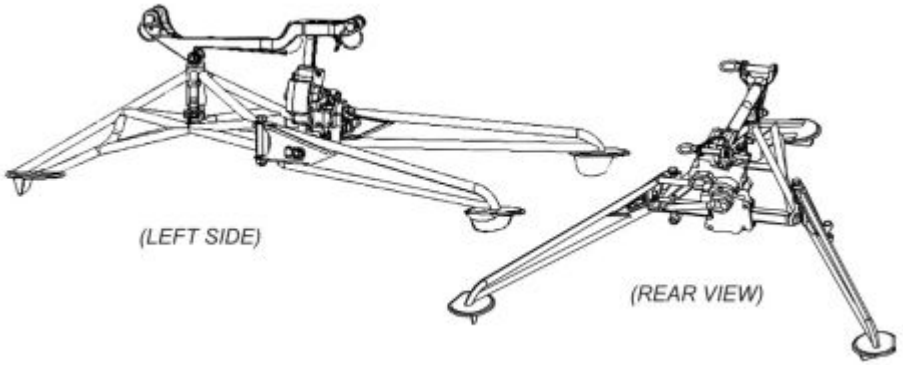
Preliminary Marksmanship Instruction and Evaluation

Light Machine Gun - M249 Series

TC 3-22.249



U.S. Army Reserve Marksmanship Program

www.usar.army.mil/ARM ArmyReserveMarksman.info

Safe Weapons Handling

Rules of Firearms Safety

Standardized for any weapon a Soldier may employ

- Rule 1: Treat every weapon as if it is loaded
- Rule 2: Never point the weapon at anything you do not intend to destroy
- Rule 3: Keep finger straight and off the trigger until ready to fire
- Rule 4: Ensure positive identification of the target and its surroundings

Safe Weapons Handling

Weapon Safety Status

Standard code using common colors to represent level of readiness. Represents specific series of actions applied.

- Green: Bolt locked forward, fire/safe selector on FIRE. Feed tray and cover assembly closed. No ammunition.
- Amber: The M249-series machine gun **does not have** an amber status. Only aviation units may HALF-LOAD door mounted systems on Army aircraft.
- Red: Ammunition loaded on feed tray, bolt open and locked rearward, fire/safe selector on SAFE.
- Black: Red plus selector on FIRE, awaiting command to engage. Follow unit ROE and/or SOP.

Safe Weapons Handling

Weapons Control Status

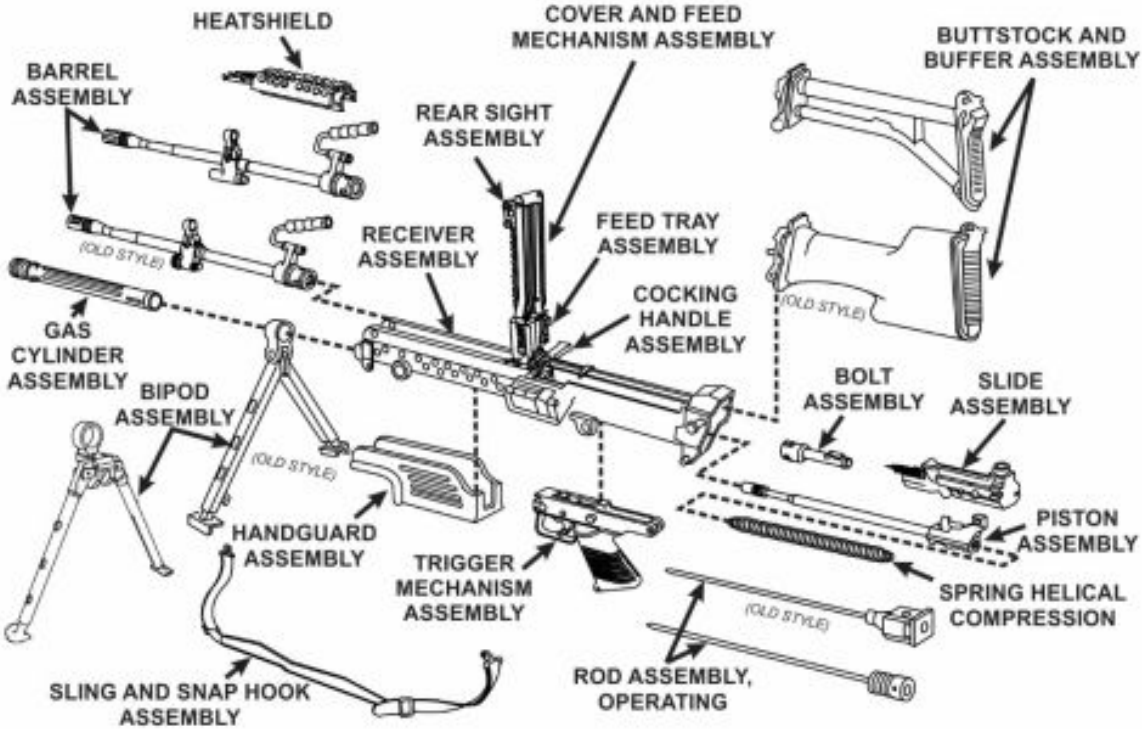
Tactical method of fire control given by a leader incorporating the situation, ROE, and anticipated enemy contact.

- Weapons Hold: Engage only if engaged or ordered to engage.
- Weapons Tight: Engage only if target is positively identified as enemy.
- Weapons Free: Engage targets not positively identified as friendly.

Principles of Operation

Major Components

The M249 is a gas-operated, belt-fed, air-cooled, fully automatic weapon that fires from the open-bolt position.



Principles of Operation

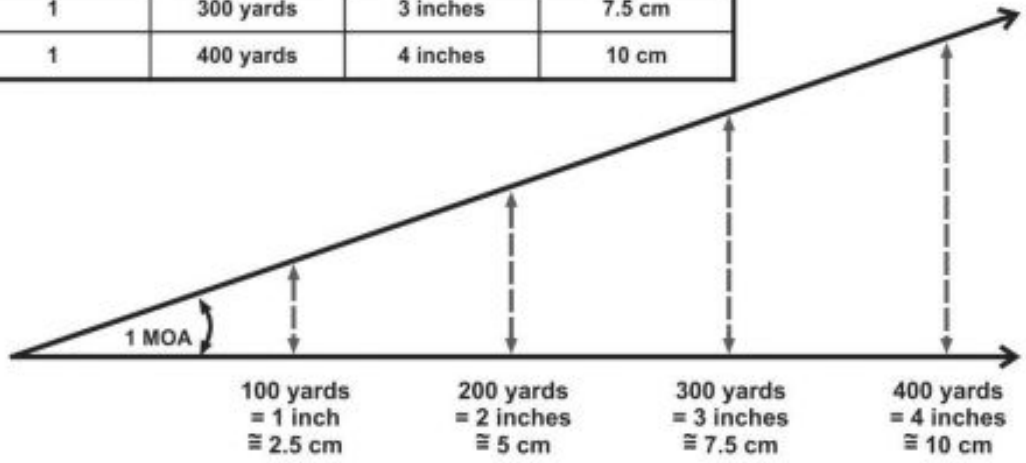
Technical Data

OLD STYLE BARREL	NEW MONO BLOCK BARREL
Carrying handle: Folding (three position)	Integral gas collar and gas regulator has no parts to disassemble.
Compensator: Minimizes muzzle flash, reduces and lessens muzzle climb.	
Gas collar: Setting has no effect on cyclic rate. Only function is to lock gas regulator into barrel assembly.	
M249 WITH EQUIPMENT	**M249 WITH EQUIPMENT (LMG)**
Equipped with sling assembly and two each magazine and cartridge.	Equipped with sling assembly, tripod adapter assembly, and magazine adapter.
	Used in the LMG role and mounted on the tripod.

Aiming Devices

Units of Angular Measurement - MOA

MOA	At Distance	Equals	
1	100 yards	1 inch	2.5 cm
1	200 yards	2 inches	5 cm
1	300 yards	3 inches	7.5 cm
1	400 yards	4 inches	10 cm



Angle dimension exaggerated for clarity. Examples are not to scale. Centimeter (cm) conversions are approximate.

MINUTE OF ANGLE (MOA) Unit of Measeurement	
There are 360 degrees in a circle.	There are 60 MOA in a degree.
There are 21,600 MOA in a circle.	1 MOA at 100 yards ≈ 1 inch.
Smaller measurements of an MOA are described in fractions, not seconds (i.e., 1/2 MOA).	

