

## Appendix E

### Zeroing

Zeroing a weapon is not a training exercise, nor is it a combat skills event. Zeroing is a maintenance procedure that is accomplished to place the weapon in operation, based on the Soldier's skill, capabilities, tactical scenario, aiming device, and ammunition. Zeroing achieves the desired relationship between the line of sight and the trajectory of the round at a known distance. The zeroing process ensures the Soldier, weapon, aiming device, and ammunition are performing as expected at a specific range to target with the least amount of induced errors.

Soldiers must zero their weapon to achieve a high level of accuracy and precision aiming. The Soldier must first achieve a consistent grouping of a series of bursts, then align the mean point of impact of that grouping to the appropriate point of aim. Soldiers use the process described in this appendix with their weapon and equipment's TMs to complete the zeroing task. Appendix E covers the zeroing process for the iron sights and the M145 straight telescope.

#### BATTLESIGHT ZERO

E-1. The term battlesight zero means the combination of sight settings and trajectory that greatly reduces or eliminates the need for precise range estimation, further eliminating sight adjustment, holdover or hold-under for the most likely engagements. The battlesight zero is the default sight setting for a weapon, the ammunition, and the aiming device combination.

E-2. An appropriate battlesight zero allows the firer to accurately engage targets out to a set distance without an adjusted, aiming point. For aiming devices that are not designed to be adjusted in combat, or do not have a bullet drop compensator, the selection of the appropriate battlesight zero distance is critical.

#### ZEROING PROCESS

E-1. A specific process should be followed when zeroing. The process is time-efficient and produces the most accurate zero possible. The zero process includes a 10-meter laser borelight and zero and field zero (battlesight zero).

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*Note.* Although wind and gravity have the greatest effect on the projectile's trajectory, air density and elevation must be taken into consideration, also.

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#### TEN METER LASER BORELIGHT AND ZERO

E-2. Ten-meter zero (mechanical zero) is the standardized starting point for the M240-series medium machine gun. The gunner places the range scale on a range of 500 meters on the rear sight. The gunner 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. (See figure E-1 on page E-2.)

#### NUMBER 1 BLADE (LOW 9.8 MM)

E-3. 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 11.8 MM)

E-4. 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.

