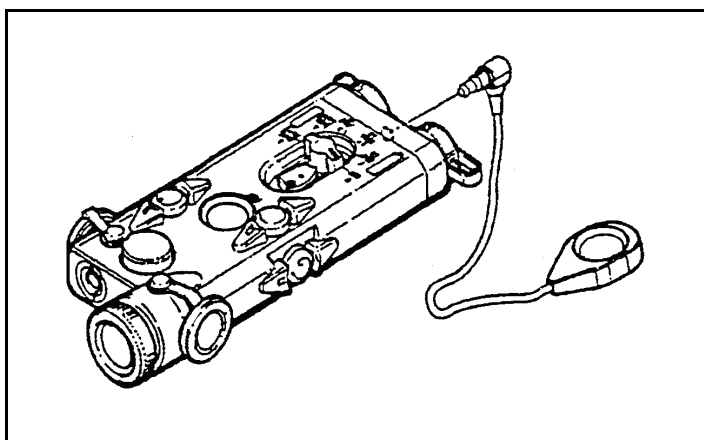


Figure J-14. Installation of the cable switch.

### FOCUS KNOB

J-48. The gunner uses the focus knob (Figure J-15) to vary the spread of the illumination beam based on the range and size of the area to be illuminated.

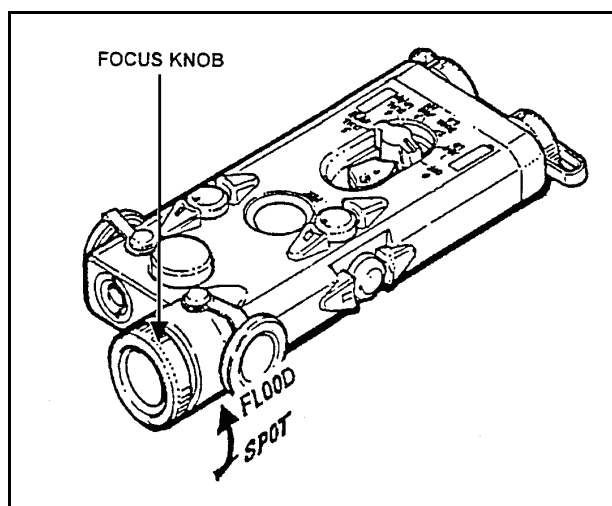


Figure J-15. Use of the focus knob.

## LENS CAP

J-49. The **black lens cap** (Figure J-16) blocks the AN/PEQ-2A illuminator or aiming laser beam should the device be activated. To use the black lens cap, pull it from its stored location on the side of the AN/PEQ-2A and stretch it over the front of the focus knob or aiming beam so that it fits snugly in place.

J-50. The **diffuser lens cap** (Figure J-16) enables the illuminator or aiming laser to emit in a 45-degree cone (10 feet at 10 feet). To use the diffuser lens cap, pull it from its stored location on the side of the AN/PEQ-2A and stretch it over the front of the focus knob or aiming beam so that it fits snugly in place.

J-51. The **neutral density lens cap** (Figure J-16) enables the AN/PEQ-2A illuminator or aiming laser to be operated in low power. To use the neutral density lens cap, pull it from its stored location on the side of the AN/PEQ-2A and stretch it over the front of the focus knob or aiming beam so that it fits snugly in place.

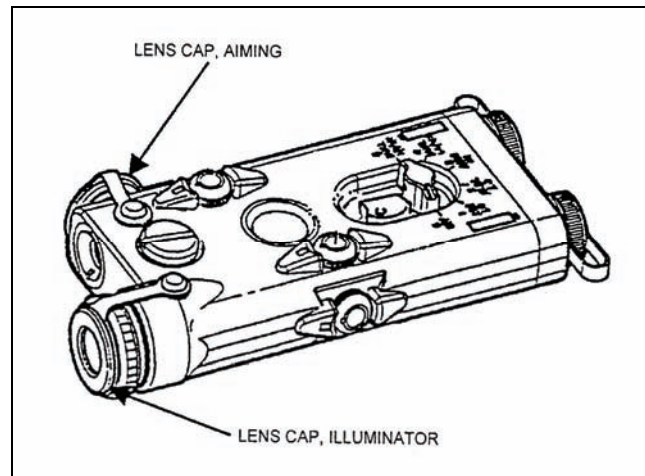


Figure J-16. Installation of the lens caps.

## ADJUSTERS

J-52. The AN/PEQ-2A has boresight adjusters (Figure J-17) for zeroing the aiming beam and illumination beam. The AN/PEQ-2A adjusters move the beams in true horizontal and vertical directions. When zeroing the AN/PEQ-2A, the gunner should zero the aiming beam to the weapon, and then align the illumination beam to the aiming beam.

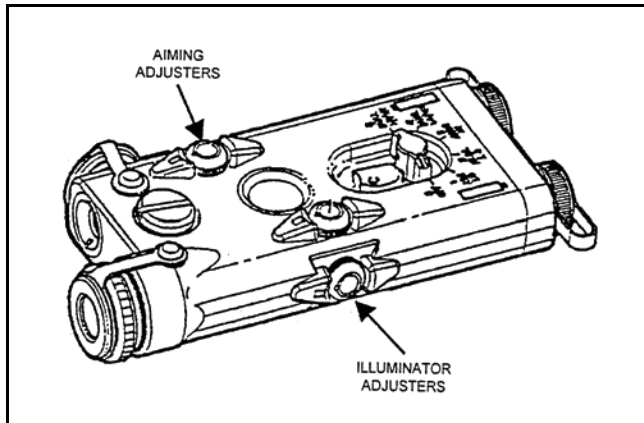


Figure J-17. Boresight adjusters for both aiming and illumination beams.

## PROCEDURES FOR MOUNTING AND DISMOUNTING

J-53. This paragraph describes the mounting procedures for the AN/PEQ-2A (M249, M60, M240B). The gunner reverses these procedures to dismount the AN/PEQ-2A.

### TWS MOUNTING BRACKET

J-54. (See Figure J-18.)

- **Attach** the rail grabber (3) (P/N 12598120) to the AN/PEQ-2A (4).
- **Loosen** the knob on the AN/PEQ-2A rail grabber.
- **Select** the slot on rail (5) for mounting. Any slot may be used as long as the mount does not hang over the edge of the rail.
- **Place** the bar of the rail grabber (3) in the slot of the rail (5).
- **Hand tighten** the knob on mount until a clicking noise can be heard.

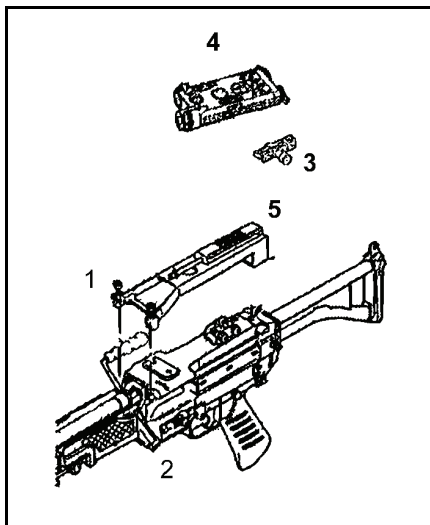


Figure J-18. Mounting of the AN/PEQ-2A to the M249 using TWS bracket.

## M60 MACHINE GUN

- **Remove** the M60 hinge pin latch and hinge pin from the cover assembly.
- **Place** the pin latch in the aiming guides on the left side-mounting bracket, and press together.
- **Place** the mounting bracket on top of the machine gun cover so that the holes in the front of the bracket align with the cover assembly pinholes.
- **Insert** the longer hinge pin supplied with the bracket, through the bracket and cover assembly, and secure by inserting the hinge pin latch.
- **Turn** the wing nuts on both leg clamps counterclockwise to loosen them.
- **Position** the leg clamps under the cover assembly.
- **Secure** the mounting bracket by tightening the wing nuts firmly. The split washer should be next to the wing nut and the flat washer next to the bracket.
- **Place** the bracket adapter in the AN/PEQ-2A mounting groove flush with the front of the AN/PEQ-2A. Tighten the thumbscrew clockwise.
- **Position** the AN/PEQ-2A with the bracket adapter on the M60 mounting bracket mounting groove.
- **Align** the front edge of the bracket adapter and the front edge of the groove.
- **Tighten** the lever screw assembly (Figure J-19).

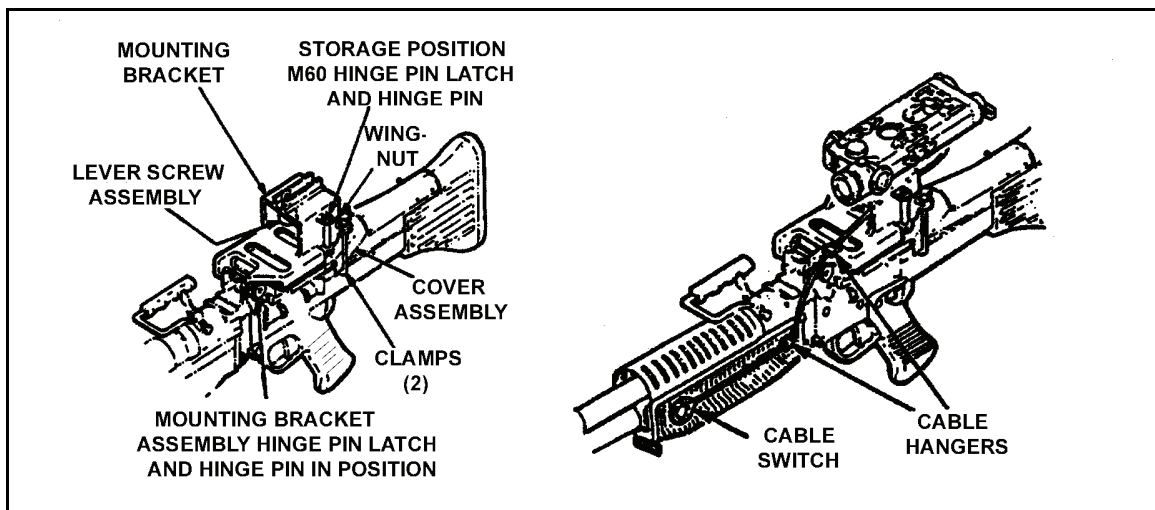


Figure J-19. Mounting of the AN/PEQ-2A to the M60 machine gun.

## M240B MACHINE GUN

J-55. The gunner mounts the AN/PEQ-2A 1 on the top cover rail (*see* arrow) using the AN/PEQ-2A bracket adapter and a standard rail grabber. The unit armorer preassembles the rail grabber and the bracket adapter. The gunner must--

- **Mount** the bracket adapter to the AN/PEQ-2A using the thumbscrew on the AN/PEQ-2A.
- **Loosen** the clamping knob until the rail grabber has sufficient space to fit over the top cover rail.
- **Tighten** the clamping knob until you hear two clicks.
- **Place** the AN/PEQ-2A at a position on the rail that is the most convenient for the operator.
- If you remove the AN/PEQ-2A from the rail, **note** the position where he zeroed the device, and then return the device to the same position to retain the zero.

- **Install** the remote switch in a convenient location using the provided cable hangers (Figure J-20).
- To dismount the devices for each weapon, **reverse** the procedures.
  - Training situations--danger area is 15 meters.
  - Tactical situations--danger area is 220 meters.

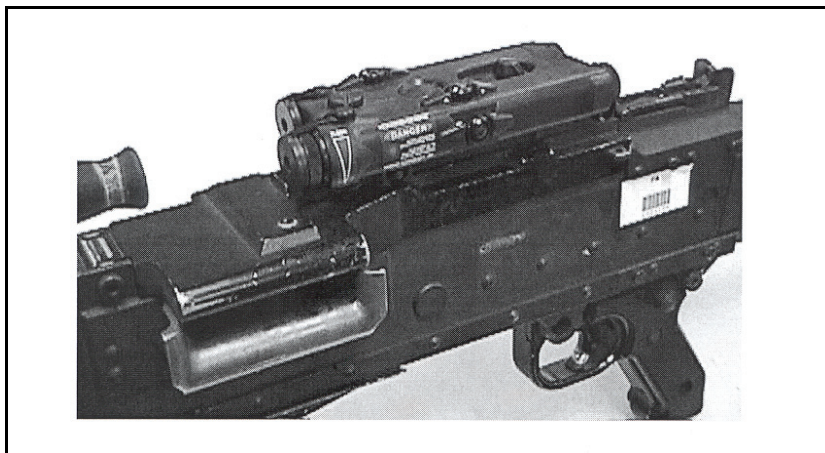


Figure J-20. Mounting of the AN/PEQ-2A to the M240B machine gun.

**WARNING**

**Handle the laser carefully.**

## FUNDAMENTALS OF MARKSMANSHIP

J-56. The fundamentals of machine gun marksmanship for the M249, M60, and M240B machine guns are the same as with the AN/PAQ-4. To use the maximum effective range of the AN/PEQ-2A, the gunner removes the safety block and places the AN/PEQ-2A on high power. Because the laser is non-eye safe in the tactical mode (high power), batteries for the AN/PEQ-2A are issued to the gunners on the firing line *only* when the weapon is oriented down range.

### BORESIGHT PROCEDURES

J-57. To boresight the machine gun and the AN/PEQ-2A, the gunner follows the stabilization procedures previously discussed in this chapter.

### ZERO PROCEDURES

J-58. To zero and field zero the machine gun and the AN/PEQ-2A, the gunner follows the stabilization procedures previously discussed in this chapter. (TM 11-5855-308-12&P discusses zeroing procedures and zeroing targets with designated strike zones.)



## SIGHT ADJUSTMENTS

J-59. Sight adjustments for the aiming light and illuminator beam are the elevation adjustment screw (1 click at 25 meters equals 4 millimeters) (clockwise equals up) and the windage adjustment screw (1 click at 25 meters equals 4 millimeters) (clockwise equals right).

- The adjustment screws will break if turned too far.
- If the laser is side-mounted, the elevation and windage knobs will switch roles.

## TRAINING STRATEGIES

J-60. Training strategies are the same for all weapons that use the AN/PAQ-4, except for the illuminating beam. This allows Soldiers to detect targets at ranges up to 2,000 meters (depending on terrain and weather constraints) in the high-power mode (tactical mode). The laser is not eye-safe in the tactical mode. In the low-power mode, during ideal limited visibility conditions, such as in 75 percent illumination like in rain or fog, the gunner can engage the targets out to 600 meters. The gunner should only use the tactical mode on the M60 and M240B machine guns.

## SECTION IV. AN/PAS-13 (V2) MEDIUM

The AN/PAS-13 (V2) medium weapon, thermal sight (MWTS) (Figure J-21) is silent, lightweight, compact, and durable battery-powered thermal imaging sensors that operate with low battery consumption.

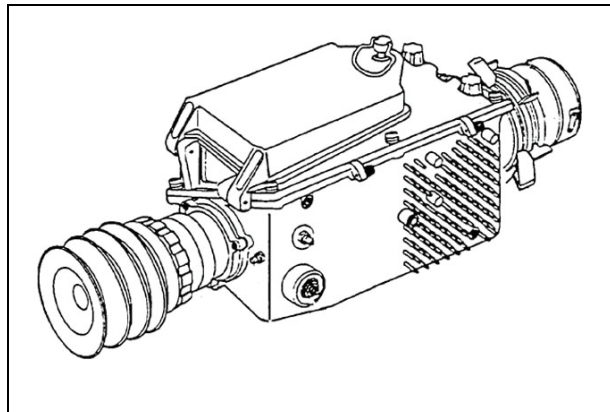


Figure J-21. Model of the medium weapon thermal sight.

## DESCRIPTION

J-61. The MWTS allows target acquisition in limited visibility conditions such as darkness, smoke, fog, dust, and haze. It operates day or night. Infrared light comes through the telescope, where the IR sensor detects it. The sight converts it to digital data, processes it, and then displays the data for the user. The MWTS has two functional groups: the telescope and the basic sensor.

## TELESCOPE

J-62. The telescope receives IR light emitting from an intended target and its surroundings. The telescope magnifies and projects the IR light on the scanner on the basic sensor (Figure J-22).

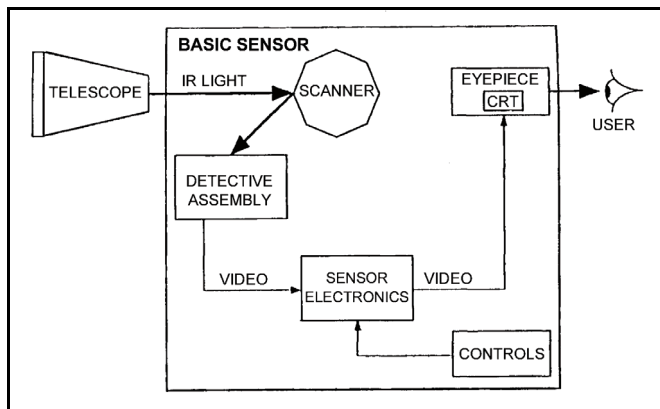


Figure J-22. Configurations.

**BASIC SENSOR**

J-63. The scanner reflects the IR light received from the telescope on the detective assembly. The detective assembly senses the IR light and converts it to video. The sensor’s electronics condition the video for display on the LED array. The LED array illuminates the IR image along with the reticle. The light from the LED array reflects off the scanner to form an image at the eyepiece. The MWTS and HWTS differ only in their telescopes, which have different magnifications and reticles. They share the same kind of basic sensor. The MWTS fits all three machine guns (M249, M60, and M240B (Figure J-23).