Aiming Devices

Units of Angular Measurement - MOA

Rifle shooting is often measured in Minutes of Angle

60 Minutes of Angle per degree

21,600 Minutes of Angle per circle/revolution

1 MoA at 300 yards = π inches

Simplify this by rounding off:

100 yards: 1 MoA ≈ 1 inch (1.0471)

200 yards: 1 MoA ≈ 2 inches (2.0943)

300 yards: 1 MoA ≈ 3 inches (3.14159)

1000 yards: 1 MoA ≈ 10 inches(10.471)

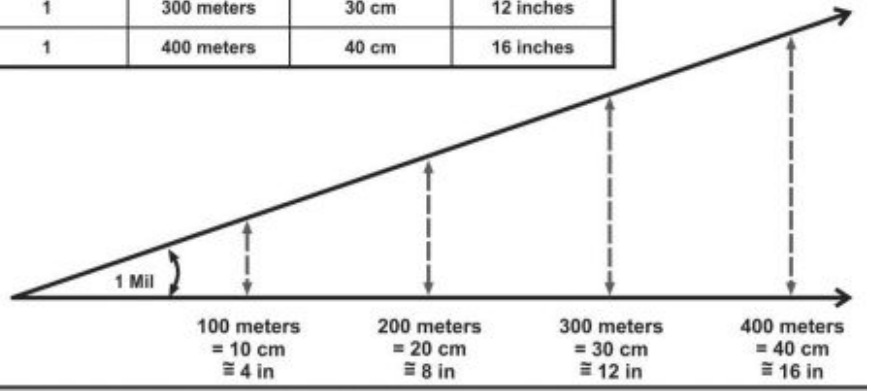
Aiming Devices

Units of Angular Measurement - Mils (milliradians)

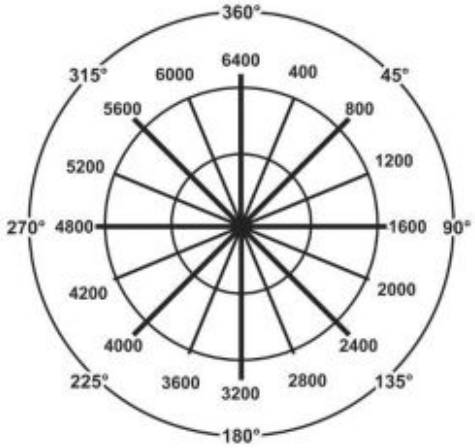
The mil is a common unit of angular measurement that is used in direct fire and indirect fire applications.

Check Technical Manual for your sight to know adjustments

Mil	At Distance	Equals	
1	100 meters	10 cm	4 inches
1	200 meters	20 cm	8 inches
1	300 meters	30 cm	12 inches
1	400 meters	40 cm	16 inches



MILS Unit of Measurement	
There are 360 degrees in a circle.	There are 17.78 mils in a degree.
There are 6400 mils in a circle	1 mil at 100 meters = 10 cm.



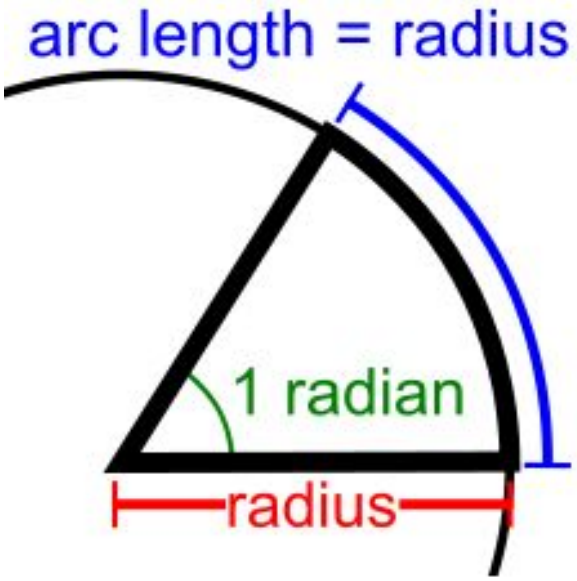
Aiming Devices

Units of Angular Measurement - Mils

Gunnery is often measured in Mils, increasingly popular for precision rifle

Mil (mrad) is short for milliradian

A circle (360 degrees) is 2 π radians



Aiming Devices

Units of Angular Measurement - Mils

"Milli-" prefix is 1/1000

Shortened to Mil, mil, or mrad

2000π milliradians = 2π radians

360 degrees = 6.283 radians = 6283 mils

1 Mil = 3.43 MoA (≈ 3.5 MoA ≈≈ 4 MoA)

Aiming Devices
Units of Angular Measurement - Mils

6283 mils are the true unit of angular measurement

1 mil subtends 1/1000 of the distance (radius)

Telescopic sight manufacturers using rangefinding reticles (e.g., mil dots) use this

There is NO difference between Army and Marine mils

6400 mils in NATO countries (“artillery mils”)

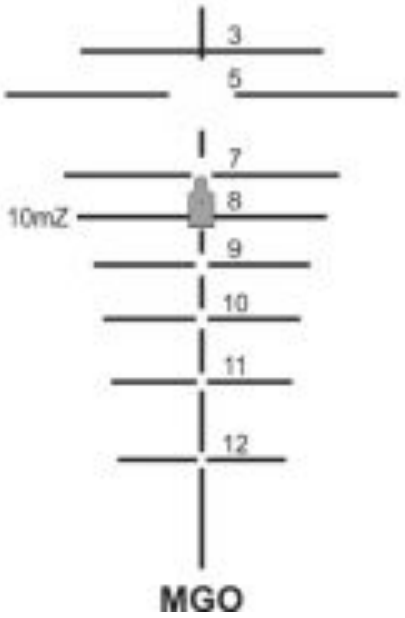
6000 mils in the former Soviet Union and Finland

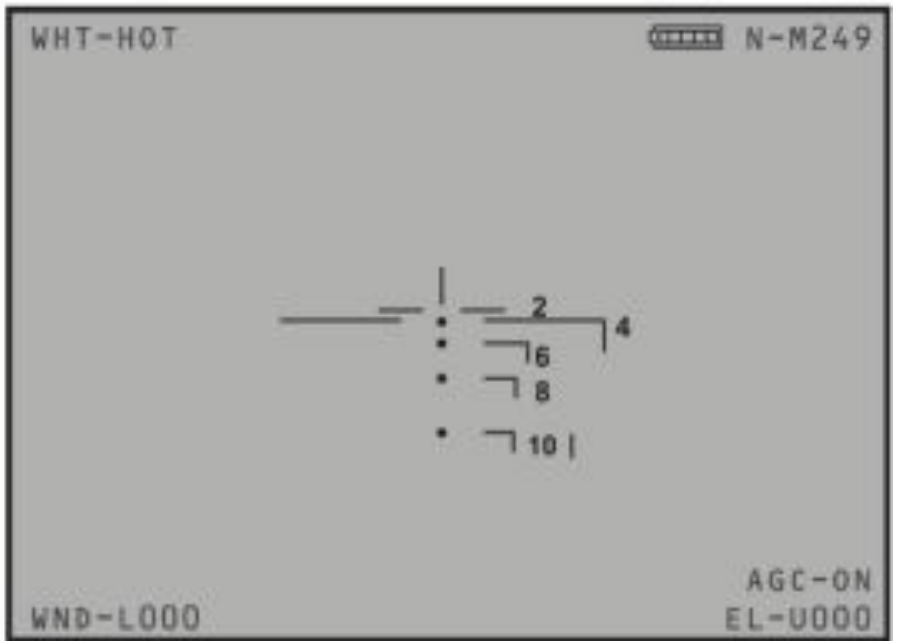
6300 mils in Sweden (streck, or “line")

Aiming Devices

Ballistic Reticles

A series of fine lines in the eyepiece used for aiming at varying distances and measuring for range estimation. Can be MOA or mils.