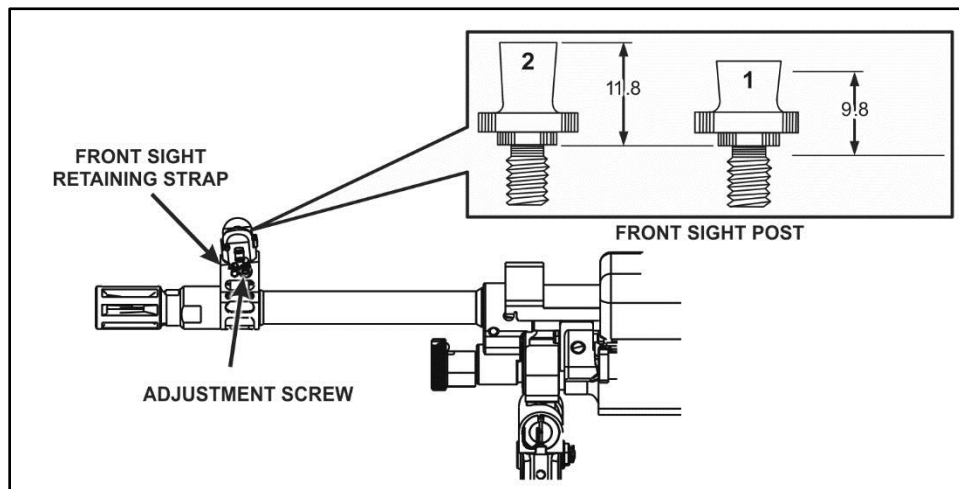


Figure E-1. Number 1 and 2 blades

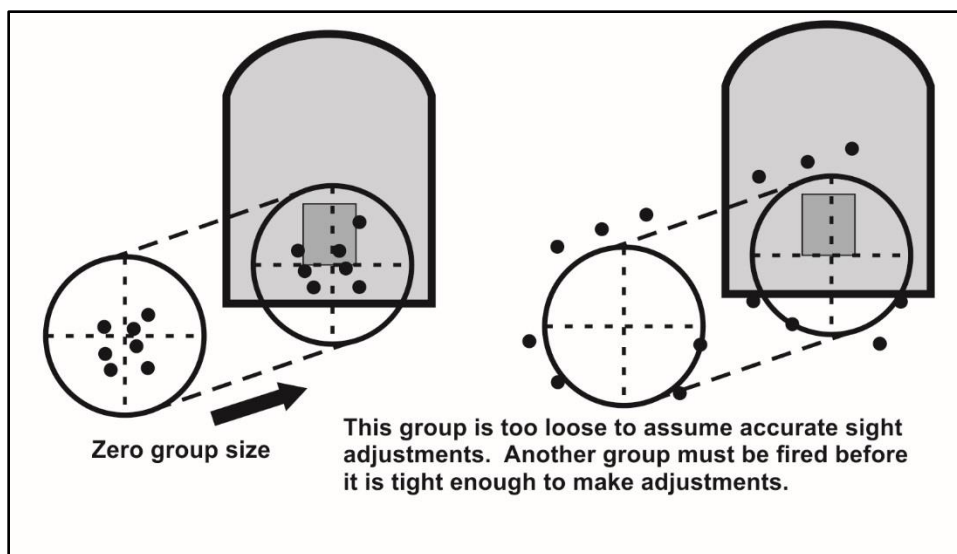
### THREE-ROUND SHOT GROUP

E-5. The gunner fires three single rounds loaded individually at the center base of the aiming points on the basic machine gun marksmanship target. The gunner fires the three rounds without making any adjustments to the sights. The shot group must be in a four-centimeter circle or smaller to establish the center of the group relative to the center base of the aiming paster.

### Grid Square Overlay/Marksmanship Target

E-6. For a more accurate adjustment, the gunner moves downrange and places the grid square overlay over pasters 1 and 2. The gunner 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 E-2 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 gunner checks their position and group.



**Figure E-2. Size of zero group example**

### Elevation Correction

E-7. If the shot group is above or below the point of aim, the gunner must use the front sight-adjusting tool (NSN 1005-01-458-7004) to adjust the front sight posts. Unlock front sight retaining strap and rotate it up. If shot group is above the point of aim, rotate sight post counterclockwise. If shot group is below the point of aim, rotate sight post clockwise. Rotating the front sight post counterclockwise brings the point of impact down on the target. Rotating front sight post clockwise brings the point of impact up on the target. Table E-1 on page E-4 provides an elevation correction chart.

E-8. At a range of 10 meters, one-half turn of front sight post blade moves the point of impact by five millimeters or .5 centimeters. One full turn of front sight post blade moves point of impact by one centimeter.

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**Note.** If the required correction cannot be obtained with the installed front sight blade, you may need to install the other blade.

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E-9. The maximum unscrewed position of either blade is where the base of the blade is flush with the front sight protector surface. If the center of the shot group is still above the point of aim with the No. 1 blade unscrewed to the maximum position, remove it and install a No. 2 blade. Start with the No. 2 blade at a flush position, two full turns (clockwise) should approximate the same position as the No. 1 blade.

E-10. If the center of the shot group is still below the point of aim with the No. 2 blade screwed all the way in (clockwise), remove it and install a No. 1 blade. Starting with the No. 1 blade screwed clockwise, two full turns (counter-clockwise) should approximate the same position as the No. 2 blade.

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**Note.** If the center of the shot group cannot be brought to the point of aim after trying both sight blades, the spare barrel (BII) should be used and a new barrel assembly acquired. If neither barrel assembly can be adjusted, the weapon should be coded and turned in through normal channels.