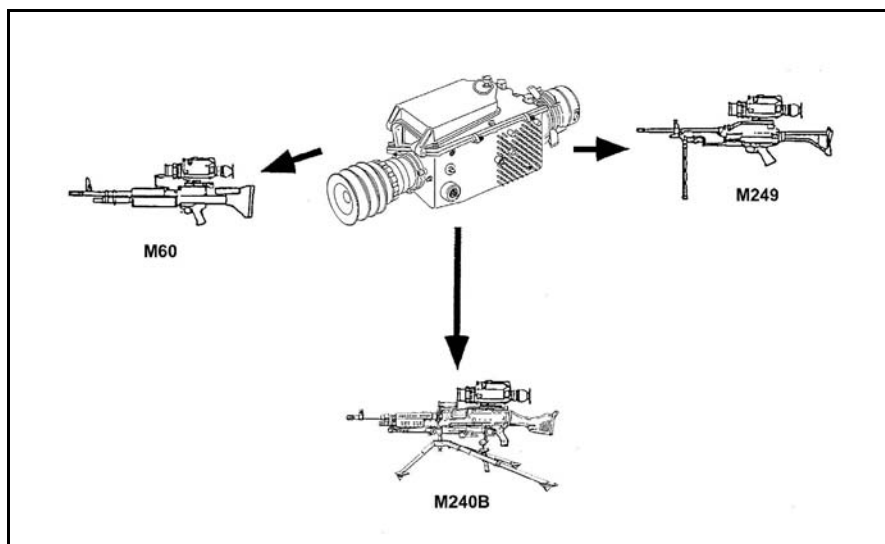


Figure J-23. Medium weapon thermal sight.

## DATA

J-64. Table J-2 shows data for the medium weapon thermal sight:

Field of view	Narrow	9 degrees
	Wide	15 degrees
Telescope magnification	Narrow FOV	3.3X
	Wide FOV	2X
Length	15.5 inches	
Width	6.25 inches	
Height	6.25 inches	
Weight	4.1 pounds	
Power consumption	ON mode	12.0 watts
	STANDBY mode	5.5 watts
Battery life	71 percent STANDBY mode	10 hours
	EMERGENCY mode	3.5 hours

**Table J-2. Data for the MWTS.**

## OPERATION

J-65. The MWTS has three modes of operation: STANDBY, ON, and EMERGENCY. Figure J-24 shows controls and indicators.

### MODES

#### *STANDBY Mode*

J-66. When the gunner first turns on the system, the MWTS begins a cool-down period of about 2 minutes. After the cool-down period, the MWTS enters the STANDBY mode. In STANDBY mode, neither the scanner nor display receives power. This extends the life of the battery.

#### *ON Mode*

J-67. When the MWTS is in STANDBY mode and the gunner applies pressure to the eyecup, the MWTS switches ON, and a switch engages to power the scanner and display. After a three-second delay, the system is operational.

#### *EMERGENCY mode*

J-68. When switched to the EMERGENCY mode, the MWTS continuously applies power to the entire system. This mode allows the operator to bypass the 3-second delay experienced when switching from the STANDBY to the ON mode. Keeping the MWTS in emergency mode reduces battery life, because the whole system is powered.

## **CONTROLS AND SWITCHES**

### **CONTRAST Control (1)**

J-69. This adjusts the contrast of the thermal scene. When turned clockwise to AUTO, contrast is automatically set.

### **EMERGENCY Control (2)**

J-70. This overrides the eyecup switch and turns entire system on, which places the MWTS in the EMERGENCY mode.

### **BRIGHTNESS Control (3)**

J-71. This is a nine-position rotary switch with an off detent position (turned fully counterclockwise). The purpose is to turn the system on or off and adjust the brightness of the eyepiece display.

### **FOCUS Ring (4)**

J-72. This adjusts the telescope focus from 20 meters to infinity. It requires a manual adjustment and affects both the wide and narrow fields of view.

### **Field of View Ring (5)**

J-73. The FOV ring, which has both wide and narrow fields of view (WFOV and NFOV), is on the telescope. The wide FOV is for use with low magnification during target detection, and the narrow FOV is for using high magnification during recognition and engagement.

### **RETICLE Select Switch (6)**

J-74. This selects one of the available reticles depending on the MWTS model (medium or heavy). It must be held for 2 seconds to enable reticle changes. After 2 seconds, release the switch to cycle to the next reticle. This control is disabled after 10 seconds of inactivity.

### **RETICLE Adjust Switch (7)**

J-75. This adjusts the reticle aiming features in azimuth and elevation. It is used during zeroing, and it must be held for 2 seconds to allow changes to be made. After 2 seconds, each press moves the reticle aiming features one increment. This control is also disabled after 10 seconds of inactivity.

### **BLACK/WHITE POLARITY Switch (8)**

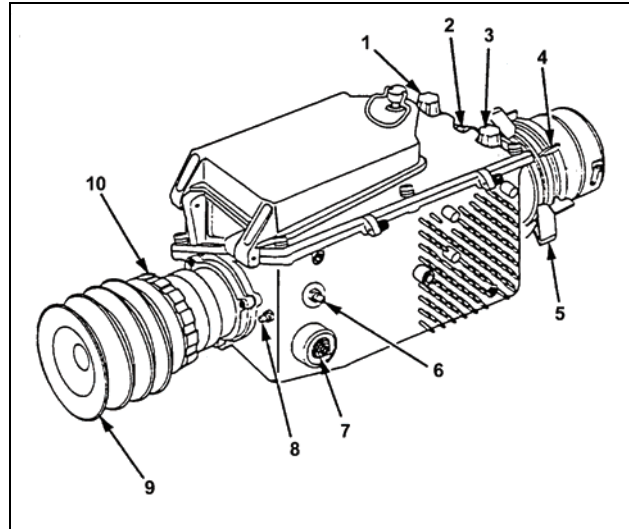
J-76. This selects the polarity of the thermal image displayed on the raster. The initial setting is WHITE HOT. The polarity switch affects the appearance of the target.

### **Eyecup (9)**

J-77. This controls STANDBY/ON when the system is on. When forward pressure is applied to the eyecup, the system is in the ON mode. When the gunner pulls his eye away from the eyecup for more than 30 seconds, the system returns to standby.

**Diopter Focus Ring (10)**

J-78. This adjusts the focus of the raster and indicators to the operator's eye. It ranges from plus 2 to minus 6 diopters.



**Figure J-24. Controls and indicators.**

**EYEPIECE INDICATORS**

J-79. Eyepiece indicators (Figure J-25) illuminate as follows:

- NOT COOL (11) when the detectors are not cool enough for proper operation.
- WHT HOT/BLK HOT (12) polarity.
- EMER (13) during emergency mode operation.
- LOW (14) when battery power has about 15 minutes of useful power left with go-to-war batteries.
- RETICLE SELECT/FOV (15) identifies the selected reticle and whether the sight is in narrow or wide FOV.
- ELEVATION INDICATOR (16) indicates the elevation zeroing adjustment of the reticle. It also displays the number of increments the reticle is UP (U) or (D) DOWN from the center zero position.
- NFOV/WFOV (17) indicates wide FOV or narrow FOV.
- ZOOM (18) indicates the zoom mode is selected.
- RET ADJ (19) indicates the reticle adjustment mode is selected.
- RET SEL (20) indicates the reticle select mode is selected.
- AZIMUTH INDICATOR (21) indicates the azimuth zeroing adjustment of the reticle. It also displays the number of increments the reticle is left (L) or right (R) from the center zero position.
- SENSOR COOLING (22) is displayed when the power is turned on, the indicator displays about a 2-minute cool-down period. After cool-down, the current reticle is displayed.

- The COOLDOWN PERIOD INDICATORS blink the first 10 seconds after the system is turned on. After 10 seconds, the NOT COOL indicator is lit and the POLARITY, EMERGENCY, and LOW BATTERY indicators function normally. The DISPLAY RASTER displays the thermal image with a superimposed reticle.

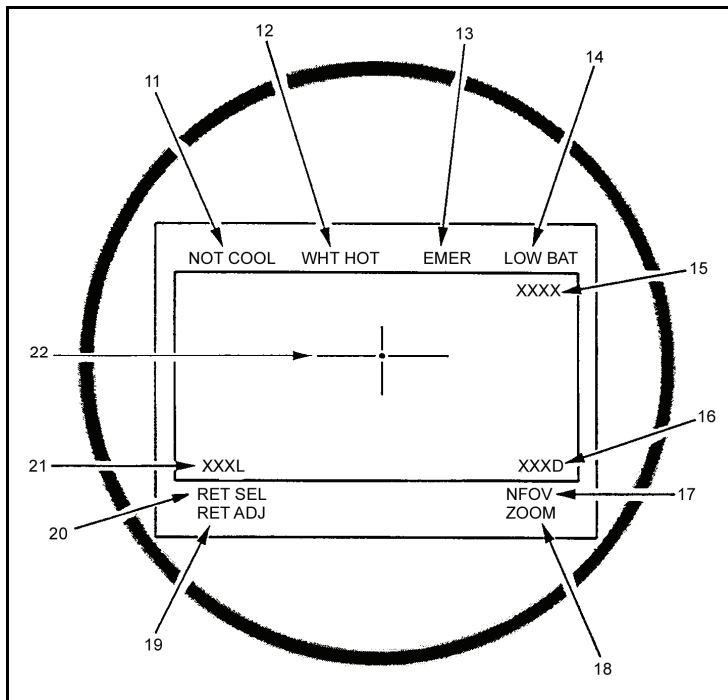


Figure J-25. Eyepiece indicators.

**CAUTION**

HANDLING OF COVER

When raising or lowering the cover with the MWTS installed, take care to avoid slamming the MWTS into the heat shield or slamming the cover closed.

**M249 MACHINE GUN**

**Mounting Procedures**

J-80. Before zeroing and qualifying with the AN/PAS-13, the gunner must mount the sight on the weapon (Figure J-26).

- **Open** the cover of the weapon.
- **Rotate** the hook-retaining pin downward (over the top of the hinge pin).
- **Remove** the retaining clip from the left side of the hinge pin.
- **Remove** the weapon's hinge pin. *Do not lose the retaining clip.*

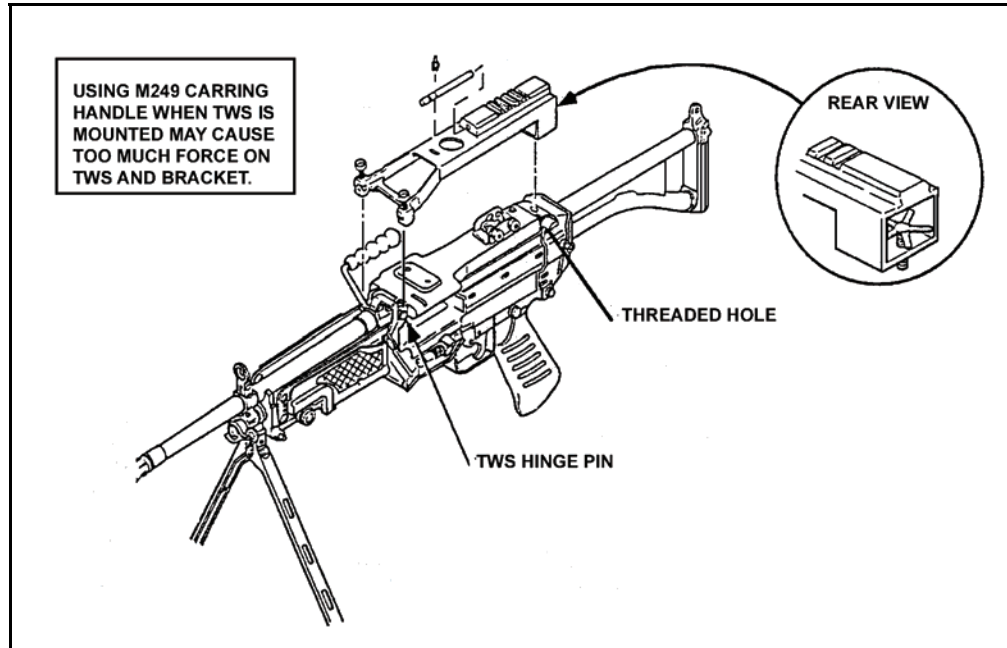


Figure J-26. Mounting of the sight on the M249.

- **Remove** the retaining clip from the M249 mounting bracket (Figure J-27).
- **Remove** the MWTS hinge pin from the mounting bracket.
- **Replace** it with the M249 hinge pin (Figure J-28).
- **Secure** it to the mounting bracket by replacing the retaining clip (the one from the mounting bracket).

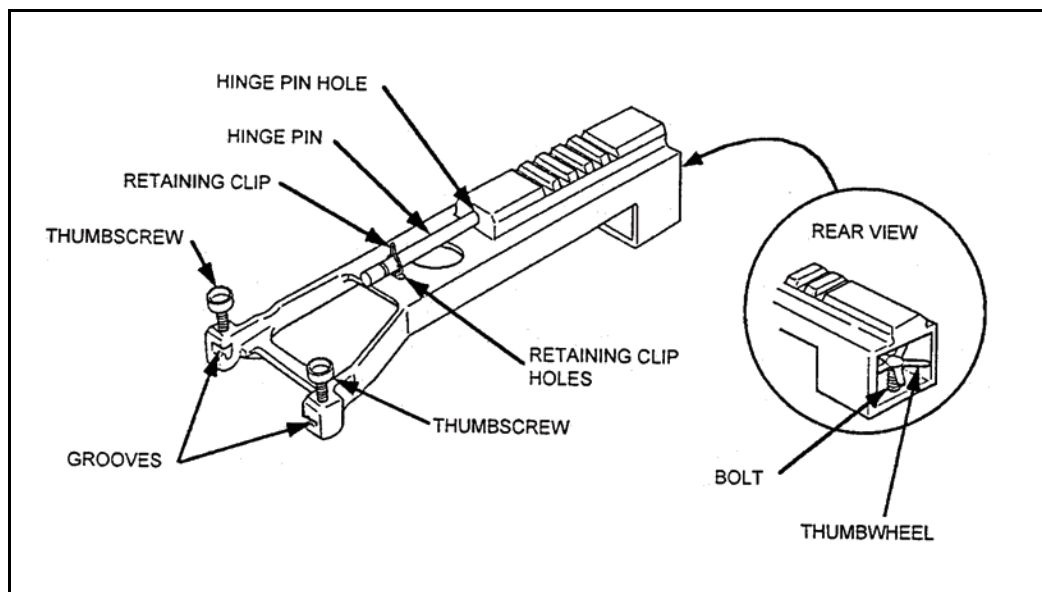


Figure J-27. M249 bracket.

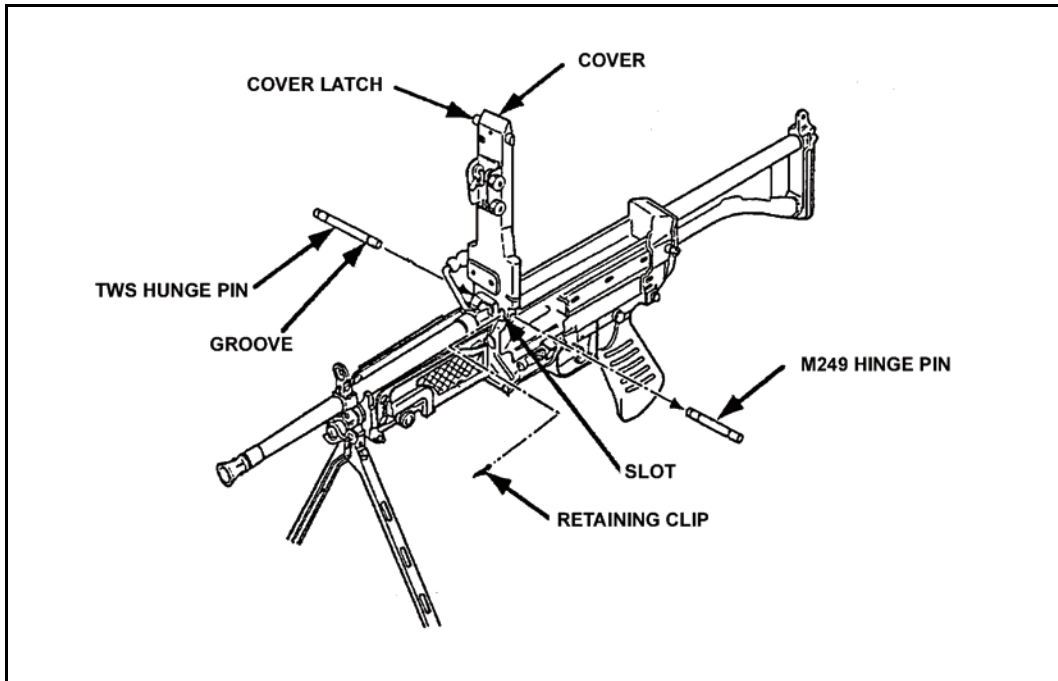


Figure J-28. Replacement of M249 hinge pin.