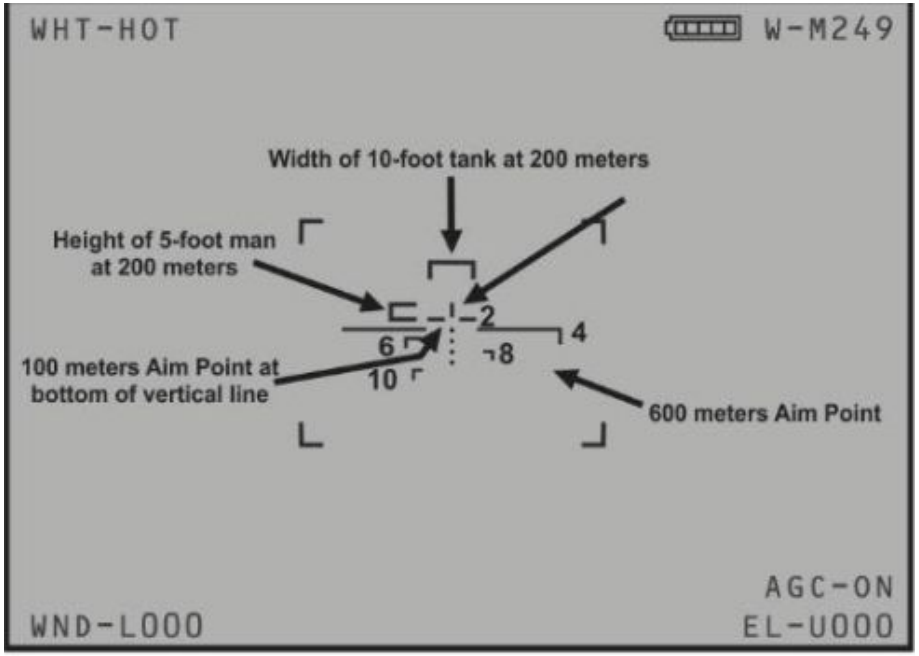




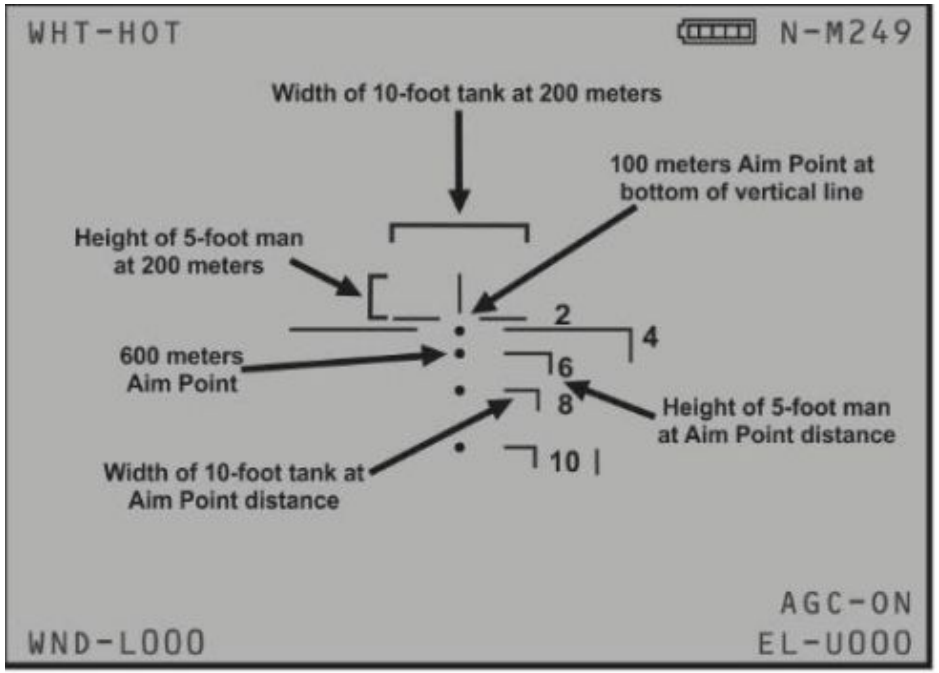
Aiming Devices

Stadia Reticles

Vertical and horizontal lines reflect size of vehicles, personnel, etc. at distance.
Placed next to a series of aim points (dots here) for different ranges.



WFOV



NFOV

Aiming Devices

Iron Sights

Rear sight adjusts elevation and windage/azimuth

- Elevation: Twist rear peep. 1 full turn/revolution = 1 mil
- Windage: 1 click = 0.5 mil
- POI in same direction sight moves.

Rear sight elevation knob adjusts for range AFTER zero

700m = 10m zero

400m = 25m zero

IRON SIGHT

FUNCTION	SINGLE CLICK	
ZERO WINDAGE	M249	White Line
ZERO ELEVATION	M249	400 (25 meters) / 700 (10meters)
WINDAGE	M249	0.5 cm at 10 Meters
ELEVATION (RANGE)	M249	0.5 cm at 10 Meters

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Aiming Devices

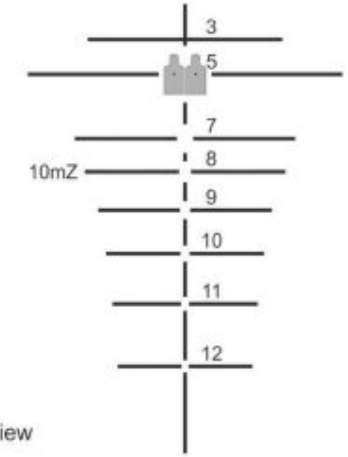
M145 MGO

- 100m Bullet Drop Compensator
- Double target (1 meter) wide
- Clicks: 0.25 mil ~ 1 MOA
- Illuminated reticle (battery)
- 10mZ/800: Aim point for 10 mete zero and 800 meters
- Elcan (Canada) made sight

M145 STRAIGHT TELESCOPE		
DIMENSIONS		
LENGTH	7.0 in	17.8 cm
BATTERY LIFE	175 hours average (New Battery)	
WEIGHT	24 oz	681 g

FUNCTION	SINGLE CLICK	
	10 METERS	500 METERS
ZERO WINDAGE	2.5 mm	5 inches
ZERO ELEVATION	2.5 mm	5 inches

RETICLE



NOTE: 500 m reticle view

LEGEND

cm	centimeters	in	inches	mZ	meter zero
g	grams	mm	millimeters	oz	ounces

Mountable Equipment

Tripods: M122

Critical for gunnery (not just marksmanship.) Stable, repeatable adjustments along left/right (traverse) and up/down (search) axis.

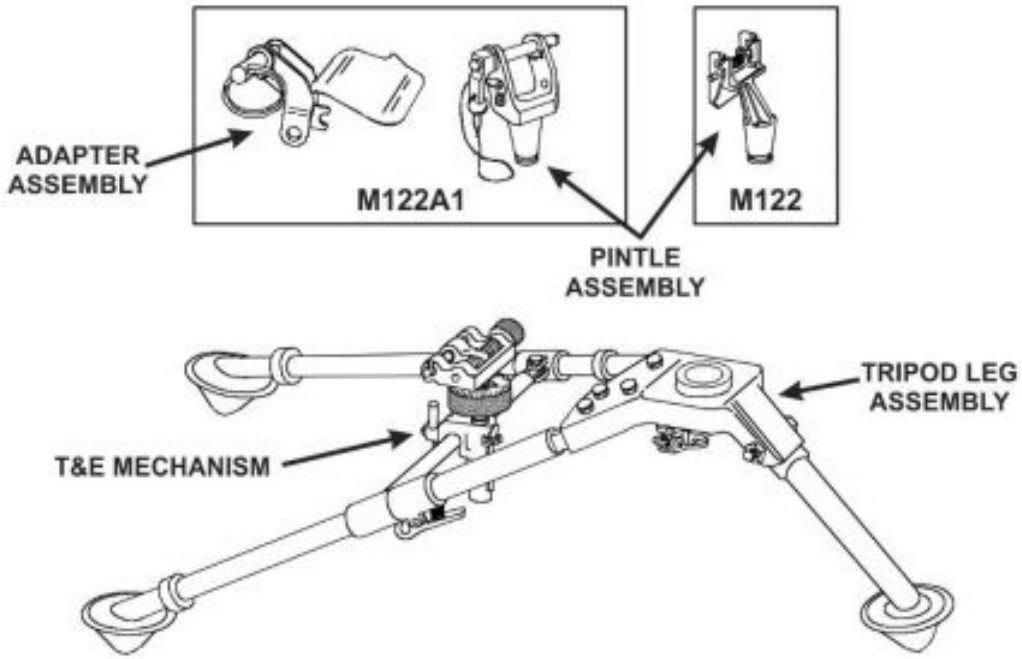
Traverse & Elevation

Search: 250 mil depression, 100 mil elevation

Traverse: 100 mil on T&E

Traverse Bar: 450 mils left, 425 mils right

1 mil clicks



Mountable Equipment

Tripods: M192

Critical for gunnery (not just marksmanship.) Stable, repeatable adjustments along left/right (traverse) and up/down (search) axis. Integrated T&E

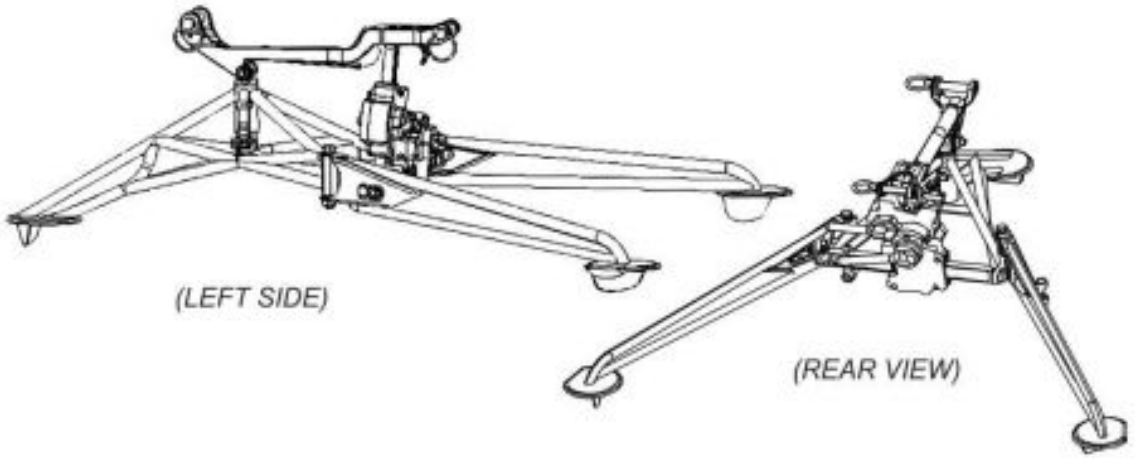
Traverse & Elevation

Search: 0-530 mils total

Traverse: 0-900 mils

4-5 mils push/release

Pull handle(s) out to freely adjust



Employment

Shot Process

The object is to fire an Accurate Initial Burst, adjust fire, and develop speed.