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Table E-1. Elevation correction chart

<i>At This Range</i>	<i>One Full Turn Moves Strike Up Or Down Centimeters or Inches</i>	
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

### Windage Correction

E-11. At a range of 10 meters, one complete rotation of the adjusting screws will move point of impact 8 millimeters or .8 centimeters. As you turn the adjusting screws, you should detect eight clicks per revolution. Each click should be 1 millimeter or .1 centimeter. If not, have the armorer repair it.

E-12. If the center of the shot group is to the left of the point of aim, move the front sight protector to the left. To move the front sight protector to the left, first unscrew the screw on the left side (looking from the rear of the weapon) of the sight protector more than the number of turns needed for the sight correction. Then screw in the right side of the front sight protector the desired number of turns. Finally screw in the left side of the sight protector fully home.

E-13. If the center of the shot group is to the right of the point of aim, move the front sight protector to the right. To move the front sight protector to the right, first turn the hex adjusting screw on the right counter-clockwise to loosen it the desired amount. Then turn the hex adjusting screw on the left side clockwise the same number of turns to tighten.

E-14. 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. 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 exactly the same amount. Check for play in the front sight assembly by lightly clamping it between finger and thumb and attempting to move sight assembly laterally. If you feel no play, the windage adjustment is completed. Carefully check both screws for looseness. (See table E-2.)

Table E-2. Windage correction chart

<i>At This Range</i>	<i>One Full Turn Moves Strike Up Or Down Centimeters 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

## Confirmation

E-15. The gunner 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

E-16. The gunner can refrain from recording the 10-meter zero, because it applies only to firing at the 10-meter basic machine gun target

## FIELD ZERO

E-17. A gunner must know how to zero the machine gun at a known distance. The gunner 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

E-18. The gunner uses the same procedures as for 10-meter zeroing except that they place the rear sight on the range to the target. The recommended range is 500 meters.

## BURST

E-19. The gunner assumes a stable position and fires a burst (6 to 9 rounds at the center base of the target). They observe where each burst strikes.

## CORRECTION FOR ELEVATION

E-20. If the center of the beaten zone is higher or lower than the target, the gunner corrects for elevation. Because determining this is difficult, they rely on trial and error to gain the experience to make reliable estimates. They correct for elevation the same as he did for 10-meter zeroing. (Refer to table E-1.)

## CORRECTION FOR WINDAGE

E-21. If the center of the beaten zone is to the left or right of the target, the gunner corrects for windage. (Refer to table E-2 on page E-4.)

## CONFIRMATION

E-22. After correcting for elevation and windage, the gunner fires a confirming burst. If they miss the target, they repeat the procedures.

## RECORDING OF ZERO

E-23. On confirming a zero, for both windage and elevation, the gunner records how many clicks (and the direction) that they moved the sight from its original settings.

## LASER BORELIGHT

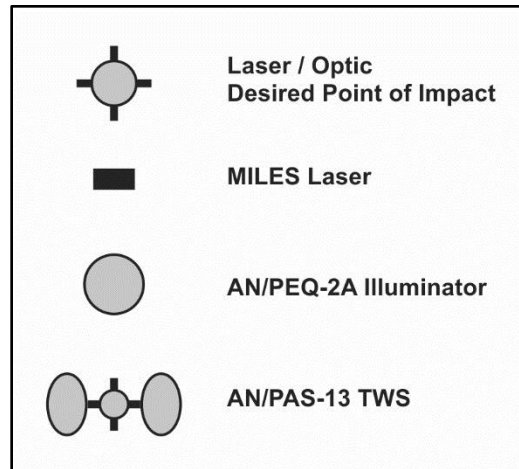
E-24. This section provides the 10-meter target offsets for the M240 machine gun mounted with iron sight, optics, MILES, or aiming lasers. A blank reproducible 10-meter target offset (DA Form 7476, *10-Meter Boresight Offset Target*) is provided along with a table and an example of every weapon configuration in figure E-4 on page E-7 and figure E-5 on page E-8.

## 10-METER TARGET OFFSET

E-25. 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 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 (see figure E-3).