- **Replace** the cover of the M249 so that the slot in the cover lines up with the holes in the receiver group.
- **Push** the MWTS hinge pin through the slot and the spring.
- **Secure** the MWTS hinge pin by rotating the hook-retaining pin upward (over the hinge pin) and replacing the retaining clip on the left side of the pin.
- **Close** the cover of the weapon.
- **Place** the grooves on the front of the bracket over the edges of the MWTS hinge pin and **Rotate** the bracket downward onto the cover.
- **Ensure** that the thumb wheel on the rear of the mounting bracket lines up with the threaded hole on the cover of the weapon.
- **Secure** the mounting bracket to the cover by tightening the thumbscrews and the thumb wheel.
- **Select** a slot on the rail of the bracket.
- **Place** the bar of the MWTS mount in the slot.
- **Hand-Tighten** the knob on the MWTS mount until it clicks at least twice.

### Dismounting Procedures

- **Loosen** the knob on the MWTS mount until it is free of the rail.
- **Remove** the MWTS.
- **Unscrew** the thumb wheel and thumbscrews.
- **Remove** the mounting bracket from the weapon.
- **Open** the cover of the weapon.
- **Remove** the retaining clip from the MWTS hinge pin.
- **Rotate** the hook-retaining pin downward (over the top of the hinge pin).
- **Remove** the MWTS hinge pin.
- **Remove** the M249 hinge pin from the mounting bracket.



- **Replace** it with the MWTS hinge pin. Secure it with the MWTS retaining clip.
- **Place** the cover of the M249 on top of the weapon, aligning the holes in the cover with the slot in the receiver.
- **Replace** the M249 hinge pin to the weapon.
- **Secure** the M249 hinge pin by replacing the retaining clip and rotating the hook-retaining pin upward (over the top of the hinge pin).

### CAUTION

#### POSITION OF SIGHT

To avoid damaging the sight by slamming it closed or into the heat shield, move it to the rear before opening the feed tray. To do so, first push in on the cam release, and then push the sight to the rear.

## M60 MACHINE GUN

### Mounting Procedures

J-81. Before zeroing and qualifying with the AN/PAS-13, the gunner must mount the sight on the weapon (Figure J-29).

- **Loosen** the clamping bars all the way on the MWTS mounting brackets by turning the thumb wheels.
- **Loosen** the locking nuts on the front of the MWTS mounting bracket (Figure J-30).
- **Open** the feed tray cover of the M60.
- **Remove** the M60 hinge pin and hinge pin latch (Figure J-31).

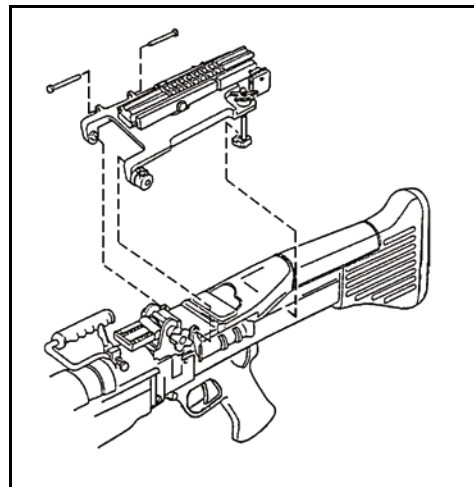


Figure J-29. Mounting of the MWTS on the M60.

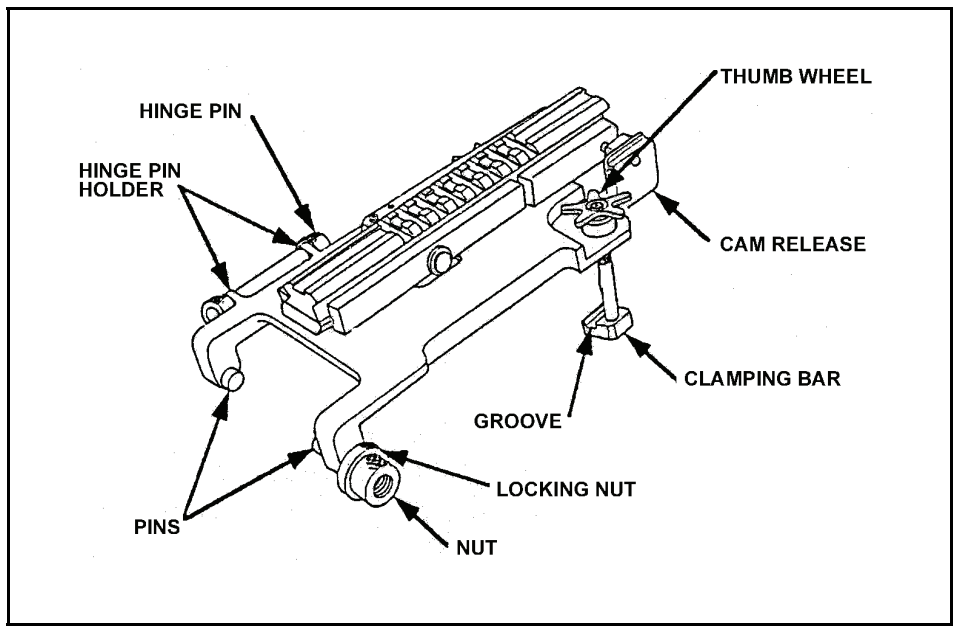


Figure J-30. M60 bracket.

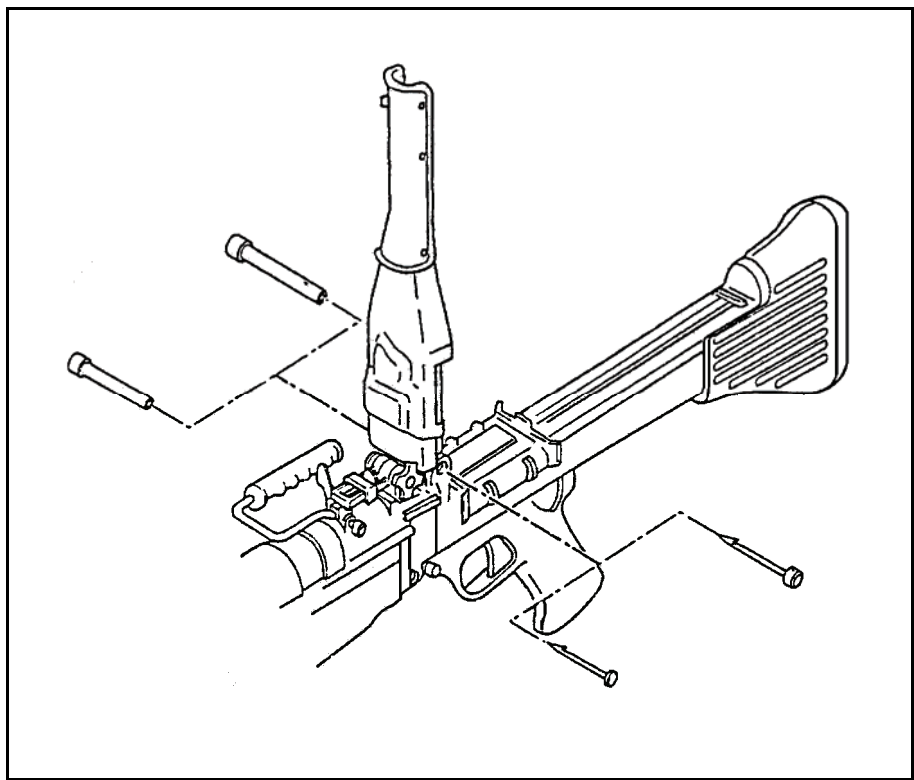


Figure J-31. M60 hinge pin replacement.

- **Remove** the MWTS hinge pin and hinge pin latch from the M60 mounting bracket.
- **Place** the MWTS hinge pin and hinge pin latch through the holes in the feed tray and feed tray cover to secure them to the M60.

- **Insert** the hinge pin (the larger pin) from the left side of the gun. **Insert** the hinge pin latch (the smaller pin) from the right.
- **Place** the M60 hinge pin and hinge pin latch into the hinge pin holder on the MWTS mounting bracket.
- **Place** the pins on the inside front of the MWTS mounting bracket over the holes in the hinge pin and hinge pin latch.
- **Place** the clamping bars so that the grooves in them fit under the lip of the feed tray cover.
- **Tighten** the locking nuts by hand and tighten the clamping bars by rotating the thumb wheels.
- **Select** a slot on the rail of the bracket.
- **Place** the bar of the MWTS mount in the slot.
- **Hand tighten** the knob on the MWTS mount until it clicks at least twice.

### Dismounting Procedures

- **Loosen** the mounting knob located on the left side of the MWTS mount until it is free of the rail.
- **Remove** the MWTS.
- **Unscrew** the thumb wheels and locking nuts.
- **Remove** the mounting bracket from the weapon.
- **Open** the cover of the weapon and remove the MWTS hinge pin.
- **Remove** the M60 hinge pin from the mounting bracket.
- **Replace** it with the MWTS hinge pin. Secure it with the retaining clip.
- **Place** the cover of the M60 on top of the weapon, aligning the holes in the cover with the slot in the receiver.
- **Replace and secure** the M60 hinge pin to the weapon.

### CAUTION

#### HANDLING OF COVER

When raising or lowering the cover with the MWTS installed, avoid slamming the MWTS into the heat shield or slamming the cover closed.

## M240B MACHINE GUN

### Mounting Procedures

J-82. Before zeroing and qualifying with the AN/PAS-13, the gunner must mount the sight on the weapon. The M240B machine gun has a rail mount already attached to the cover assembly.

- **Install** the sight on the M240B rail mount by loosening the mounting knob located on the left side.
- **Position** the sight on the rail mount by placing the bar of the mount in a slot on the rail.
- **Hand tighten** the knob on the mount until you hear two clicks. Any slot can be used as long as the mount does not hang over the edge of the rail (Figure J-32).

**WARNING**

Remove batteries before storing the AN/PAS-13.

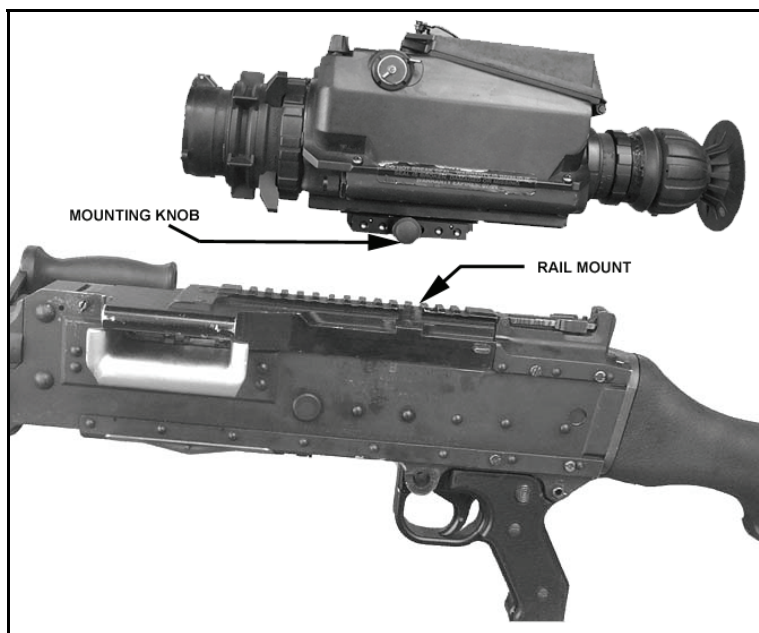


Figure J-32. Mounting of the AN/PAS-13 to the M240B.

**Dismounting Procedures**

- Unscrew the mounting knob on the left side.
- Lift up on the sight to remove it from the M240B machine gun.

**BORESIGHTING PROCEDURES**

J-83. Follow the instructions to boresight the weapon as outlined in TC 23-AIMSS. Choose the correct reticle for the weapon by pressing the reticle select switch for 2 seconds. Then scroll through the reticles until the correct one is found. Follow the instructions for boresighting the MWTS on the boresight target offset. Adjust the aiming point until the red dot is centered on the crosshair on the offset. You must boresight in both the narrow FOV and wide FOV.

**Zeroing Procedures**

J-84. Refer to TM 11-5855-309-12&P for zeroing procedures for the M249, M60, and M240B machine guns.

**TRAINING STRATEGIES**

J-85. The training strategies for the 5.56-mm and 7.62-mm caliber weapons with the MWTS are the same as with the AN/PVS-4 for both the night initial and night sustainment training strategies.

## SECTION V. M145 STRAIGHT TELESCOPE

The M145 telescope is a fixed 3.4-power, 28-mm optical sight designed to engage targets accurately out to 1,200 meters. The optical sight weighs 24 ounces (681 grams) and is extremely rugged for rough field conditions. The sight has an 8.2-mm diameter exit pupil, which provides excellent vision in low light levels; for example, dawn and dusk, and also for rapid target acquisition.

### DESCRIPTION

J-86. The M145 straight telescope is a telescopic sight. The telescope magnifies targets by three and a half times, so it appears to bring the shooter three and a half times closer to the target. The telescope shows the strike of the round more clearly and allows more accurate shooting. In low-light conditions, looking through the sight without the laser filter allows for more accurate target detection than not using the sight at all, that is, than relying on the naked eye (Figure J-33). The lens cover protects the lens when the gunner transports or stores the sight. He should keep the lens cover closed when not using the sight. An O-ring keeps moisture out of the battery. With practice, the gunner might be able to keep both eyes open. With both eyes open, he is more aware of his surroundings and feels less strain on his eyes. The M145 straight telescope must remain matched with the same weapon, attached at the same slot in the rail system. Otherwise, it must be rezeroed.

### DATA

J-87. The following data apply to the M145 telescope:

- Weight: 24.0 ounces (681 grams)
- Length: 7 inches (175 mm)
- Battery Life: 175 hours average (fresh battery). Sight comes with a new battery.
- Optics: Antireflective coated lens system, (28 mm) clear objective, 3.4X magnification.

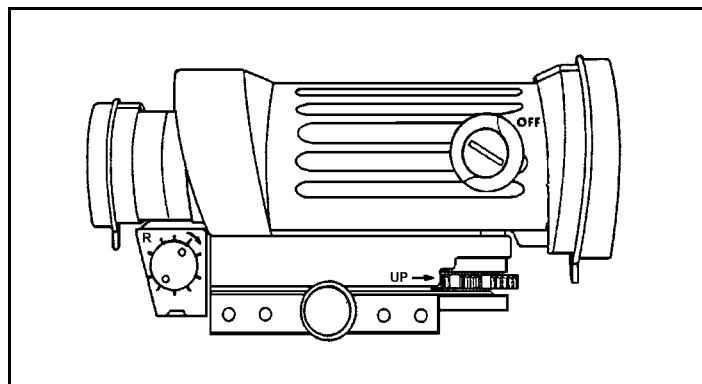


Figure J-33. M145 Telescope.

## CONTROLS

J-88. The following briefly describes the operational controls and indicators:

### ELEVATION ADJUSTMENT DIAL

J-89. The elevation adjustment dial allows the gunner to zero the telescope to the weapon. He can only rotate the dial after moving the silver lock (1) to the UP position. Turning the elevation adjustment dial (2) counterclockwise in the direction of the arrows one click moves the point of impact up 2.5 mm at 10 meters. Turning the elevation adjustment dial (2) clockwise (opposite direction to the arrow) one click moves the point of impact down 2.5 mm at 10 meters. The gunner moves the silver lock (1) down to prevent any further movement of the elevation adjustment dial (Figure J-34).

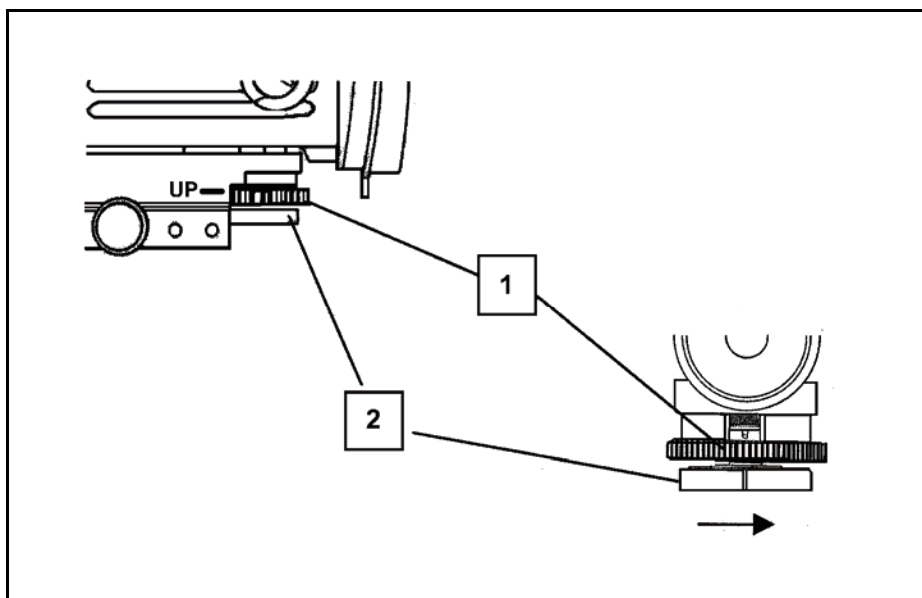


Figure J-34. Rotation of the elevation adjustment dial.

### WINDAGE ADJUSTMENT SCREW

J-90. The gunner uses the windage adjustment screw when zeroing the weapon. Turning the windage adjustment screw (3) clockwise one click moves the point of impact left 2.5 mm at 10 meters. Turning the windage adjustment screw (3) counterclockwise, one click moves the point of impact right 2.5 mm at 10 meters (Figure J-35).