- Pre-shot
- Shot
- Post-shot

Pre-shot	Position
	Natural Point of Aim
	Sight Alignment / Picture
	Hold
Shot	Refine Aim
	Breathing Control
	Trigger Control
Post-shot	Follow-through
	Recoil management
	Call the Shot
	Evaluate

Employment

Functional Elements

The object is to fire an Accurate Initial Burst, adjust fire, and develop speed.

- **Stability**: Provide a consistent base to fire from and maintain through the Shot Process until the recoil pulse has ceased. Includes hold/position.
- **Aim**: Continuous process of orienting the weapon, aligning the sights, using appropriate lead and elevation during engagement.
- **Control**: All conscious actions before, during, and after the Shot Process. Trigger control is of primary importance, along with whether, when, and how to engage. Incorporates the Soldier as a function of safety and responsibility.
- **Movement**: The process of moving during the engagement process. Into and out of position, moving laterally, forward, diagonally, and in a retrograde manner while maintaining stabilization, appropriate aim, and control

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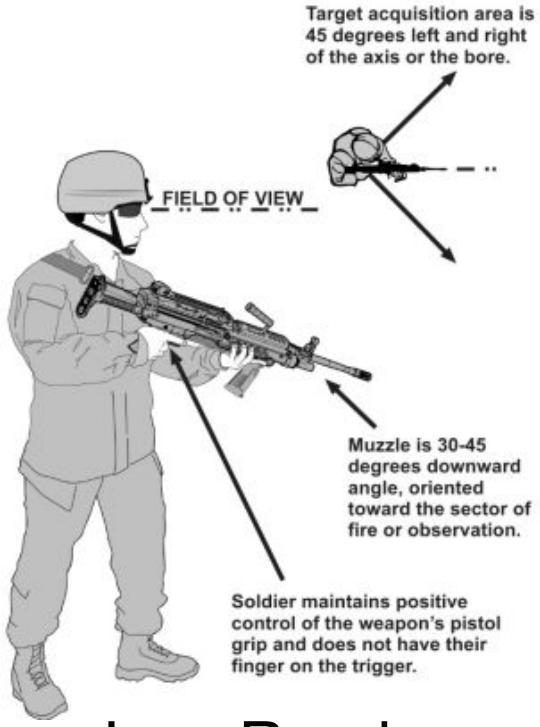
Employment

Carry Positions

Safe Hang



Low Ready

Ready

Employment

Stability

The object is to fire an Accurate Initial Burst, adjust fire, and develop speed

- **Support**: Use support (tripod/bipod) and bone structure primarily.
- **Muscle relaxation**: Use good positioning (cheek weld, body straight behind line of recoil, etc.) to enhance support.
- **Natural Point of Aim**: Where barrel naturally orients when position is solid, muscles relaxed and support is achieved. Should be **on target**.
- **Recoil management**: Maintain stable firing position and followthrough the recoil pulse to mitigate movement during the cycle of function,

Note. The steadier the position, the smaller the wobble area. The smaller the wobble area, the more precise the burst.

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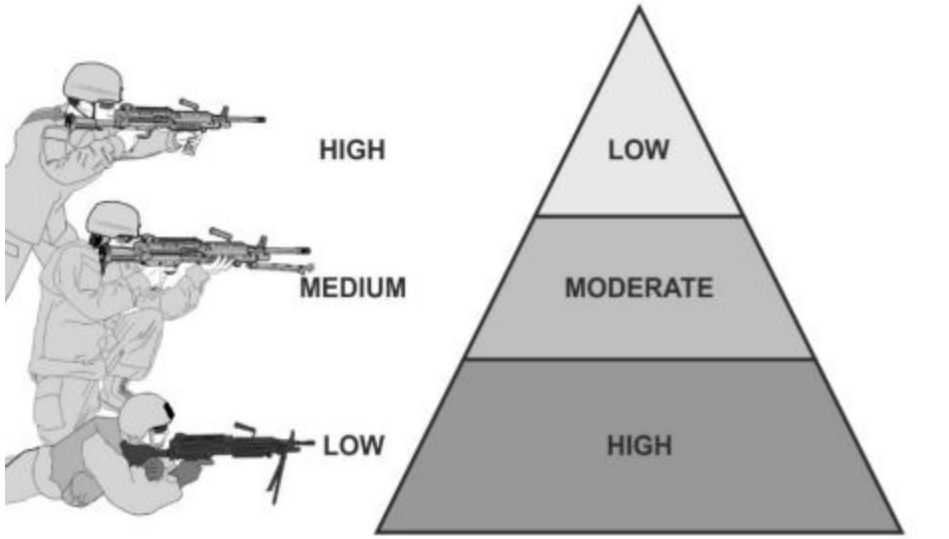
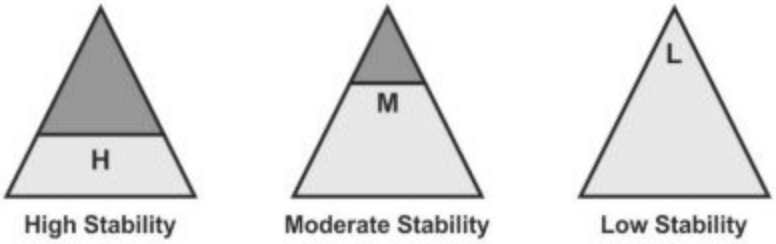
Employment



As the center of gravity (CoG) increases, the level of stability decreases.



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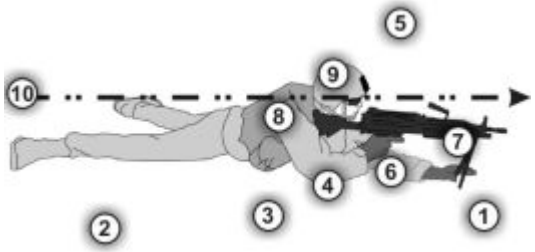
Employment

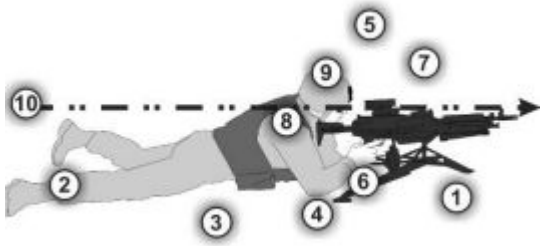
Firing Positions

A position is good *ONLY* if it consistently produces a tight Cone of Fire!



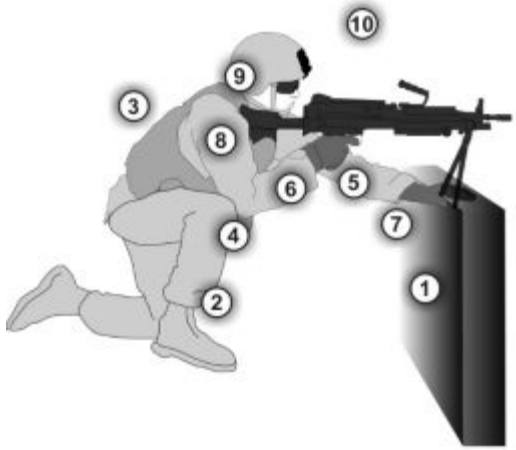
Bipod

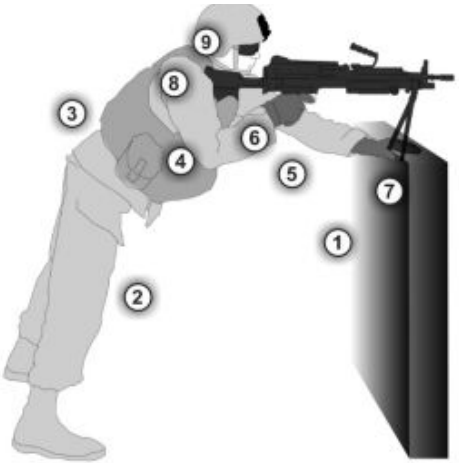
- Straight inline with recoil
- Both hands firm grasp
- Pull into shoulder
- Firm cheek weld



Tripod

- Straight inline with recoil
- Left hand T&E
- Right down/pull into shoulder
- Firm cheek weld





Employment

Aim

Sight Alignment: Relationship between the aiming device and the firer's eye.

Maintain by using **consistent cheek weld and head placement**.

- **Iron sight**. Relationship of front sight, rear sight, and firer's eye. Maintain by keeping focus on the top of the front sight.
- **Optics/Thermal**. Relationship between the reticle and the firer's eye. Maintain by ensuring full, centered field of view (no shadow in magnified optics)
- **Pointers/Illuminators/Lasers**. Relationship between the firer's eye, the night vision device placement and focus, and the laser aiming point on the target.