**Figure E-3. 10-meter target offset symbols**

**10-METER BORESIGHT OFFSET TARGET**

For use of this form, see TC 3-22.249 or TC 3-22.240; the proponent agency is TRADOC.

See back of this form for quick reference to possible weapon configurations.



**LASER BORE LIGHT**

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 E-4. Example DA Form 7476 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
M240	IRON SIGHTS	NA	500m	TBD	TBD	1.9L/0.5U
M240	MGO	FEED TRAY COVER RAIL	500m	NA	0.0/0.0	5.0R/4.1D
M240	AN/PAQ-4C	PICATINNY RAIL GRABBER TOP	500m	1.75R/2.2D	1.5L/3.5U	5.0R/4.1D
M240	AN/PEQ-2A	INSIGHT RAIL GRABBER TOP	500m	2.0R/1.5D	1.7R/3.71U	5.0R/4.1D
M240	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240	AN/PAQ-4C	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	500m	6.2R/16.8D	6.2R/8.1D	5.0R/4.1D
M240	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240	AN/PAQ-4C	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	500m	7.9R/16.8D	7.9R/8.1D	5.0R/4.1D
M240	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240	AN/PEQ-2A	INSIGHT RAIL GRABBER FORWARD RAILS LEFT	500m	6.2R/12.8D	6.2R/4.1D	5.0R/4.1D
M240	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS RIGHT	500m	TBD	TBD	5.0R/4.1D
M240	AN/PEQ-2A	PICATINNY RAIL GRABBER FORWARD RAILS LEFT	500m	7.9R/12.8D	7.9R/4.1D	5.0R/4.1D
M240	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
M240	AN/PAS-13	FEED TRAY COVER	500m	0.0/2.3U	0.0/8.0U	5.0R/4.1D

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Figure E-5. Quick reference card from back of DA Form 7476

## ZERO CONFIRMATION OUT TO 500 METERS

E-26. The most important step in the zeroing process is zero confirmation out to 500 meters. Having a 10-meter zero does not guarantee a center hit at 500 meters. The only way to rely on a 500-meter hit, is to confirm a 500-meter zero.

E-27. Confirmation can be done on any range where Soldiers can see the impacts of their rounds. Groups should be fired and aiming devices should be adjusted. At a minimum, the confirmation should be done at 500 meters. If rounds are available, groups can be fired at various ranges to show the firers where their impact will be.



E-28. When confirming zero at ranges past 100 meters, the effects of the wind needs to be considered and acted upon, if necessary. If a zero is confirmed at 500 meters on a windy day, and then the weapon is fired at a later date in different wind conditions or no wind at all, the impact changes. (See figure E-6.)