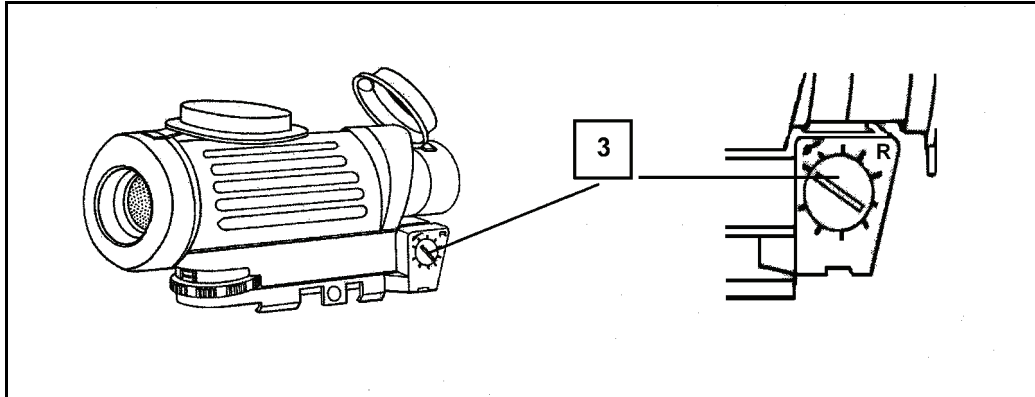


Figure J-35. Rotation of the windage adjustment screw.

## BATTERY

J-91. This paragraph explains how to install and check the battery. Remove the battery cap (1) by turning it counterclockwise and holding the rotary reticle illumination switch (3) stationary.

### CAUTION

#### MOISTURE AND DIRT

Before installing the battery cap, ensure that the threads on the battery housing and cap are free of moisture and dirt.

J-92. Ensure that the O-ring is in the battery cap. Using the sight without an O-ring in the battery cap can allow a short and shorten battery life. Insert battery (2) with positive (+) end to cap (Figure J-36).

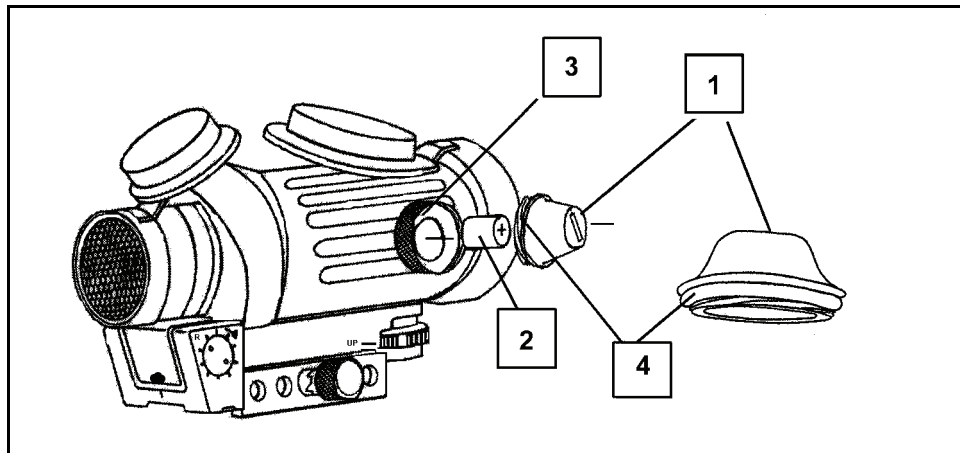


Figure J-36. Installation and inspection of batteries.

**CAUTION**

**MOISTURE AND DIRT**

Before installing the battery cap, ensure that the threads on the battery housing and cap are free of moisture and dirt.

Ensure that the O-ring is in the battery cap. Using the sight without an O-ring in the battery cap can reduce battery light or short out the battery altogether.

Hand-tighten the battery cap. Using a tool to tighten it further could strip the threads.

J-93. Reinstall the battery cap (1) by holding the rotary reticle illumination switch (3) stationary turning clockwise until snug. Tighten by hand only. Open the rear lens cover (4). Turn the rotary reticle illumination switch (3) and look through rear lens. Verify that the reticle is illuminated. If not, replace the battery. When finished, turn the rotary switch to the OFF position, and then replace the rear lens cover (Figure J-37).

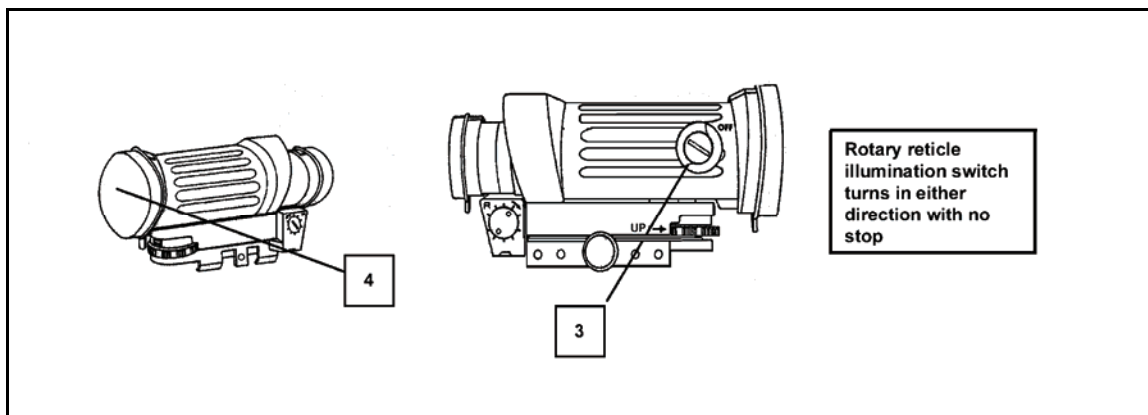


Figure J-37. Rotary reticle illumination switch.

**CAUTION**

**MOUNTING HARDWARE**

By hand, tighten the torque-limiting knob until you hear two clicks. Using tools to tighten the mounting hardware could damage equipment.

**INSTALLATION**

J-94. The M145 straight telescope mounts directly to the mounting rail on the M249, and M240B machine guns. The gunner must adjust the position of the M145 telescope either backwards or forward on the rail to obtain the correct eye relief (distance of the eye from the back of the telescope). If he installs the same sight in the same position slot on the rail, on the same weapon, then he need not re-zero.



J-95. Back off on the torque limiting knob just enough for the rail grabber to go over the rail. Do not force the torque-limiting knob past its intended stop. Mount the M145 straight telescope firmly over the rail. Ensure that the mount seats squarely over the rail. Tighten the torque-limiting knob (clockwise) until it rotates with two clicks. Fasten the mount securely before adjusting the eye relief. The sight is now mounted to the weapon about 3 inches (70 mm) in front of the firing eye (Figure J-38 [M249] and Figure J-39 [M240B]). Assume a comfortable firing position and achieve a good stockweld (at trigger pull length) with both eyes closed. Open the sighting eye and compare the view through the scope with the following figures:

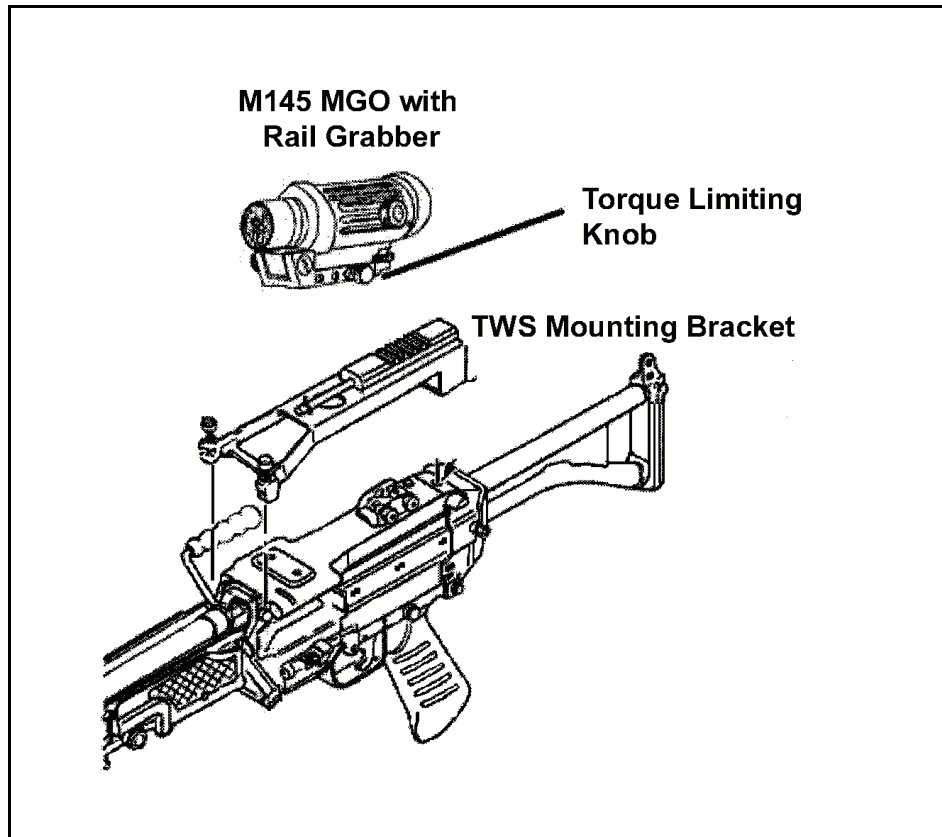
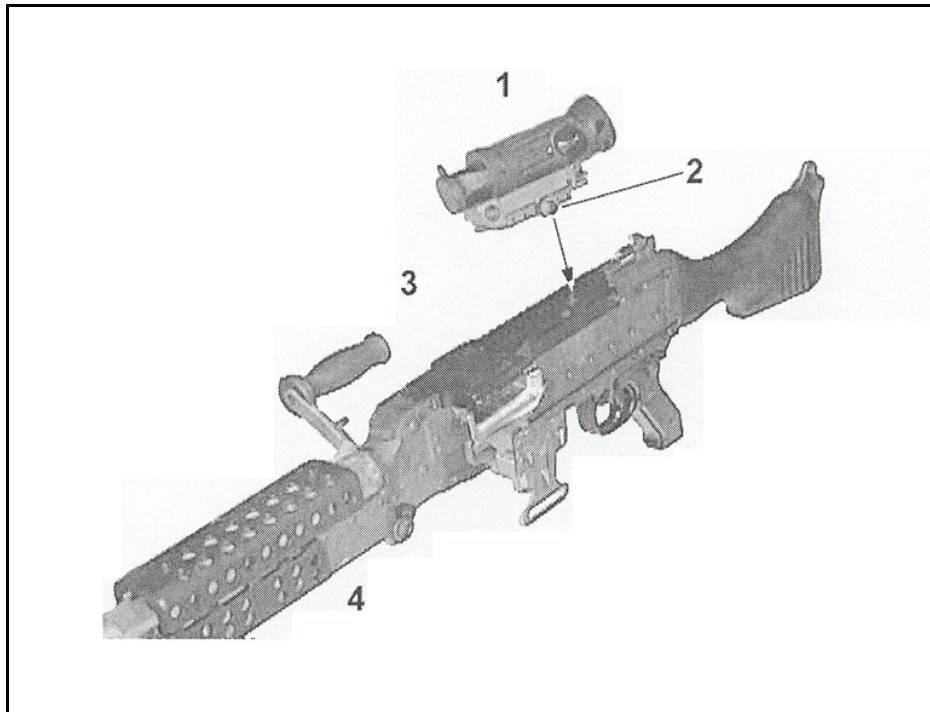
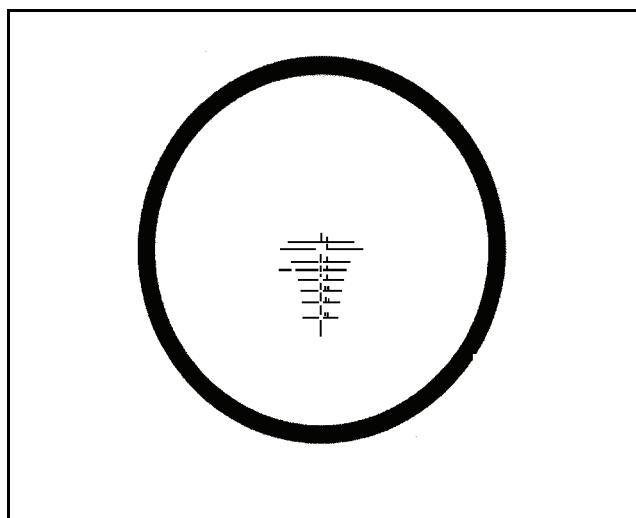


Figure J-38. Mounting of sight onto the M249.



**Figure J-39. Mounting of the sight onto the M240B.**

J-96. If the target scene fills the scope to provide the maximum field of view, then you have achieved the correct eye relief (Figure J-40). No further repositioning of the M145 on the mounting rail is required.



**Figure J-40. Correct eye relief.**

J-97. If the target scene does not fill the sight's field of view, you must move the optical sight forward or backward on the rail (Figure J-41).

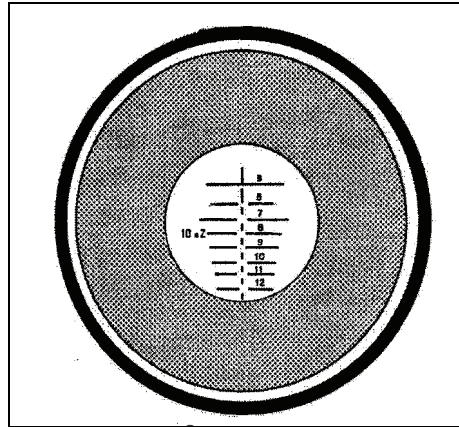


Figure J-41. Incorrect eye relief.

J-98. You must reposition the optical sight for correct eye relief. Loosen the torque limiting knob and move the optical sight in the appropriate direction (forward or backward), which provides the full field of view. Repeat until you obtain the correct sight picture as shown in Figure J-41.

## PROCEDURES FOR MOUNTING ON THE M60

J-99. The gunner should refer to Figure J-42 when mounting MWTS on M60 machine gun.

- **Press** on the end of the MWTS hinge pin latch (1) and
- **Remove** the MWTS hinge pin latch and the MWTS hinge pin (2) from the M60 bracket (3).
- **Install** the MWTS hinge pin (2) and the MWTS hinge pin latch (1) on the M60 machine gun (4).
- **Press** on the right side end of the M60 hinge pin latch (5) with a pointed object.
- **Remove** the M60 hinge pin latch.
- **Release** the feed tray cover latch (6).
- **Fully raise** the feed tray cover (7).
- **Remove** the M60 hinge pin (8).
- **Hold** the cover in place.
- **Install** the MWTS hinge pin (2) in right side of the hole (9).
- **Insert** the MWTS hinge pin latch (1) through the left side of the MWTS hinge pin (2) until interlocked.
- **Lower** the feed tray cover (7).
- **Connect** the feed tray cover latch (6).
- **Insert** the M60 hinge pin (8) through the holes (10) of the bracket (3).
- **Insert** the M60 hinge pin latch (5) through the M60 hinge pin until interlocked.
- **Close** the objective lens cover.
- **Push in** the cam release.
- **Slide** the rail back until the rail locks in place.
- **Open** the M60 machine gun feed tray cover.
- **Install** the bracket (3) on the M60 machine gun (4).
- **Fold** the rear sight (11) forward.
- **Place** the pins (12) of the bracket (3) in the cups (13) of the MWTS hinge pin (2) and the MWTS hinge pin latch (1).
- **Tighten** the nut (14) and then the locking nut (15) by hand.

- **Place** the groove (16) of the two clamping bars (17) on the edge of the feed tray cover (4).
- **Tighten** the two thumbwheels (18).
- **Install** the MGO on the rail.
- **Loosen** the clamping knob on the mount.
- **Select** the slot on the rail for mounting. You can use any slot, as long as the mount does not hang over edge of rail.
- **Place** the bar of the mount in the slot of the rail.
- **Tighten** the knob on the mount by hand until you hear two clicks.

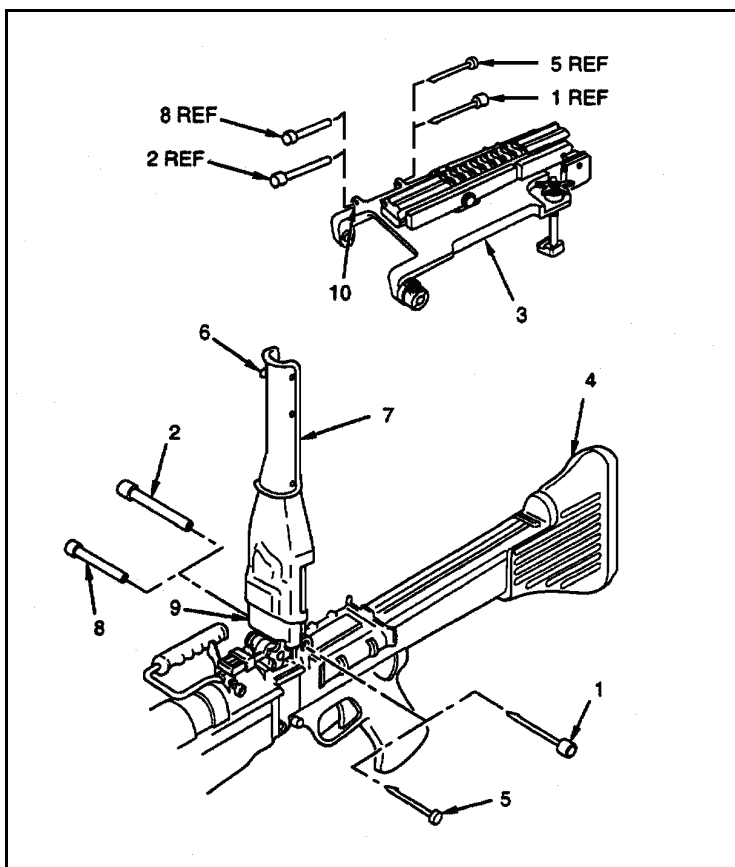


Figure J-42. Mounting of the sight onto the M60 machine gun.