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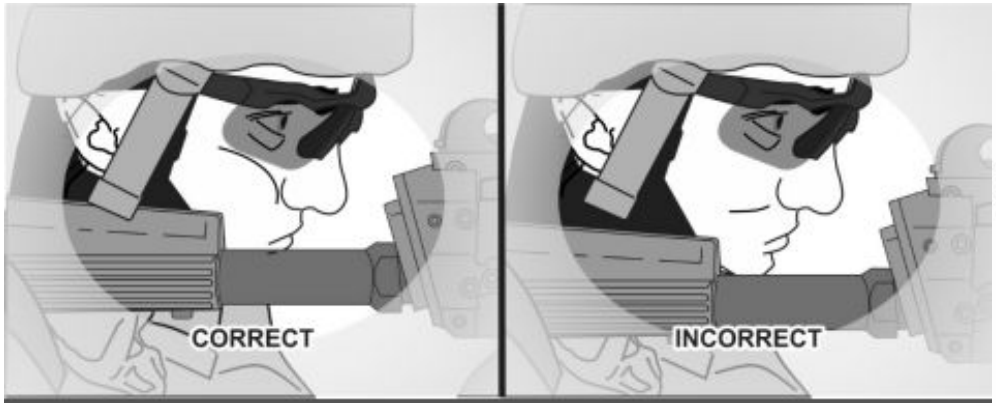
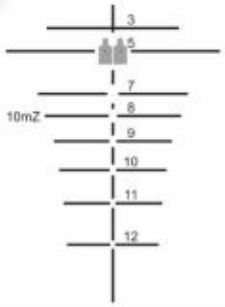
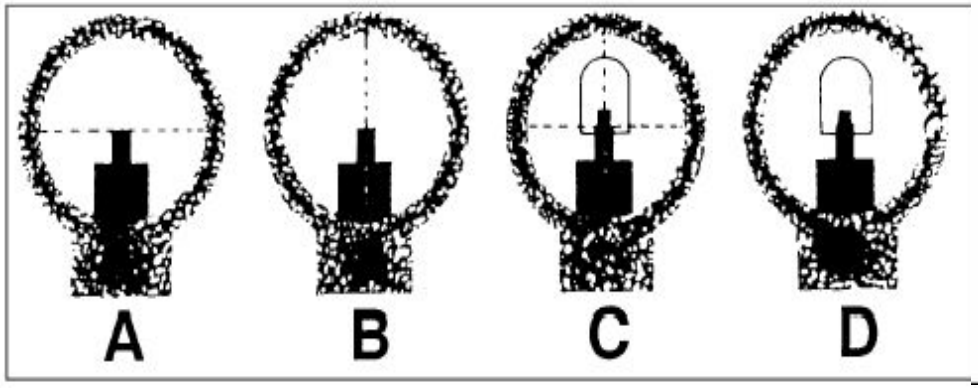


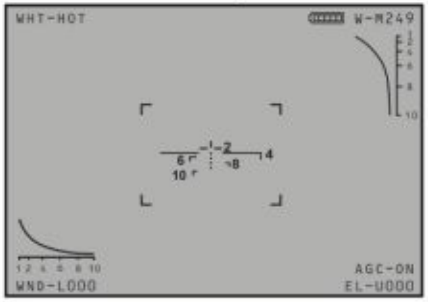
Focus on the front sight post, not the target itself.

Focus on the correct aim point along the bullet drop compensator.





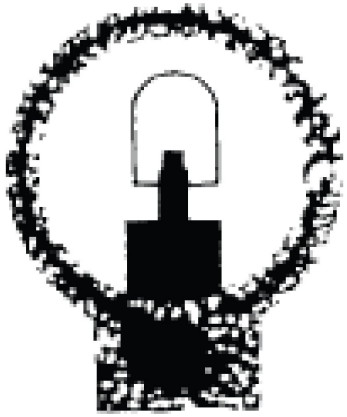
There is no difference in focal viewing when using thermal optics. Align the reticle at the desired point of aim.

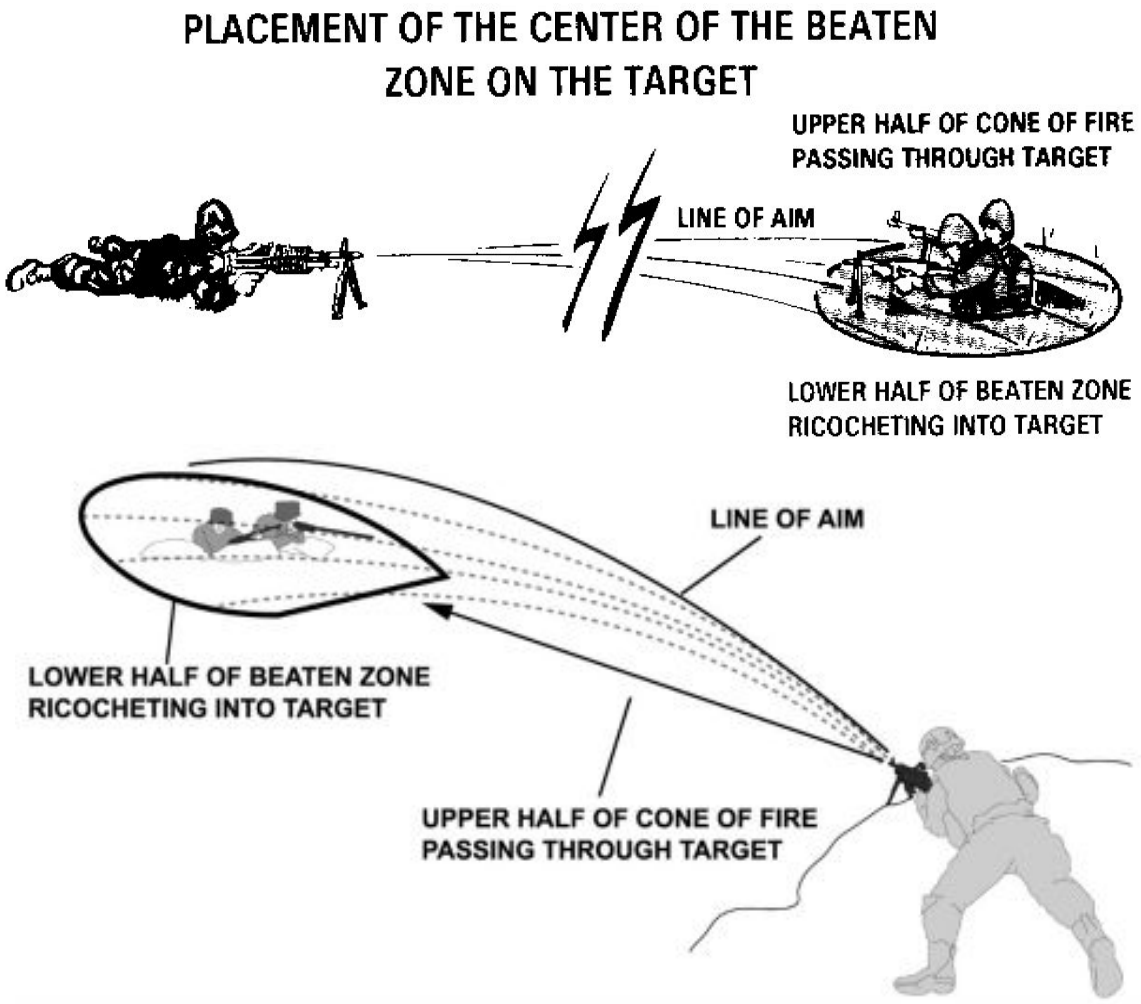


Employment

Center Base Aimpoint

- Used to place Beaten Zone correctly on targets with depth
- **NOT** because "the gun climbs in recoil"
- Gun climbing in recoil = poor position and bad shooting