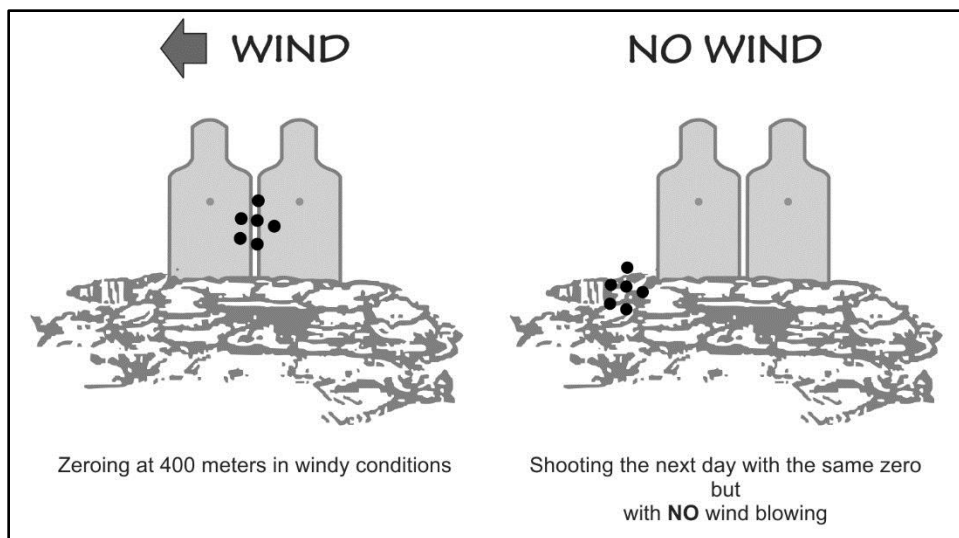


Figure E-6. Wind effects on zero at 500 meters

## M145 STRAIGHT TELESCOPE

E-29. The M145 straight telescope (see figure E-7) is a fixed 3.4 power, 28-mm optical sight that has been designed to engage targets accurately out to 1200 meters. The telescope weighs 24 ounces (681 grams) and is extremely rugged for rough field conditions. The telescope has an 8.2-mm diameter exit pupil, which provides excellent vision in low light levels, dawn and dusk, and also allows for rapid target acquisition.

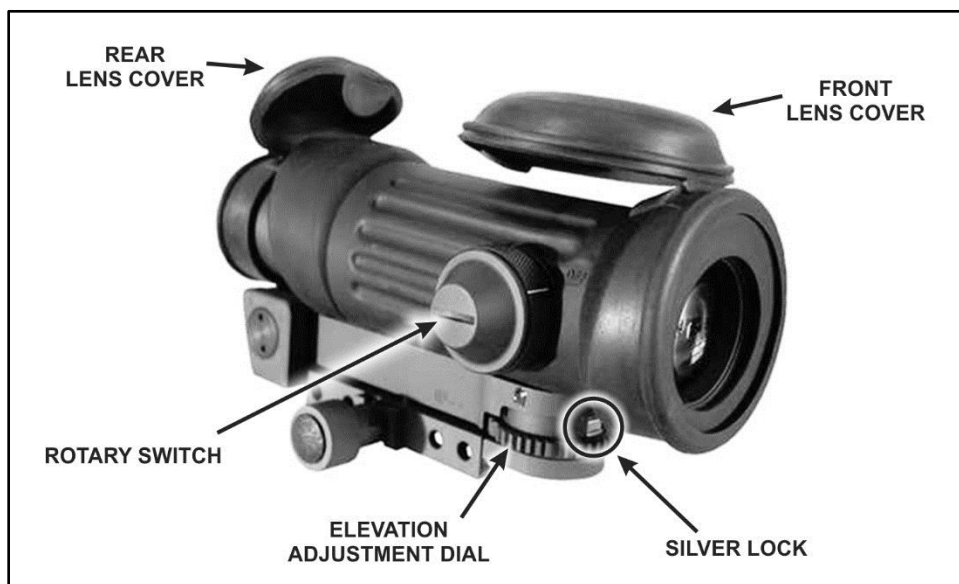


Figure E-7. M145 straight telescope

### SET THE M145 TELESCOPE TO MECHANICAL ZERO

1. Adjust the telescope so that the weapon's barrel and optical sighting axis are in approximate alignment. The sighting axis will be approximately two to three inches (51 to 76 millimeters) above the machine

gun barrel and therefore the strike of the bullet at 10 meter range will also be approximately two to three inches (51 to 76 millimeters) low without further zeroing adjustment. (See figures E-8 and E-9.)