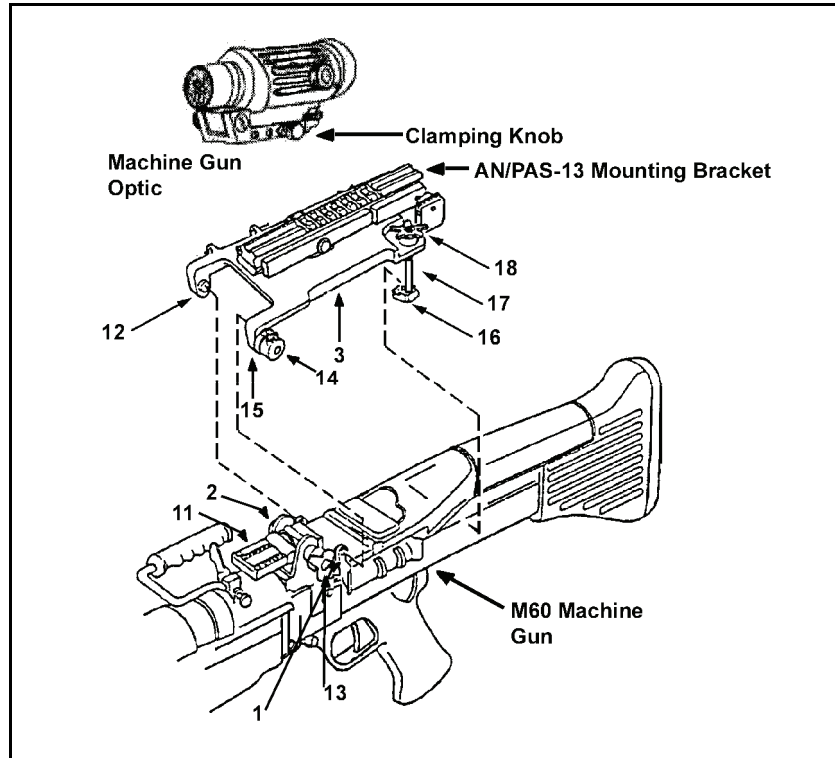


Figure J-42. Mounting of the sight onto the M60 (continued).

## ZEROING PROCEDURES

J-100. The following subparagraphs explain the different ways to zero the M145 straight telescope on the M240B, M60, and M249 machine guns:

### ZEROING TO WEAPON

J-101. Zeroing the M145 straight telescope aligns the sight to the barrel of the machine gun so that the point of aim equals the point of impact. The M145 straight telescope is adjusted and centered at the factory.

- **Open** the front (1) and the rear (2) lens covers.
- **Turn** each cover inside out to stow the lens covers while the sight is being used (Figure J-43).

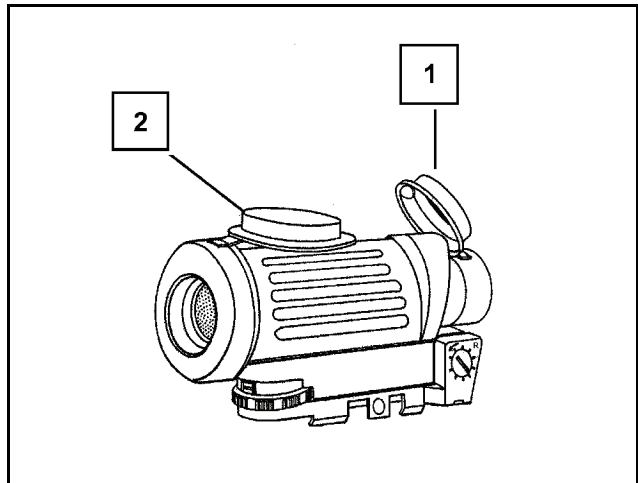


Figure J-43. Stowage of the lens covers.

**10-METER ZEROING, SETTING TO MECHANICAL ZERO**

J-102. The gunner adjusts the straight telescope so that the weapon’s barrel and the optical sighting axis align. The sighting axis is about 2 to 3 inches above the machine gun barrel. Therefore, the strike of the bullet at a 10-meter range is also about 2 to 3 inches low, without further zeroing adjustment (Figure J-44). To bring the strike of the bullet up, the gunner lifts the silver lock and rotates the elevation adjustment dial counterclockwise (to the right) about one full turn.

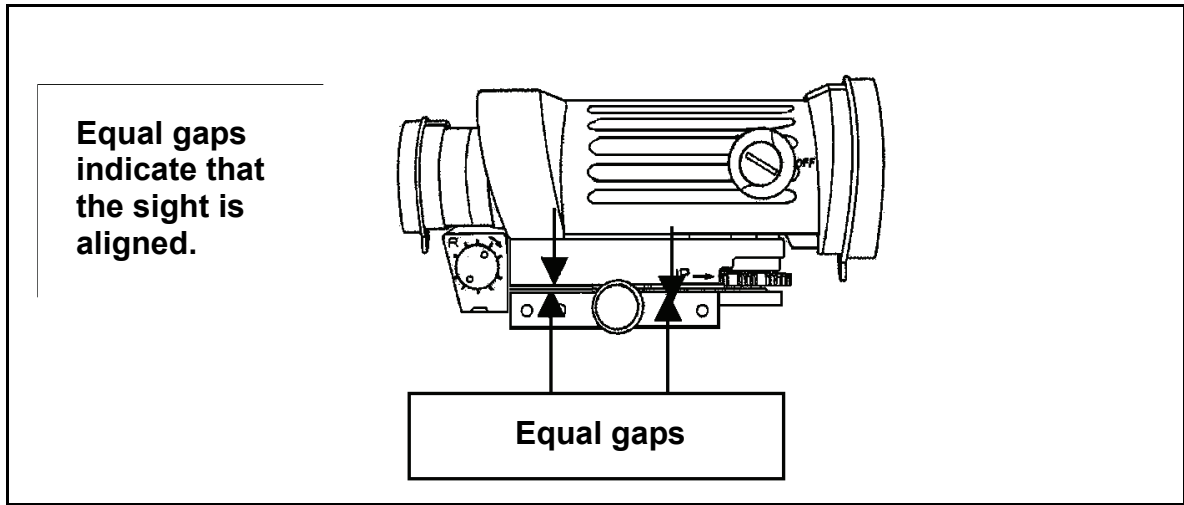


Figure J-44. Gaps.

J-103. The gunner adjusts the windage dial to center the markings on the front of the sight. This adjustment brings the bullet’s point of impact to the middle of the point of aim (Figure J-45). Each click of zeroing adjustments makes a 2.5 mm movement of the point of impact at 10 meters.

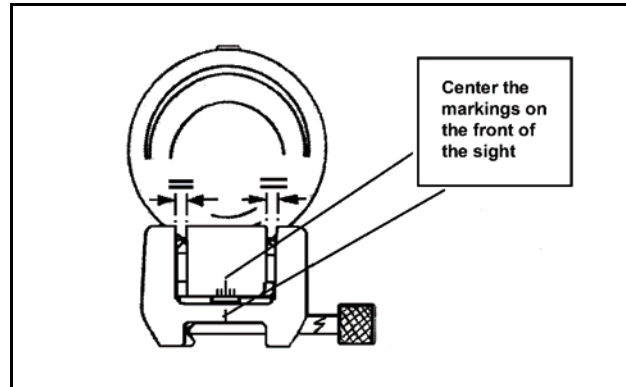


Figure J-45. Centered markings.

- To move the point of impact to the right, turn the windage adjustment screw (2) counterclockwise with the arrow marked on the dial.
- To move the point of impact to the left, turn the windage adjustment screw (2) clockwise opposite to the arrow.
- To move point of impact up, turn the elevation adjustment screw (1) counterclockwise (right) with the direction of the arrow marked and "UP."
- To move the point of impact down, turn the elevation adjustment screw (1) clockwise (left) opposite to the arrow (Figure J-46).

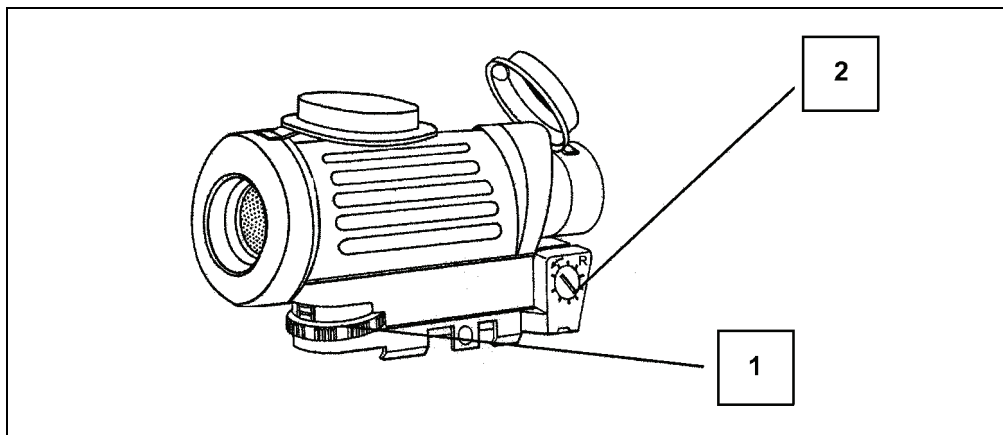


Figure J-46. Adjustment of point of impact.

## 10-METER RANGE ZEROING

J-104. When zeroing, the gunner fires groups of three single-shot rounds at a target. After each three rounds, he must determine the center of the group.

- Look through the telescope and align the reticle's 10-meter zeroing mark on the center base of the aiming points on the basic machine gun marksmanship target (Figure J-47).

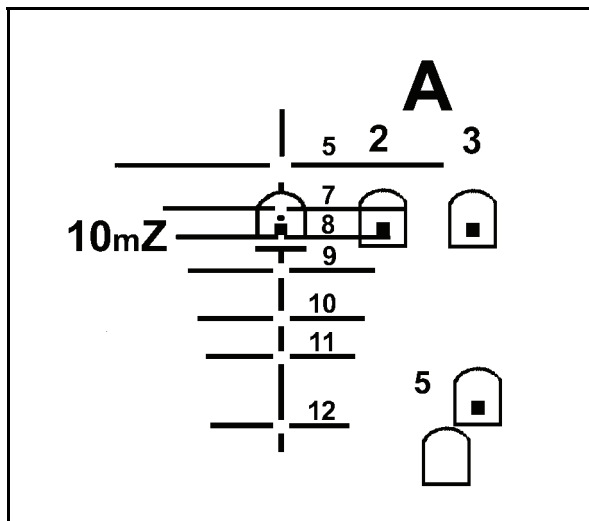


Figure J-47. Ten-meter reticle aiming point.

- Fire three-single rounds loaded individually without making any sight adjustments.
- The three-round shot group should be within a 4-cm circle to establish the center of the shot group in relation to the center base of the aiming paster.
- Measure the amount of movement that is required left or right (windage) and either up or down (elevation) to move the three-round shot group onto the center of the aiming paster.
- Upon completion, return to the firing line to make corrections to the weapon and refire a three-round shot group to confirm zero (Figure J-48).

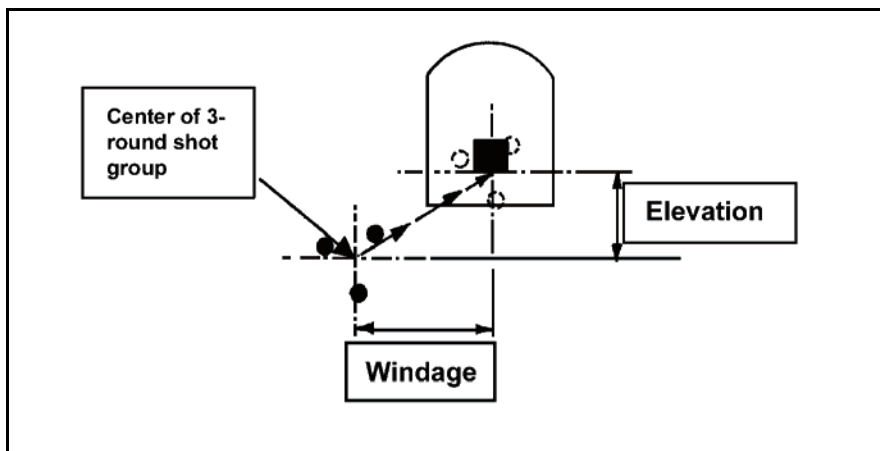


Figure J-48. Three-round shot group with adjustments.

- Repeat the above steps until the strike of the round is coincident with the center of the target. Close the silver lock down to prevent any further movement of the elevation zeroing adjustment dial.

### FIELD ZEROING AT 500-METER RANGE

J-105. The gunner looks through the telescope and aligns the reticle's 500-meter mark on the center of mass of the double "E" silhouette target (Figure J-49).



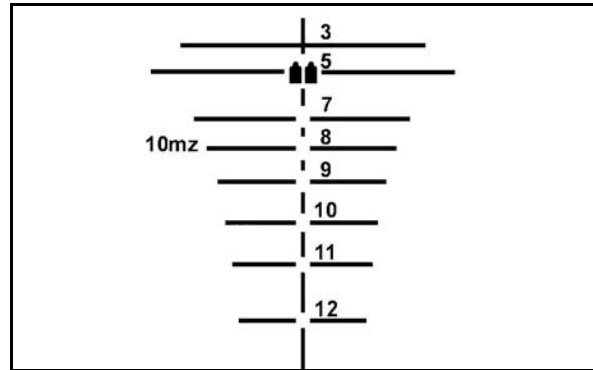


Figure J-49. Aiming point, 500-meter reticle.

- M240B, M60, and M249 machine guns: Fire a 5- to 7-round burst.
- Observe the impact of the rounds.
- Determine the direction of impact to be moved (up or down, left or right).
- Estimate or measure the amount of movement required to move the strike of the round to the center of the target (at 500 meters; 5 inches equals one click of adjustment in both windage and elevations). Repeat these steps until the strike of the round coincides with the center of the target.

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*Note:* Close the silver lock down to prevent any further movement of the elevation zeroing adjustment dial. The M145 straight telescope is now zeroed and ready for operational shooting.

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### USING RETICLE TO ESTIMATE RANGE

J-106. The gunner uses the vertical gap in the stadia lines to estimate ranges. The height of gaps in the stadia lines represents a 60-inch high target at the range noted, for example, 5, 7, 8, 9, 10, 11, or 1,200 meters (Figure J-50).

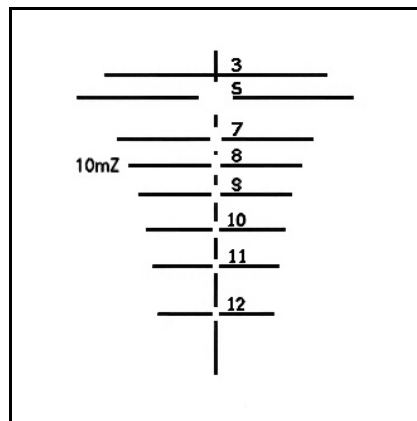


Figure J-50. Reticle stadia lines.

## ILLUMINATING THE RETICLE

J-107. For low light operations, the reticle can be illuminated to show the 300-, 500-, 700-, and 800-meter aiming marks (Figure J-51). The sight has variable-intensity LED reticle illumination. It has ten positions: OFF plus nine other reticle-intensity settings.

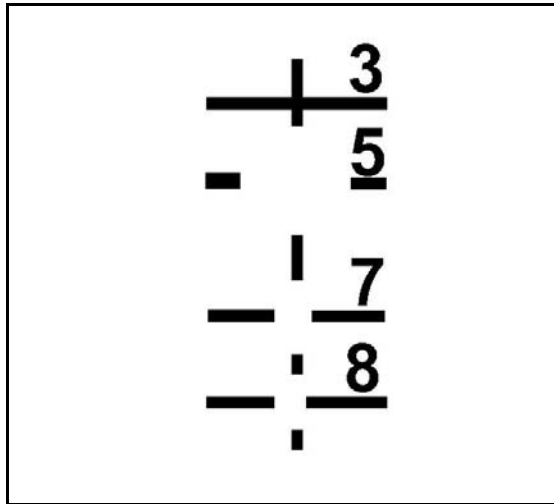


Figure J-51. Illuminated reticle.

- To make reticle illumination adjustments, turn the rotary switch (1) clockwise. The intensity of the illumination increases the further the switch is turned (Figure J-52).