Employment

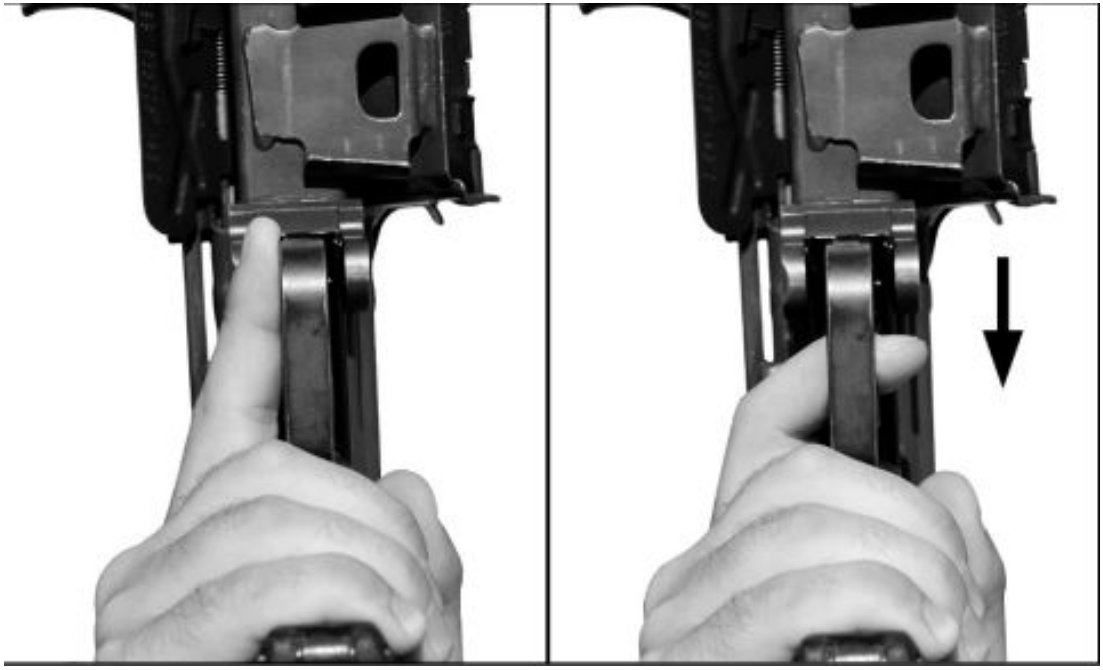
Control

- All conscious actions before, during, and after the shot process
- Includes safety and decision to shoot (when/if based on ROE)
- Proper trigger control without disturbing the sights is a critical aspect of Control and the most difficult to master
- Shot anticipation (flinch, pre-ignition push) disrupts Control
- Reducing or eliminating shot anticipation with good trigger control is often most effective way to improve shooting results

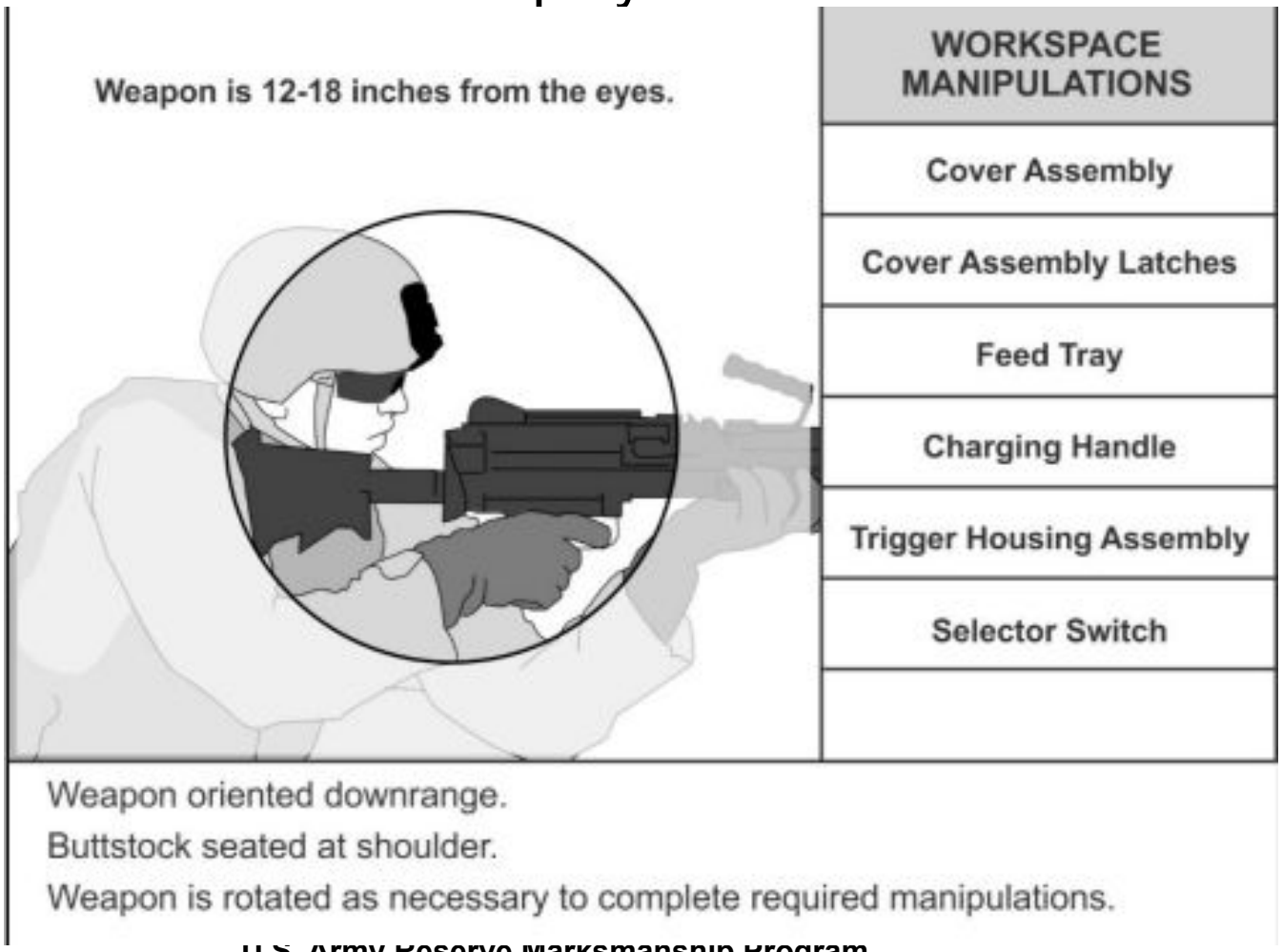
Employment

Control

- Trigger finger placement lays naturally across the trigger after achieving proper grip. No specified point must be used
- Trigger squeeze/press. Pull in a smooth, consistent manner. Add steady pressure until the weapon fires.
- Trigger reset. Retain sight focus while resetting the trigger



Employment


Weapon is 12-18 inches from the eyes.
WORKSPACE MANIPULATIONS
Cover Assembly
Cover Assembly Latches
Feed Tray
Charging Handle
Trigger Housing Assembly
Selector Switch
Weapon oriented downrange.
Buttstock seated at shoulder.
Weapon is rotated as necessary to complete required manipulations.

Employment

Control: Rate of Fire

- **Sustained**: Approximately 50 rounds/minute, 6-9 round bursts, 4-5 seconds between bursts, including barrel change every 10 minutes. **Normal use**.
- **Rapid Fire**: Approximately 100 rounds/minute, 6-9 round bursts, 2-3 seconds between bursts, barrel change every 2 minutes.
- **Cyclic Fire**: 850 rounds/minute, continuous bursts, barrel change every minute. Can be useful for suppression **only if** accurately directed. Learn Sustained and Rapid first.
- **Suppressive Fire**: Fires that degrades the performance of an enemy force below the level needed to fulfill its mission. Must either hit directly or land close enough to convince the enemy fires ***could*** have hit.
  - Volume does NOT equal suppressive fire unless directly accurately enough that it ***could*** hit on purpose

Employment

Control

- **Follow-through**: Continued mental and physical application of the shot process' functional elements
  - Firer's head stays in contact with the stock, the firing eye remains open, and the trigger finger holds the trigger back through recoil (semi-auto and fixed ammunition drill)

- **Calling The Shot**: State where you think the shot/burst went based on where the sights were when the shot/burst was released
  - Call is expressed in clock direction and amount from point of aim
  - Peer coach/Assistant Gunner verifies actual location
  - Poor/inconsistent shot call is a poor application of Control

Drills

Drill structure is standardized for all weapons to reinforce common actions

A: Weapon Check-Condition Green, serial numbers, function check

B: Sling/Unsling. Go between Safe Hang, Low Ready, Ready, and other positions

C: Equipment Check/PCC

D: Load

E: Carry (5/3) Move between 5 methods of carry 3 times.

F: Fight Down. Start in the standing/offhand position and assume the kneeling, sitting, and prone (or variations) in order.

G: Fight Up. Start prone and assume positions up to standing in order.

H: Go-To-Prone. Rapidly drop from standing/crouching low ready into prone. Do while stationary, walking, or during a tactical rush.

I: Reload and Barrel Change. Completely reload from ammunition stored in load bearing equipment.

J: Clear Malfunction. Reduce the most common malfunctions.