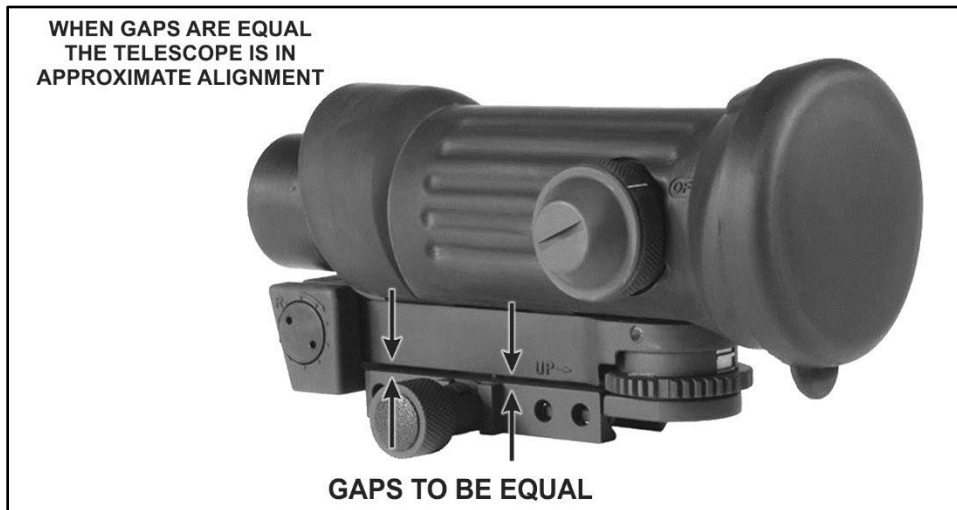


Figure E-8. Mechanical zero

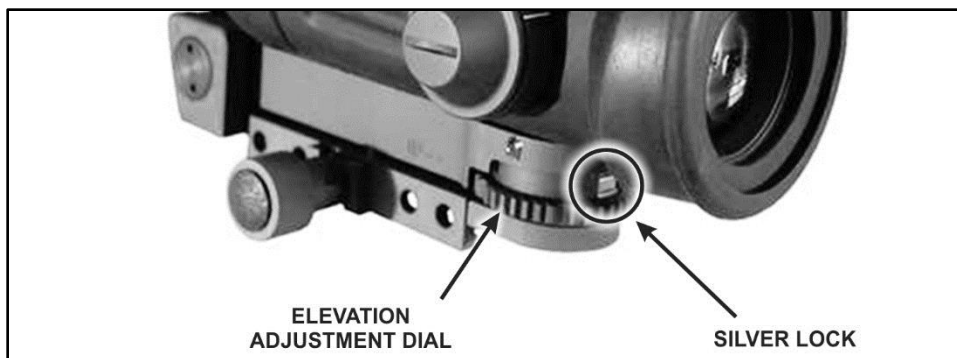


Figure E-9. Elevation adjustment

2. To bring the strike of the bullet up, lift the silver lock (see figure E-10) and rotate the elevation adjustment dial counterclockwise (to the right) approximately one full turn.

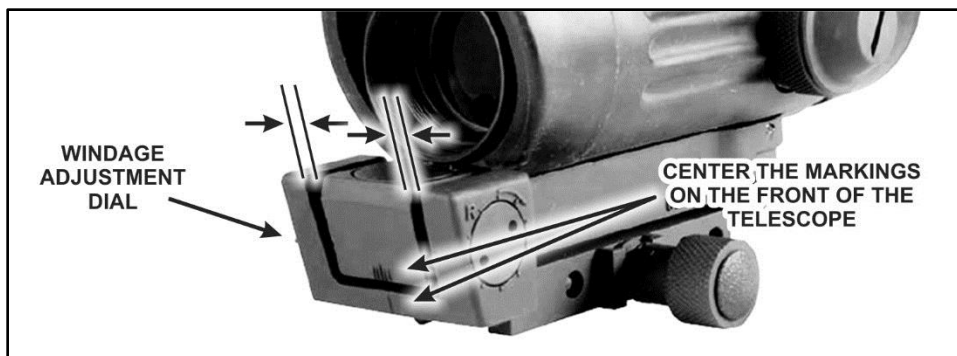
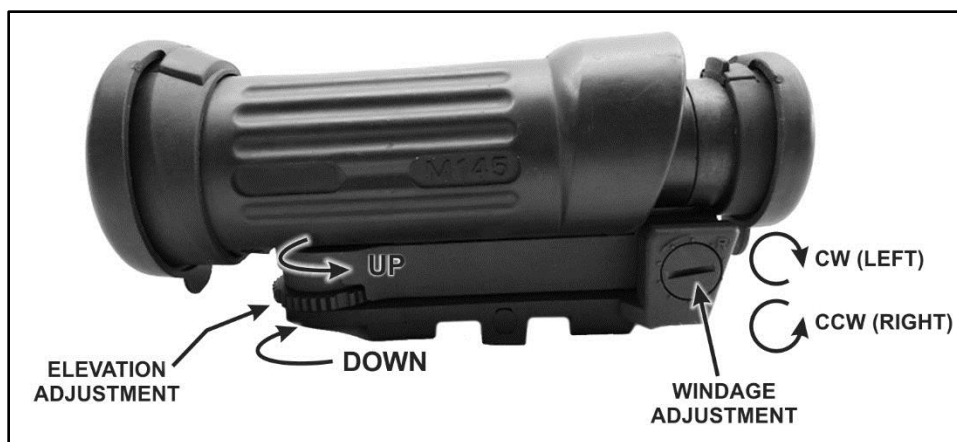