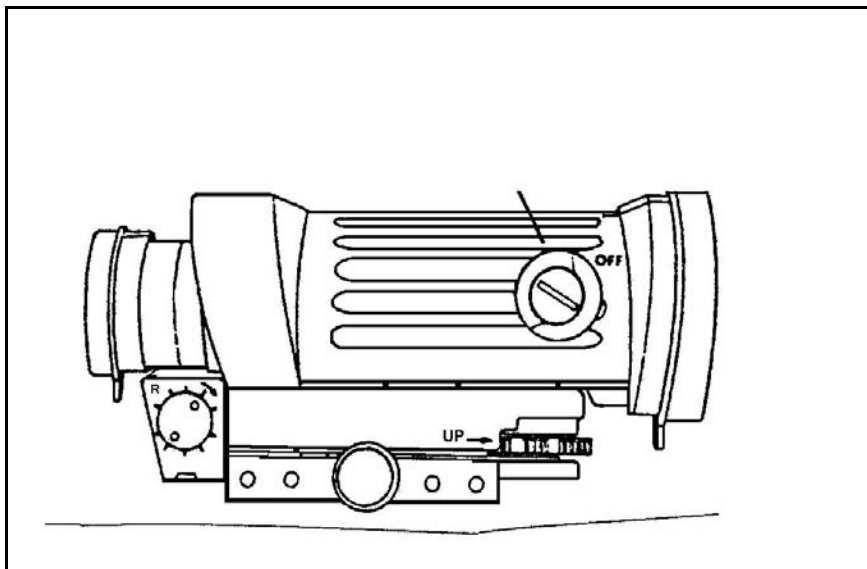


Figure J-52. Illuminated reticle adjustments.

- Turn the rotary switch to the OFF position when the telescope is being used during normal daylight or when illumination is not required (Figure J-53). Ensure the reticle illumination switch is turned to the OFF position when not required.

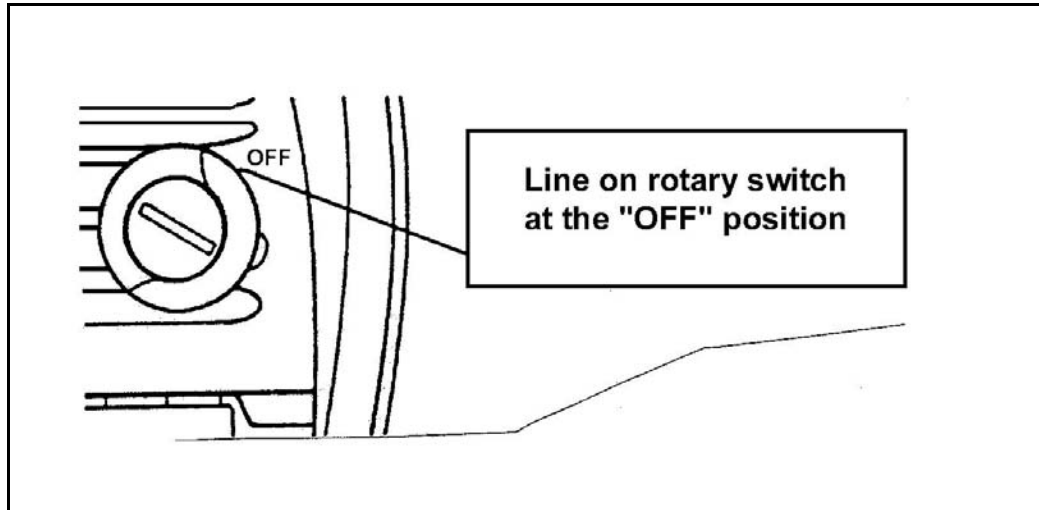


Figure J-53. Off switch.

## PROCEDURES FOR MOUNTING AND ZEROING THE AN/PVS-4

J-108. Zeroing aligns the AN/PVS-4 to the M249. The gunner can zero the sight in daylight or darkness (TM 11-5855-213-10). In daylight, he must use the daylight cover. For a precise zero, he should zero at 300 meters and at night. Once he has zeroed an AN/PVS-4 to an M249 machine gun, anyone who knows how to use the reticle should be able to fire the weapon effectively. However, either adjusting the objective focus to fire at targets at various ranges, or adjusting the diopter focus for the vision of different firers can change the zero. A metal target is excellent for zeroing purposes, because the gunner can observe the strike of the round easily using an AN/PVS-4. Zeroing procedures follow:

### MOUNTING THE BRACKET AND DEVICE

J-109. Before zeroing and qualifying with the AN/PVS-4, the gunner must mount the bracket and sight onto his weapon.

#### CAUTION

##### ALIGNMENT FOR MOUNTING

When mounting an AN/PVS-4 to the bracket, ensure that the screw hole in the AN/PVS-4 is lined up with and firmly pressed against the bracket screw. Otherwise, the screw will strip the threads in the screw hole.

- Place the mounting bracket on top of the feed cover mechanism assembly so that the two forked ends are secured around the headless pins.
- Remove the screw cover behind the rear sight assembly, and screw the bracket knob in until it is tight.
- Position the AN/PVS-4 on top of the bracket so that the mount of the AN/PVS-4 is aligned with the mounting knob of the bracket.
- Turn the mounting knob clockwise until the AN/PVS-4 is tight (Figure J-54).

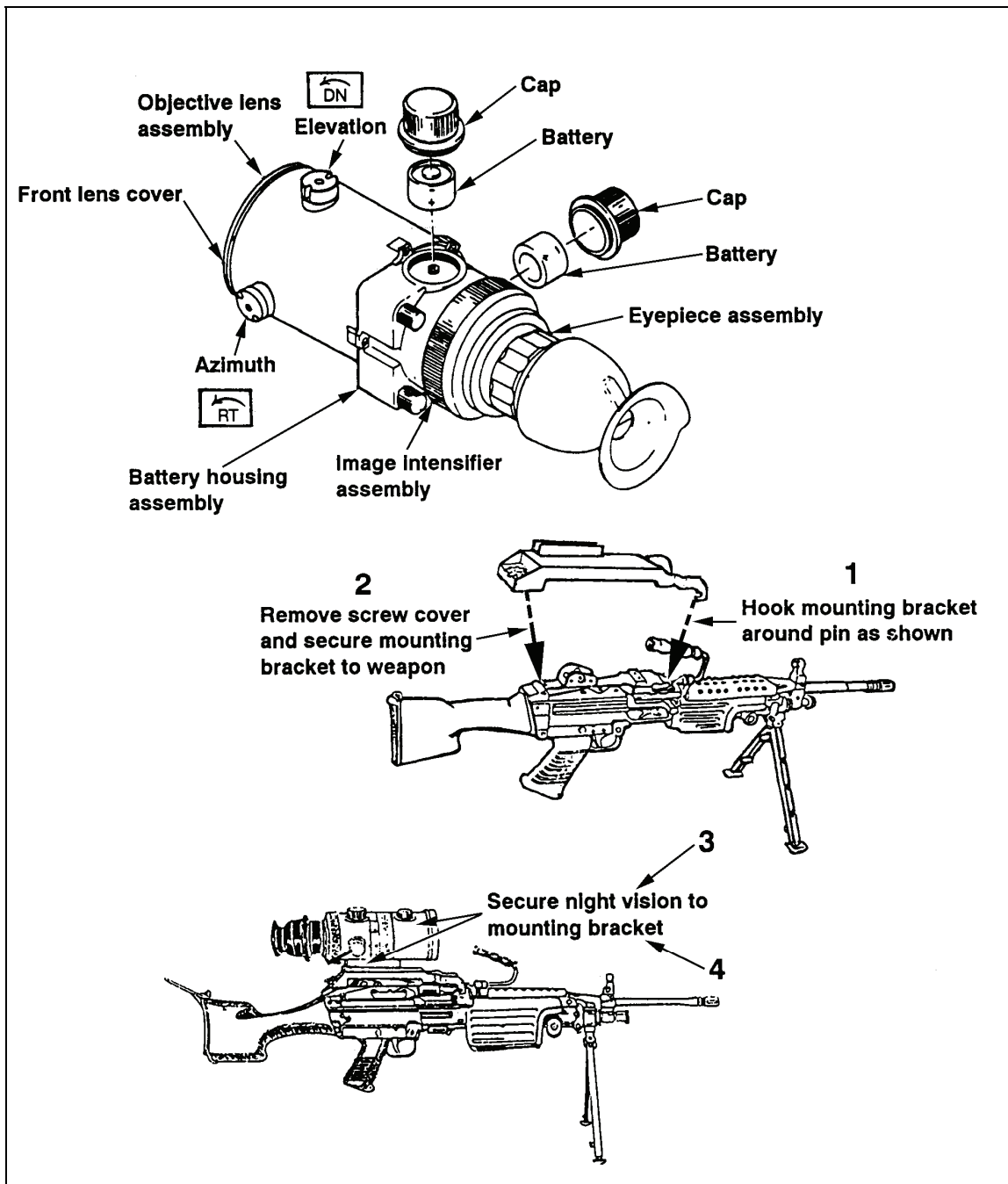


Figure J-54. Mounting of the AN/PVS-4 onto the M249 light machine gun.

**SEATING THE DEVICE**

J-110. Once the device is mounted, the gunner fires a 3-round burst to seat the device, checks and tightens the mounting knob, and then fires another 3-round burst. He checks the device to ensure it is settled and securely fastened and tightens the mounting knob if necessary. He does not fire at the boresight target during this procedure.

## CENTERING THE RETICLE IN THE FIELD OF VIEW

J-111. The gunner turns the device on and centers the reticle pattern in the field of view by using the azimuth and elevation actuators. To be accurate, he does this by rotating the elevation and azimuth actuators from one side to the other and from top to bottom, while counting the number of clicks. The elevation actuator has the down direction marked DN with an arrow. This moves strike of the round. The azimuth actuator has the right direction marked RT with an arrow. This also moves the strike of the round. He divides the number of clicks for each by two and moves the elevation and azimuth actuators that number of clicks. This manually centers the reticle in the field of view horizontally and vertically. This enables the gunner to reach an accurate boresight between the point of aim (reticle) and the center of the bore (Figure J-55).

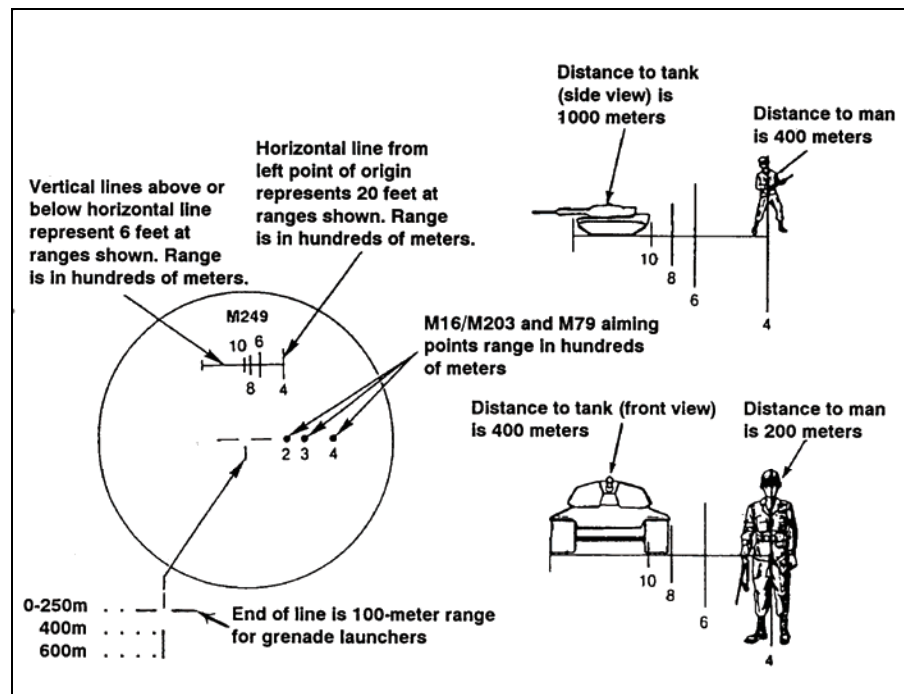


Figure J-55. Centered reticle pattern.

## CONFIRMING THE BORESIGHT

J-112. To do this, the gunner centers and affixes a 25-meter (M16A2) zero target to the back of a basic machine gun paster target. This provides a large, clear surface for identifying the strike of the round. Then, he emplaces the target 10 meters from the firing position. The gunner places the reticle aiming point on the 25-meter zero target aiming point (Figure J-56) and fires a single round. If the round impacts anywhere near the aiming point, he fires two more rounds to establish his group.

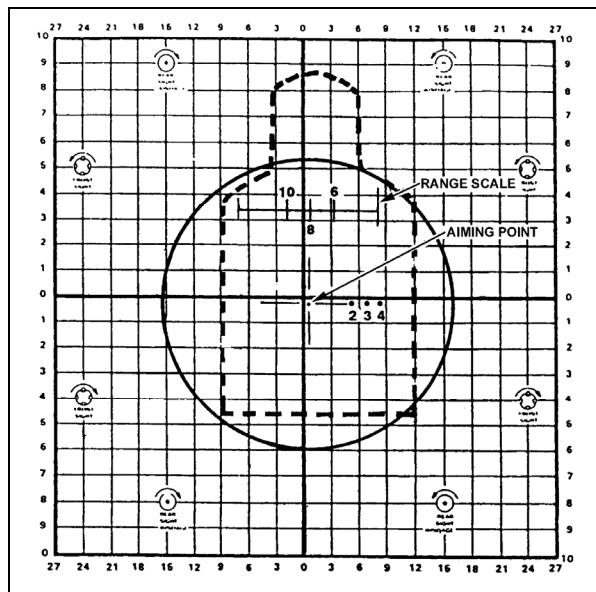


Figure J-56. Reticle aiming point, target aiming point, and shot group.

## 25-METER ZEROING

J-113. After a boresight has been established, the gunner moves back to a 25-meter firing position. He affixes another 25-meter zero target to the back of a 10-meter machine gun target and fires three rounds.

- Locate and triangulate the center of the shot group. From the center of the shot group, adjust the reticle to move the center of the shot group to a point 8 cm below and 2 cm right of the target aiming point (Figure J-57). This location on the 25-meter zero target is 9 squares below (8 cm divided by .9) and 2 squares right (2 cm divided by .9) of the target aiming point. Make the adjustment using the AN/PVS-4 azimuth and elevation adjustment actuators. Each square on the 25-meter zero target is .9 cm. Each click of the actuators moves the strike of the round .25 cm (or .1 inch) at 10-meters. Therefore, 4 clicks on either the elevation or azimuth actuator move the strike of the round one square.
- After making the adjustments, assume a stable position; place the reticle aiming point on the target aiming point, and fire three more single rounds. Repeat the process until the rounds impact within the desired location (9 squares below and 2 squares right).
- If you miss the 25-meter zero target with the first round but strike the 10-meter machine gun paster target, make a large adjustment with the elevation and azimuth actuators. Continue this process with three-round groups and adjustments until the rounds strike the desired location.
- Do not record the zero because when the AN/PVS-4 is dismounted and remounted on the same M249, some changes may occur. It is best to zero each time.
- Once the AN/PVS-4 is mounted and boresighted, fire a 3-round burst at the center base of the target and note the strike of the rounds. While maintaining the reticle aiming point on the target, move the reticle aiming point to the strike of the rounds by manipulating the elevation and azimuth actuators.
- Acquire a good sight picture on the target with the reticle aiming point once again and fire another 3-round burst. Note the strike of the rounds and repeat the process until the rounds impact on target.

## MOUNTING THE AN/PVS-4 ON THE M60

J-114. Before zeroing and qualifying with the AN/PVS-4, the gunner must mount the bracket and sight onto his weapon. The M60 machine gun requires a mounting bracket.

### CAUTION

#### ALIGNMENT FOR MOUNTING

When mounting an AN/PVS-4 to the mounting bracket, ensure that the hole for the screw in the AN/PVS-4 aligns flush against the bracket screw. If not, the screw will strip the threads in the AN/PVS-4 and prevent its use with the machine gun.

- The gunner removes the M60 hinge pin latch and hinge pin from the over assembly by pressing on the latch (open end of pin) with an empty cartridge case, and separates the latch and pin. He places the pin and latch in the aiming guides on the left side of the mounting bracket and presses together.
- The gunner positions the mounting bracket assembly on top of the machine gun cover so that the holes in the front of the bracket align with the cover assembly pin holes.
- The gunner inserts the longer hinge pin supplied with the bracket through the bracket-and-cover assembly, and secures by inserting the hinge pin latch.
- The gunner loosens the wing nuts on both leg clamps and positions the clamps under the cover assembly. He secures the mounting bracket by tightening the wing nuts firmly (Figure J-57).
- The split washer is placed next to the wing nut and the flat washer is placed next to the bracket.

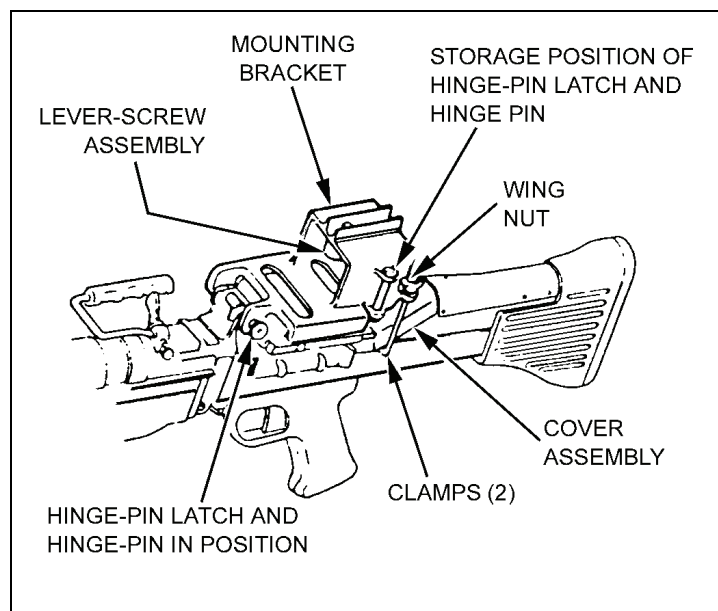


Figure J-57. Installation of mounting bracket.