K: Unload/Show Clear

L: Mount To Tripod

M: Manipulate Traverse & Elevation

Drill A: Weapon/Function Check

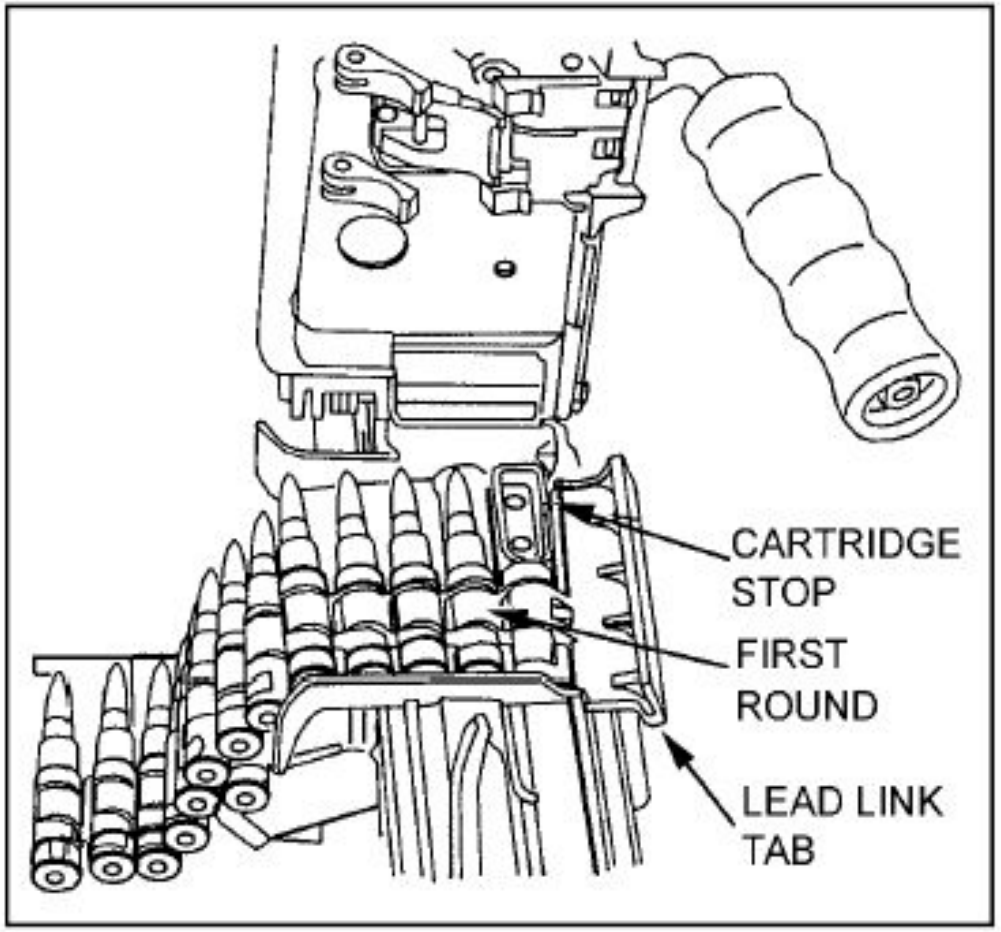
Go to Condition Green

- Lock bolt to rear, place on SAFE. Pull trigger. Nothing should happen.
- Grasp charging handle, place on FIRE, pull trigger, ride bolt forward.
- Lock bolt to rear, place on FIRE.
- Use linked dummy ammo to check stripping, locking, loading, unlocking, extracting and ejecting.
- CAUTION: Do not dry fire on empty chamber.
- Weapon should not go on SAFE when bolt is forward
- DO NOT HALF COCK
- There is no Amber with the M249 series

Drill D: Load

- Condition Red
- Bolt rear, on Safe
- Cover open, belt placed on feed tray

- Condition Black
- Red plus selector on Fire
- Follow unit ROE and/or SOP



Drill J: Clear Malfunctions

Any failure of the weapon to complete normal cycle of function. Correct by:

- Use secondary weapon (if available and appropriate)
- Apply Corrective Action
  - **Immediate action**. Simple, rapid action to correct basic disruptions
  - Commonly fix simple failures to fire, especially ammunition related
    - **Pull** and lock the cocking handle to the rear
    - **Observe** ejection port and belt for ejection and advance
    - **Push** the cocking handle to its forward position
    - **Proceed/Press** trigger

  - **Remedial action**. Skilled/thorough response to specific problem or issue that simple Immediate action cannot correct
  - Typically requires unload/show clear to correct

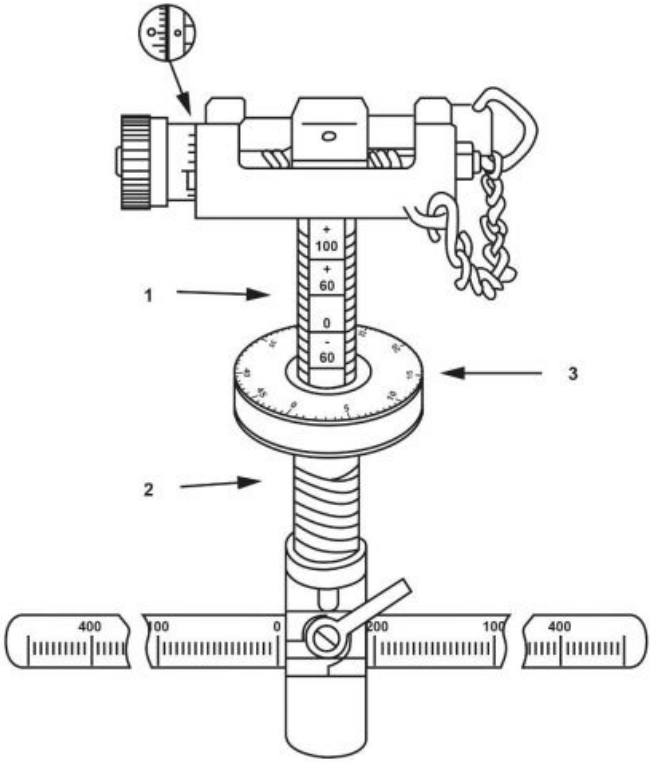
No single corrective resolve all malfunctions.

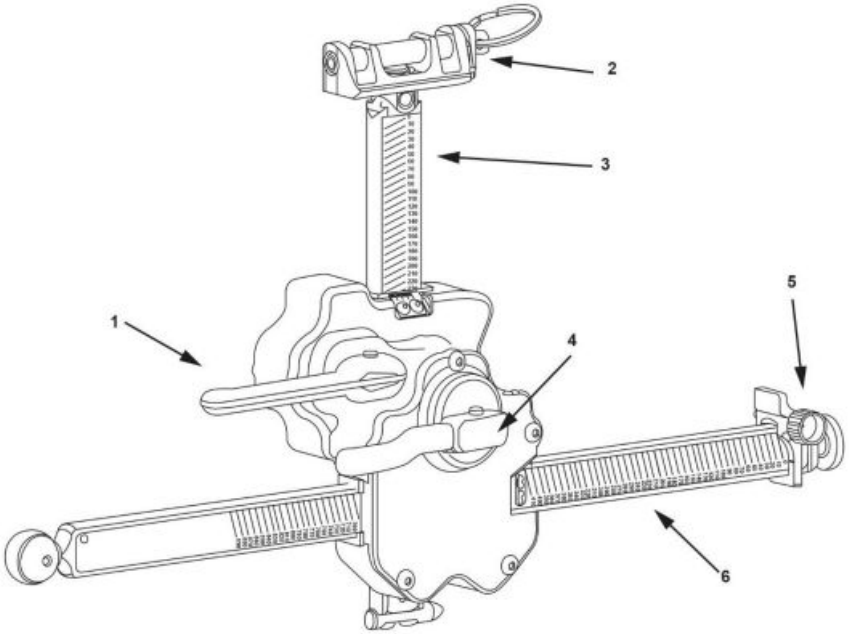
Drill K: Unload/Show Clear

- Check feed pawl assembly under feed cover
- Check feed tray assembly
- Lift feed tray assembly and inspect chamber
- Check space between bolt assembly and chamber
- Weapon is now Green

Drill M: Weapon and T&E Manipulation

- Practice traversing and searching between target and along target areas.
- Need large swings (move to different objective) and controlled increments (~4-5 mils) search and traverse for even, overlapping coverage





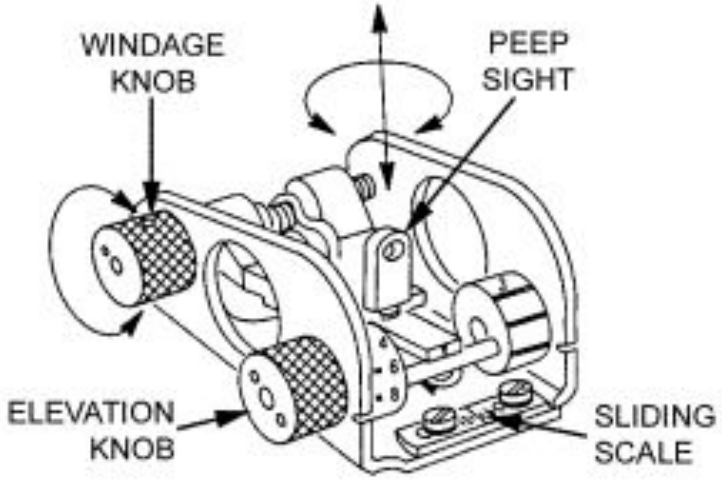
Zeroing

At 10 meters:

- Iron sight:
  - 700 (10 meters)
  - 400 (25 meters)
- M145: Top of 800 meter

10 meters: 1 cm = 1 mil

IRON SIGHT		
		
FUNCTION	**SINGLE CLICK**	
ZERO WINDAGE	M249	White Line
ZERO ELEVATION	M249	400 (25 meters) / 700 (10meters)
WINDAGE	M249	0.5 cm at 10 Meters
ELEVATION (RANGE)	M249	0.5 cm at 10 Meters