- The gunner installs the sight on the M60 mounting bracket assembly by positioning it in the groove on top of the bracket so that the scribe line on the bracket is aligned with the scribe line on the sight-mounting adapter. He tightens the lever screw assembly to secure the sight to the

bracket. He uses an empty cartridge case placed over the lever arm to increase leverage as he tightens the screw (Figure J-58).

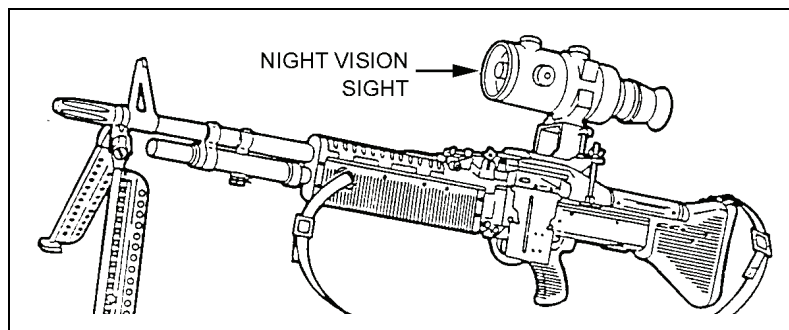


Figure J-58. Position of the AN/PVS-4.

### MOUNTING THE AN/PVS-4 ON THE M240B

J-115. Before zeroing and qualifying with the AN/PVS-4, the gunner must mount the sight onto his weapon. The M240B machine gun has a rail mount already attached to the cover assembly (Figure J-59). The gunner installs the sight on the M240B rail mount by loosening the mounting knob located on the left side. He then positions it in a slot on the rail mount. He can use any slot, as long as the mount does not hang over the edge of the rail. He places the bar of the mount in a slot on the rail and hand tightens the knob on the mount until he hears two clicks. This will allow the sight to retain its zero. As long as he places the sight in the same slot after zeroing, the sight will retain its zero to a degree (Figure J-60).

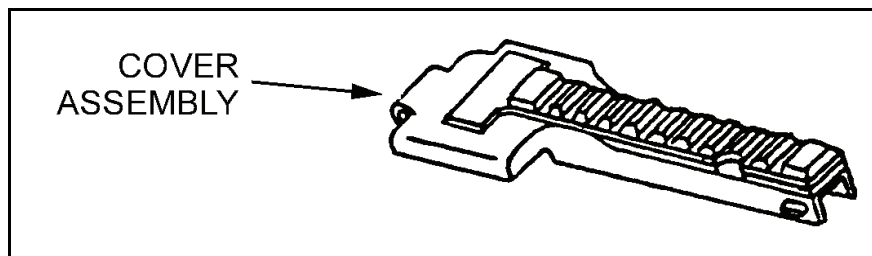


Figure J-59. Rail mount on the M240B.



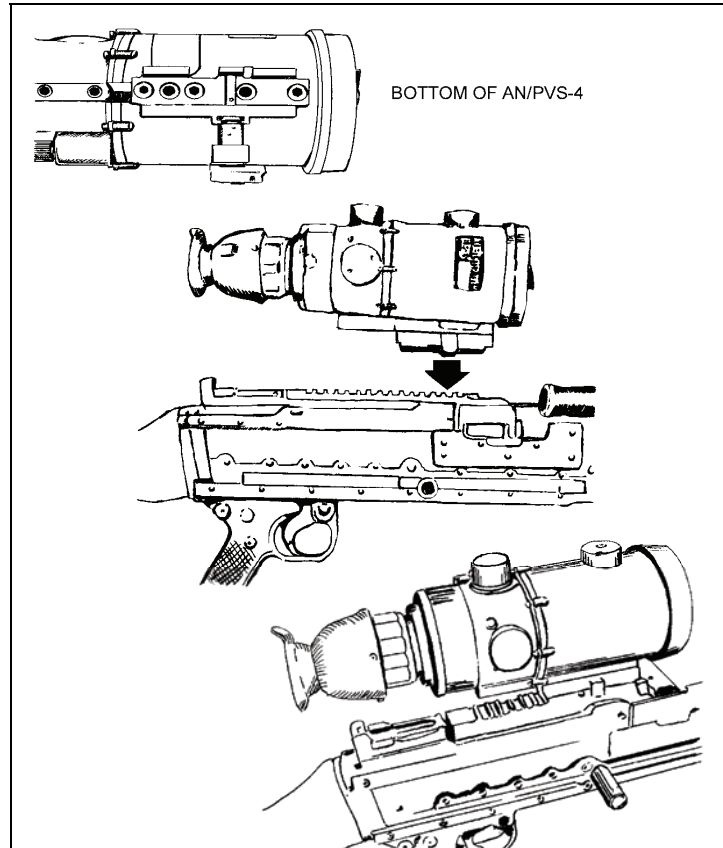


Figure J-60. Mounting of the AN/PVS-4.

### ZEROING THE AN/PVS-4 TO THE M60/M240B

J-116. Zeroing aligns the AN/PVS-4 to the machine gun. The gunner can zero the sight in daylight or darkness. (AN/PVS-4 TM 11-5855-213-10) When zeroing during daylight, the daylight cover must be used. To obtain a precise zero, it is best done at 300 meters and at night. Once the AN/PVS-4 is zeroed on the machine gun, any Soldier who knows how to use the reticle should fire the weapon effectively. However, there may be some changes in zero when the objective focus is adjusted to engage targets at various ranges and when the diopter focus is adjusted for the vision of different firers. A metal target is excellent for zeroing purposes, because the strike of the round can be easily observed with an AN/PVS-4. The procedures to zero are as follows:

#### Seating the Device

J-117. Once the device is mounted, the gunner fires a seven-round burst to seat the device, checks and tightens the mounting knob, and then fires another three-round burst. He checks the device to ensure it is settled and securely fastened and tightens the mounting knob if necessary. He does not fire at the boresight target during this procedure.

### Centering the Reticle in the Field of View of the AN/PVS-4

J-118. The gunner turns the device on and centers the reticle pattern in the field of view by using the azimuth and elevation actuators. To be accurate, he does this by rotating the elevation and azimuth actuators from one side to the other and from top to bottom, while counting the number of clicks. The elevation actuator has the down direction marked DN with an arrow. This moves strike of the round. The azimuth actuator has the right direction marked with RT with an arrow. This also moves the strike of the round. He divides the number of clicks for each by two and moves the elevation and azimuth actuators that number of clicks. This manually centers the reticle in the field of view horizontally and vertically. This enables the gunner to reach an accurate boresight between the point of aim (reticle) and the center of the bore (Figure J-61).

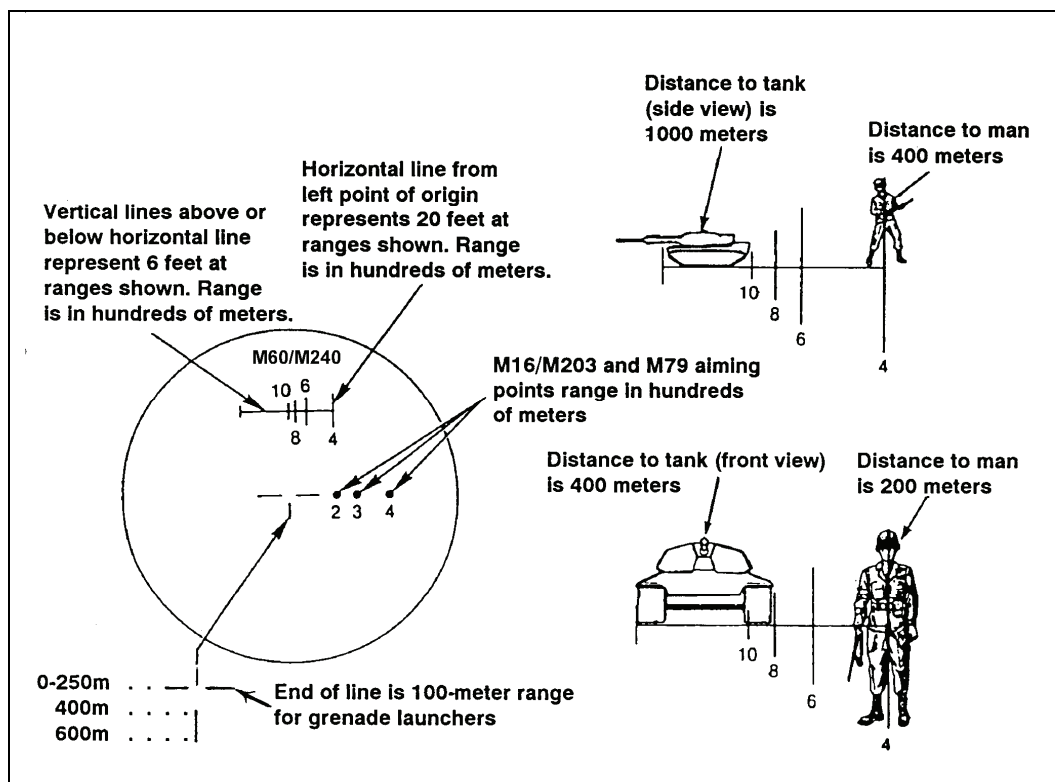


Figure J-61. Centered reticle pattern.

### Confirming the Boresight

J-119. To confirm the boresight, the gunner centers and affixes a 25-meter (M16A2) zero target to the back of a basic machine gun pasteur target. This provides a large, clear surface for identifying the strike of the round. Then, he emplaces the target 10-meters from the firing position. The gunner places the reticle aiming point on the 25-meter zero target-aiming point (Figure J-62) and fires a single round. If the round impacts anywhere near the aiming point, he fires two more rounds to establish his group.

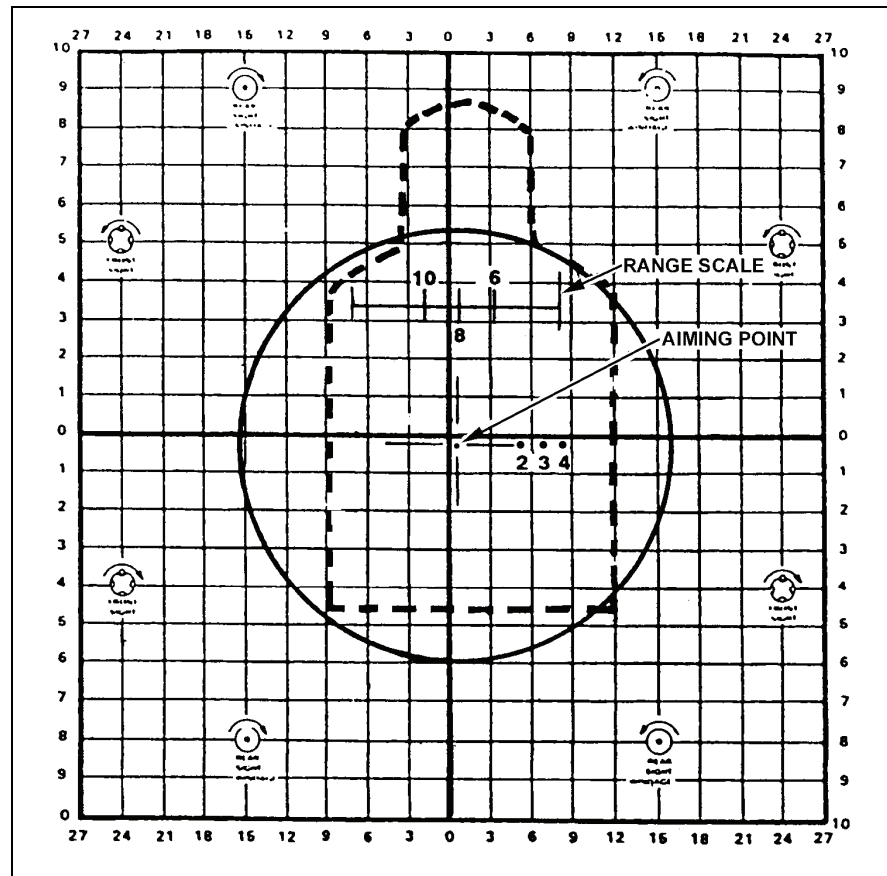


Figure J-62. Reticle aiming point, target aiming point, and shot group.

## 25-Meter Zeroing

J-120. After a boresight has been established, the gunner moves back to a 25-meter firing position. He affixes another 25-meter zero target to the back of a 10-meter machine gun target and fires three rounds.

- AN/PVS-4 (M60 and M240B) The gunner locates and triangulates the center of the shot group. From the center of the shot group, he adjusts the reticle to move the center of the shot group to a point 8 cm below and 2 cm right of the target aiming point. This location on the 25-meter zero target is 9 squares below (8 cm divided by .9) and 2 squares right (2 cm divided by .9) of the target aiming point. He makes the adjustment using the AN/PVS-4 azimuth and elevation adjustment actuators. Each square on the 25-meter zero target is .9 cm. Each click of the actuators moves the strike of the round .25 cm (or .1 inch) at 10 meters. Therefore, 4 clicks on either the elevation or azimuth actuator move the strike of the round one square.
- After making the adjustments, the gunner assumes a stable position, places the reticle aiming point on the target aiming point, and fires three more single rounds. He repeats the process until the rounds impact within the desired location (9 squares below and 2 squares right).
- If he misses the 25-meter zero target with the first round but strikes the 10-meter machine gun paster target, he makes a large adjustment with the elevation and azimuth actuators. He continues this process with three-round groups and adjustments until the rounds strike the desired location.
- He does not record the zero with the old style bracket because when the AN/PVS-4 is dismounted and remounted on the same M60, some changes may occur. It is best to zero each time. The zero is recorded with the new rail bracket because when the AN/PVS-4 is

dismounted and remounted on the same machine gun, and as long as the gunner places a mark on the rail slot the sight will have some changes. However, the gunner does not need to re-zero his sight to the machine gun.

- Once the AN/PVS-4 is mounted and boresighted, the gunner fires a three-round burst at the center base of the target and notes the strike of the rounds. While maintaining the reticle aiming point on the target, he moves the reticle aiming point to the strike of the rounds by manipulating the elevation and azimuth actuators.
- The gunner acquires a good sight picture on the target with the reticle aiming point once again and fires another three-round burst. He notes the strike of the rounds and repeats the process until the rounds impact on target.

# Glossary

## Acronyms and Abbreviations

<b>AAR</b>	after-action report
<b>ALICE</b>	all-purpose, lightweight, individual carrying equipment
<b>AR</b>	Army regulation
<b>ARTEP</b>	Army Training and Evaluation Program
<b>BFA</b>	blank firing adapter (for some weapons) or attachment for others
<b>CBRN</b>	chemical, biological, radiological, or nuclear
<b>CLP</b>	cleaner, lubricant, preservative
<b>cm</b>	centimeters
<b>CO</b>	company
<b>DA</b>	Department of the Army
<b>DODAC</b>	Department of Defense Ammunition Code
<b>EST</b>	engagement skills trainer
<b>FM</b>	field manual
<b>FPF</b>	final protective fire
<b>FPL</b>	final protective line
<b>FSN</b>	federal stock number
<b>FTX</b>	field training exercise
<b>GTA</b>	graphic training aid
<b>HMMWV</b>	high-mobility, multipurpose wheeled vehicle
<b>IAW</b>	in accordance with
<b>IET</b>	initial entry training
<b>IOAC</b>	Infantry officer's advanced course
<b>IOBC</b>	Infantry officer's basic course
<b>instr</b>	instruction
<b>LAW</b>	lubricating oil, arctic weather
<b>LFX</b>	live-fire exercise

## Glossary

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<b>LRA</b>	local reproduction authorized
<b>LSA</b>	lubricating oil, semifluid, automatic weapons
<b>LTA</b>	local training area
<b>LWGM</b>	lightweight ground mount
<b>m</b>	meter
<b>METL</b>	mission-essential task list
<b>MGO</b>	machine gun optic
<b>MILES</b>	multiple-integrated laser engagement system
<b>mm</b>	millimeter
<b>MOLLE</b>	modular, lightweight load-carrying equipment
<b>mph</b>	miles per hour
<b>MPRC</b>	multipurpose range complex
<b>MTA</b>	major training area
<b>MTP</b>	mission training plan
<b>MWTS</b>	medium weapon thermal sight
<b>N/A</b>	not applicable
<b>NATO</b>	North Atlantic Treaty Organization
<b>NCO</b>	noncommissioned officer
<b>NCOES</b>	Noncommissioned Officer Education System
<b>NCOIC</b>	noncommissioned officer in charge
<b>NSN</b>	national stock number
<b>NVD</b>	night vision device
<b>OIC</b>	officer in charge
<b>PAM</b>	pamphlet
<b>PDF</b>	principal direction of fire
<b>PLT</b>	platoon
<b>POPP</b>	Pull, Observe, Push, and Press (memory aid for immediate action)
<b>prac</b>	practice
<b>qual</b>	qualification
<b>rd</b>	round
<b>sec</b>	second
<b>SM</b>	soldier's manual

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<b>SMCT</b>	soldier's manual of common tasks
<b>SOP</b>	standing operating procedures
<b>sqd</b>	squad
<b>STP</b>	soldier's training publication
<b>STRAC</b>	standards in training commission
<b>STX</b>	situational training exercise
<b>T&amp;E</b>	traversing and elevating
<b>TC</b>	training circular
<b>TM</b>	technical manual
<b>TOE</b>	table of organization and equipment
<b>TPIAL</b>	target pointer, illuminator, aiming light
<b>TRADOC</b>	US Army Training and Doctrine Command
<b>US</b>	United States
<b>VCE</b>	vehicle crew evaluator

#### Terms

<b>armorer</b>	the Soldier who repairs, assembles, and tests firearms such as an enlisted Soldier responsible for repairing and maintaining the unit's small arms
<b>butt plate</b>	the usually metal plate on the butt end of a gunstock
<b>cam</b>	(noun) a rotating or sliding piece in a mechanical linkage that transforms rotary into linear motion or vice versa
<b>cam</b>	(verb) to move or control the movement of something with a cam
<b>paster</b>	a [round piece] of paper with a gummed back designed to be pasted [over a hole in a target so that the target may be reused]
<b>pintle</b>	a usually upright pivot pin (as of a hinge or a rudder) on which another part turns; a hook at the rear of a limber to receive the lunette of a gun trail, caisson, or other vehicle when the gun is limbered
<b>spot-weld</b>	noun : a joint made by spot welding
<b>towelette</b>	a usually premoistened small piece of material used for personal cleansing

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## References

### SOURCES USED

These are the sources quoted or paraphrased in this publication.

ARTEP 7-8-MTP	<i>Mission Training Plan for the Infantry Rifle Platoon and Squad.</i> 29 September 1994.
ARTEP 7-8-DRILL	<i>Drills for the Infantry Rifle Platoon and Squad.</i> 25 June 2002.
FM 7-8	<i>Infantry Platoon and Squad.</i> 22 April 1992.
FM 3-25.26	<i>Map Reading and Land Navigation.</i> 20 July 2001.

### DOCUMENTS NEEDED

These documents must be available to the intended users of this publication.

AR 385-63	<i>Policies and Procedures for Training, Target Practice and Combat.</i> 19 May 2003.
DA Form 5517-R	<i>Standard Range Card (LRA).</i>
DA Form 85-R	<i>Scorecard for M249, M60, and M240B Machine Guns.</i>
DA Form 7304-R	<i>Scorecard for M249 AR.</i>
DA Form 7476-R	<i>10-Meter Boresight Offset Target.</i>
DA Pam 25-30	<i>Army Electronic Library.</i> 1 July 2002.
DA Pam 350-38	<i>Training Standards for Weapon Training.</i> September 1990.
FM 3-5*	<i>NBC Decontamination.</i> 28 July 2000.
FM 21-60*	<i>Visual Signals.</i> 30 September 1987.
STP 21-24-SMCT	<i>Soldier's Manual of Common Tasks (Skill Levels 2-4).</i> 31 August 2003.
TC 25-8*	<i>Training Ranges.</i> 5 April 2004.
TM 9-1005-319-10	<i>Operator's Manual List for Rifle 5.56-mm, M16A2.</i> 1 October 1998.
TM 9-1005-201-10*	<i>Operator's Manual Machine Gun, 5.56-mm, M249 with Equipment.</i> 26 July 1991.
TM 9-1005-224-10*	<i>Operator's Manual for Machine Gun, 7.62-mm, M60, W/E; Mount, Tripod, Machine Gun, 7.62-mm, M122.</i> 2 April 1998.

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- TM 9-1005-313-10\*     *Operator's Manual for Machine Gun, 7.62-mm, M240B, W/E; Flex-mount, Tripod, Machine Gun, 7.62-mm, M122A1.* 19 July 1996.
- TM 9-1300-200\*     *Ammunition General.* 3 October 1969.
- TM 11-5855-213-10\*     *Operator's Manual Night Vision Sight, Individual Served Weapon, AN/PVS-4.* 1 February 1993.

## WEBSITES

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## SCORECARD FOR M249, M60, AND M240B MACHINE GUNS

For use of this form, see FM 3-22.68; the proponent agency is TRADOC.

1. ID CODE*	2. UNIT	3. LANE	4. DATE (YYYYMMDD)
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5. TABLE I, 10 METER			
TASK	RANGE (M)	TIME	TOT HIT PTS
1	10	N/A	N/A
2	10	N/A	N/A
3	10	N/A	N/A
4	10	N/A	N/A
5	10	45 SEC	
6	10	30 SEC	
8. TABLE I POINTS (TOTAL HITS):			

6. TABLE II, DAY TRANSITION						
TASK	RANGE (M)	TIME	PRACTICE		QUALIFY	
			HIT	MISS	HIT	MISS
1	500	N/A	N/A	N/A	N/A	N/A
2	400	10 SEC				
3	500	15 SEC				
4	600	20 SEC				
5	800	30 SEC				
6	400	30 SEC				
	600					
7	700	45 SEC				
	800					
8	400	45 SEC				
	500					
	600					

7. TABLE III, LIMITED VISIBILITY						
TASK	RANGE (M)	TIME	PRACTICE		QUALIFY	
			HIT	MISS	HIT	MISS
1	10	N/A	N/A	N/A	N/A	N/A
2	10	N/A	N/A	N/A	N/A	N/A
3	500	N/A	N/A	N/A	N/A	N/A
4	200	10 SEC				
5	400	15 SEC				
6	100	10 SEC				
7	300	15 SEC				
8	200	25 SEC				
	400					
9	100	25 SEC				
	300					
10	100	30 SEC				
	200					
	400					

11. REMARKS

9. TABLE II POINTS (TOTAL HITS X 10):	
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\* Do not use personal information, to include name, SSN, phone number, address, mother's maiden name, and so forth.

10. TABLE III POINTS (TOTAL HITS):	
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12. RATING CALCULATOR	
<input style="width: 100%;" type="text"/>	TABLE I POINTS (BLOCK 8)
<input style="width: 100%;" type="text"/>	TABLE II POINTS (BLOCK 9)
<input style="width: 100%;" type="text"/>	TABLE III POINTS (BLOCK 10)
<input style="width: 100%;" type="text"/>	TOTAL POINTS

13. RATING SCALE	
TOTAL POINTS	RATING
186 - 212:	EXPERT
157 - 185:	FIRST CLASS
139 - 156:	SECOND CLASS
BELOW 139:	UNQUALIFIED

14. GRADER'S INITIALS	15. DATE (YYYYMMDD)	16. OIC'S INITIALS	17. DATE (YYYYMMDD)
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### SCORECARD FOR M249 AR

For use of this form, see FM 3-22.68; the proponent agency is TRADOC.

1. ID CODE*	2. UNIT	3. LANE	4. DATE (YYYYMMDD)
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5. TABLE I, 10M WITH CBRN				6. TABLE II, DAY TRANSITION WITH CBRN						7. TABLE III, LIMITED VISIBILITY						
TASK	RANGE (M)	TIME	TOT HIT PTS	TASK	RANGE (M)	TIME	PRACTICE		QUALIFY		TASK	RANGE (M)	TIME	QUALIFY		
							HIT	MISS	HIT	MISS				HIT	MISS	
1	10	N/A	N/A	1	300	N/A	N/A	N/A	N/A	N/A	1	25	N/A	N/A	N/A	
2	10	N/A	N/A	2	200	5 SEC					2	200	N/A			
3	10	N/A	N/A	3	400	10 SEC					3	400	N/A			
4	10	N/A	N/A	4	100	10 SEC					4	100	10 SEC			
5	10	20 SEC		5	300	15 SEC					5	300	15 SEC			
6	10	40 SEC		6	100	20 SEC					6	100	10 SEC			
				6	300											
7	10	40 SEC		7	200	20 SEC										
				7	400											
8. TABLE I POINTS (TOTAL HITS):				8	100	25 SEC										
10. REMARKS				8	200											
10. REMARKS				8	400											

9. TABLE II POINTS (TOTAL HITS X 5):

\* Do not use personal information, to include name, SSN, phone number, address, mother's maiden name, and so forth.

**11. RATING CALCULATOR**

	TABLE I POINTS (BLOCK 8)
	TABLE II POINTS (BLOCK 9)
	TOTAL POINTS

**12. RATING SCALE**

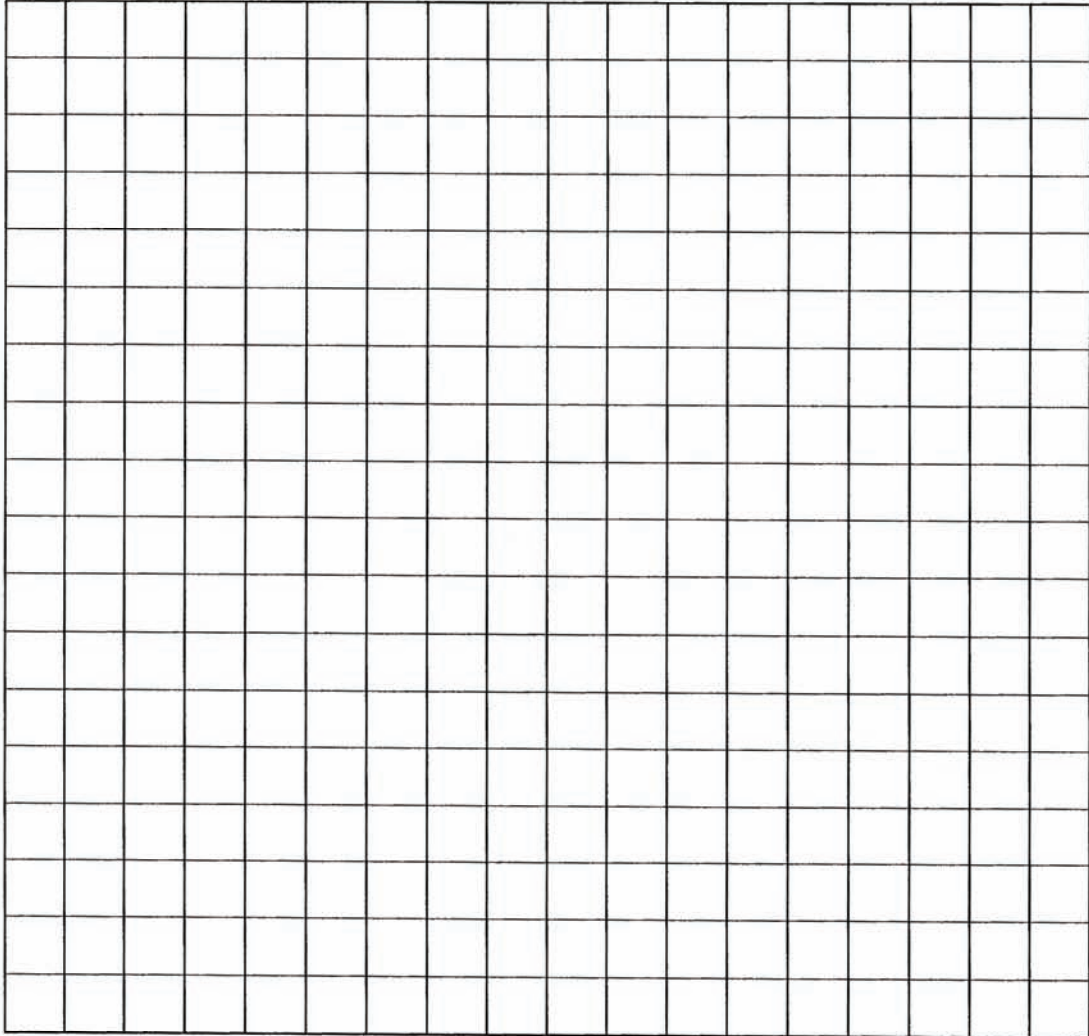
TOTAL POINTS	RATING
90 - 106:	EXPERT
80 - 89:	FIRST CLASS
70 - 79:	SECOND CLASS
BELOW 70:	UNQUALIFIED

13. GRADER'S INITIALS	14. DATE (YYYYMMDD)	15. OIC'S INITIALS	16. DATE (YYYYMMDD)
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## 10-METER BORESIGHT OFFSET TARGET

For use of this form, see FM 3-22.68; the proponent agency is TRADOC.  
See back of this form for quick reference to possible weapon configurations.



1. Use the correct offset for the weapon, sight, and location configured.
2. Stabilize the weapon and the offset.
3. Zero the bore light while it is inside the barrel of the weapon.
4. Align the laser of the bore light with the dot on the 10-meter offset.
5. Align the MILES laser with the MILES rectangle on the 10-meter offset (if applicable).
6. Adjust the aiming laser until it centers on the crosshair.
7. Center the optic aim point on the crosshair. Adjust the optic until the bore light laser aligns with the dot on the 10-meter offset.
8. Confirm that all devices still align to their aiming mark.





QUICK REFERENCE - POSSIBLE WEAPON CONFIGURATIONS						
WPN	ACCESSORY	MOUNT	RANGE ZEROED TO	ZERO TARGET OFFSET	BORESIGHT TARGET OFFSET	MILES OFFSET
M249	IRON SIGHTS	NA	400m	NA	TBD	1.9L/0.5U
M249	MGO	IFTC RAIL	400m	TBD	0.0/7.9U	1.9L/0.5U
M249	MGO	TWS BRACKET	400m	TBD	0.0/2.15U	1.9L/0.5U
M249	AN/PAQ-4C	TWS BRACKET TOP	400m	0.5R/1.5U	1.85L/7.7U	1.9L/0.5U
M249	AN/PAQ-4C	AN/PVS-4 BRACKET	400m	2.5R/1.5D	4.1L/6.1U	1.9L/0.5U
M249	AN/PAQ-4C	INSIGHT RAIL GRABBER WITH IFTC	400m	TBD	1.75L/4.69U	1.9L/0.5U
M249	AN/PAQ-4C	PICATINNY RAIL GRABBER WITH IFTC	400m	1.75R/0.0	1.75L/5.39U	1.9L/0.5U
M249	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	400m	5.9R/9.6D	5.9R/4.0D	1.9L/0.5U
M249	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	400m	6.0R/13.3D	6.0R/8.3D	1.9L/0.5U
M249	AN/PAQ-4C	PICATINNY RAIL GRABBER WITH ALL SPACER FORWARD RAILS RIGHT	400m	7.7R/9.6D	7.7R/4.0D	1.9L/0.5U
M249	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	400m	7.6R/13.3D	7.6R/8.3D	1.9L/0.5U
M249	AN/PEQ-2A	TWS BRACKET TOP	400m	1.8L/2.7D	1.8R/7.95U	1.9L/0.5U
M249	AN/PEQ-2A	AN/PVS-4 BRACKET WITH SPACER	400m	5.0R/4.0D	0.45L/6.5U	1.9L/0.5U
M249	AN/PEQ-2A	INSIGHT RAIL GRABBER WITH IFTC	400m	2.0L/1.5U	1.95R/4.79U	1.9L/0.5U
M249	AN/PEQ-2A	PICATINNY RAIL GRABBER WITH IFTC	400m	2.0L/0.5D	1.95R/6.49U	1.9L/0.5U
M249	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	400m	6.1R/13.2D	6.1R/7.6D	1.9L/0.5U
M249	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	400m	6.0R/9.4D	6.0R/4.4D	1.9L/0.5U
M249	AN/PEQ-2A	PICATINNY RAIL GRABBER WITH ALL SPACER FORWARD RAILS RIGHT	400m	7.8R/13.2D	7.8R/7.6D	1.9L/0.5U
M249	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	400m	7.6R/9.4D	7.6R/4.4D	1.9L/0.5U
M249	AN/PVS-4	IFTC TOP WITH SPACER	400m	0.0/4.3D	0.0/10.0U	1.9L/0.5U
M249	AN/PVS-4	AN/PVS-4 BRACKET	400m	2.5R/4.9D	2.25L/11.25U	1.9L/0.5U
M249	AN/PAS-13	IFTC TOP	400m	0.0/2.75D	0.0/8.6U	1.9L/0.5U
M249	AN/PAS-13	TWS BRACKET	400m	0.0/5.5D	0.0/10.05U	1.9L/0.5U
M240B	IRON SIGHTS	NA	500m	TBD	TBD	1.9L/0.5U
M240B	MGO	FEED TRAY COVER RAIL	500m	NA	0.0/0.0	5.0R/4.1D
M240B	AN/PAQ-4C	PICATINNY RAIL GRABBER TOP	500m	1.75R/2.2D	1.5L/3.5U	5.0R/4.1D
M240B	AN/PEQ-2A	INSIGHT RAIL GRABBER TOP	500m	2.0R/1.5D	1.7R/3.71U	5.0R/4.1D
M240B	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	500m	6.2R/16.8D	6.2R/8.1D	5.0R/4.1D
M240B	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	500m	7.9R/16.8D	7.9R/8.1D	5.0R/4.1D
M240B	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	500m	6.2R/12.8D	6.2R/4.1D	5.0R/4.1D
M240B	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240B	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	500m	7.9R/12.8D	7.9R/4.1D	5.0R/4.1D
M240B	AN/PVS-4	FEED TRAY COVER RAIL PICATINNY RAIL GRABBER WITH SPACER	500m	0.0/6.2D	0.0/6.0U	5.0R/4.1D
M240B	AN/PAS-13	FEED TRAY COVER	500m	0.0/2.3U	0.0/8.0U	5.0R/4.1D





By Order of the Secretary of the Army:

Official:



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