Preliminary Marksmanship Instruction and Evaluation

Light Machine Gun - M249 Series

TC 3-22.249

Zeroing

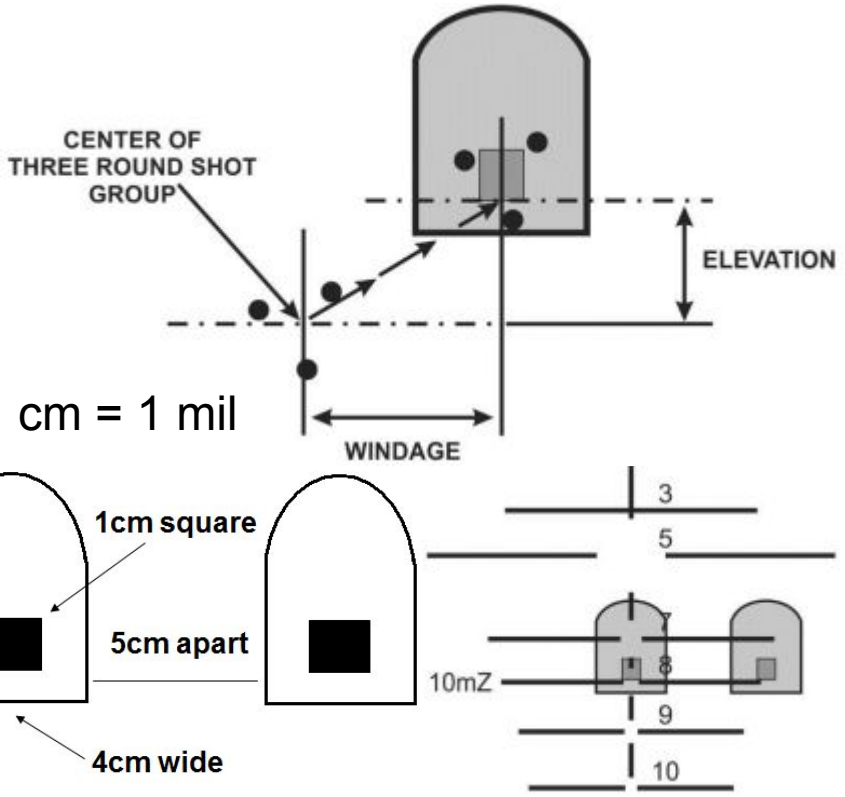
At 10 meters:

- Iron sight: 500 meter
- M145: Top of 800 meter

Zero “slick” (no field gear)

- Helmet, body army, LBE/FLC isn’t required during zeroing

Always use Peer Coaches!



Preliminary Marksmanship Instruction and Evaluation

Light Machine Gun - M249 Series

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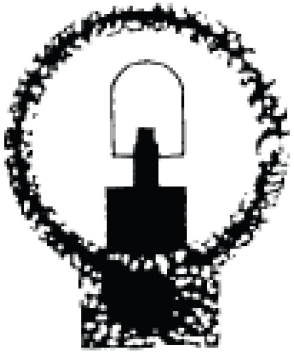
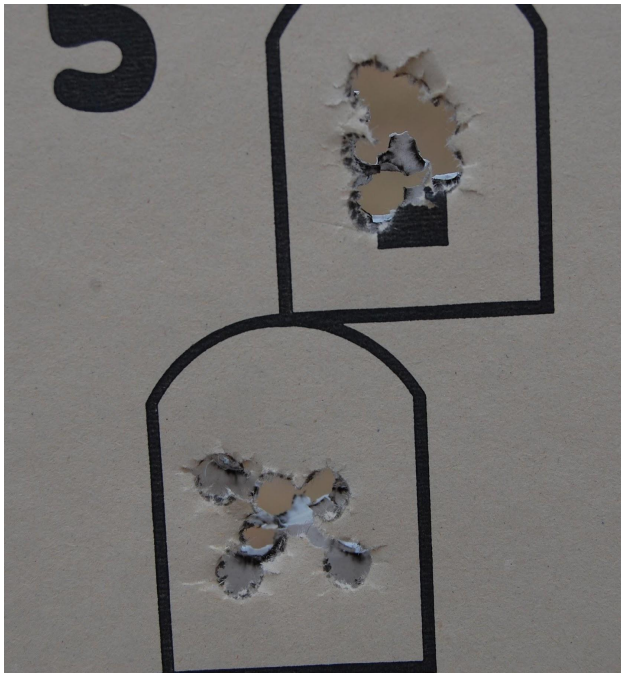


Zeroing

1. Start with single-loaded rounds
   - Center groups with center base hold
   - Single round zeros need confirmation

2. Continue zeroing with bursts
   - Load using **exact** number of rounds
   - Hold trigger and let gun empty out
   - Follow-through!
   - Start with three rounds, then seven

3. Groups and bursts should be 2-4 mils and centered in target as pictured
   - Continue until this is achieved



Preliminary Marksmanship Instruction and Evaluation

Light Machine Gun - M249 Series

TC 3-22.249

Qualification: 10 Meters

Objectives:

Accurate Initial Burst, Adjust Fire, Develop Speed

Qualification Task 5&6:

Only shoot **ONE** burst per target area/paster. Remaining ammo is NOT used or alibi granted.

- 1 point per hit, max 7 per paster
- 63 minimum, 91 max

1	No limit	12	Ball	A1 and A2	12 single rd (zero).
2	No limit	28	Ball	A3 and A4	5- to 7-rd bursts for each paster.
3	No limit	35	Ball	A5 and A6	5- to 7-rd bursts for each paster traverse and search.
4	No limit	56	Ball	A7 and A8	5- to 7-rd bursts for each paster.
*5	45 sec	56	Ball	B7 and B8	5- to 7-rd bursts for each paster.
*6	30 sec	35	Ball	B5 and B6	5- to 7-rd bursts for each paster.

TC 3-20.40 Training and Qualification, Individual and Crew Served Weapons, 7-119

"Qualification requires gunners to practice trigger control and requires the firer to fire **ONE** five to seven round burst at each specified point target or series of targets in the area target sequences. Gunners are authorized to fire **only ONE** five to seven round burst at each paster."

Preliminary Marksmanship Instruction and Evaluation

Light Machine Gun - M249 Series

TC 3-22.249

Qualification: Transition

Objectives:

Accurate Initial Burst, Adjust Fire, Develop Speed

Qualification:

Firers may only shoot **TWO** bursts per target.

- Fire a burst, adjust fire (if missed) and re-engage ONCE
- Remaining ammo is NOT used or alibi granted.
- 10 points per hit (1st or 2nd burst)
- 70 pass, 110 max
- DA Form 85

TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No Limit	28	4:1[b]		500	Fixed, 5- to 7-round burst (field zero)
2[a]	10	14	4:1[b]	Single E	400	Fixed, 5- to 7-round burst
3[a]	15	14	4:1[b]	Double E	500	Fixed, 5- to 7-round burst
4[a]	20	14	4:1[b]	Double E	600	Fixed, 5- to 7-round burst
5[a]	30	14	4:1[b]	Double E	800	Fixed and area, 5- to 7-round burst
6[a]	30	28	4:1[b]	Single E Double E	400 600	Fixed, 5- to 7-round burst
7[a]	45	28	4:1[b]	Double E Double E	700 800	Fixed and area, 5- to 7-round burst
8[a]	45	42	4:1[b]	Single E Double E Double E	400 500 600	Fixed, 5- to 7-round burst

Notes. The unit commander determines the position.

[a]Qualification task.

[b]Ball-to-tracer ratio (mix), that is, four ball rounds are loaded for every tracer round loaded.

Note: Enforcement of only one burst per target area/paster (10 meter) and two bursts per target (transition) is NOT a change to the Qualification. The Training Circulars have finally explicitly stated what the standard always was supposed to be. **You've been cheating**!

Preliminary Marksmanship Instruction and Evaluation
Light Machine Gun - M249 Series
TC 3-22.249

Postal Match: 10 Meters

Qualification Task 5&6:

Shoot and time as normal (45 and 30 seconds, respectively.

Burst: One distinct press-release of the trigger, regardless of number of rounds.

While shooting the Qual as a Postal Match, count the total number of bursts fired.

Scoring: Score target as normal (1 point per hit, max 7 per paster)

- -5 per excess burst (8 and 5, respectively)
- -5 per overtime burst
- Fire Distribution Bonus: Paster in group with **least** hits x5 points.

Postal Match: Transition

Shoot the Transition course as normal.

Burst: One distinct press-release of the trigger, regardless of number of rounds.

While shooting Qual as a Postal Match, count the total number of bursts fired at each target.

Scoring: Score as normal (10 point per hit)

- +10 First Burst Hit
- 0 Second Burst Hit
- -10 Excess Burst (shooting 3 or more bursts at a target