Figure E-10. Windage adjustment

3. Adjust the windage adjustment dial (to center the markings on the front of the telescope (see figure E-11)



**Figure E-11. Point of impact adjustment**

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**Note.** Each click of the zeroing adjustment makes a 2.5-millimeter movement of the point of impact at 10 meters.

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4. Make the final adjustments as follows (see figure E-12, page E-12):
  - a. To move the point of impact to the right, turn windage adjustment dial counterclockwise with the arrow marked on the dial.
  - b. To move the point of impact to the left, turn windage adjustment dial clockwise opposite to the arrow.
  - c. To move point of impact up, turn elevation adjustment dial counterclockwise (right) in the direction of the arrow and UP marking.
  - d. To move the point of impact down, turn elevation adjustment dial clockwise (left) opposite to the arrow.

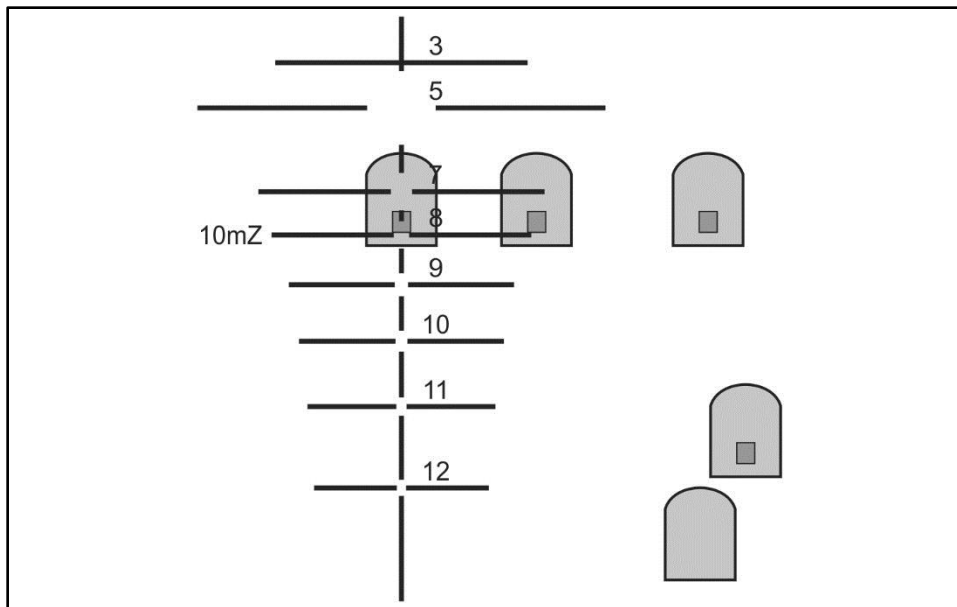
#### **TEN-METER ZEROING USING THE M145 STRAIGHT TELESCOPE**

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**Notes.** In the zeroing process, groups of three single shot rounds are fired at a target. After each three rounds, the center of the group has to be determined.

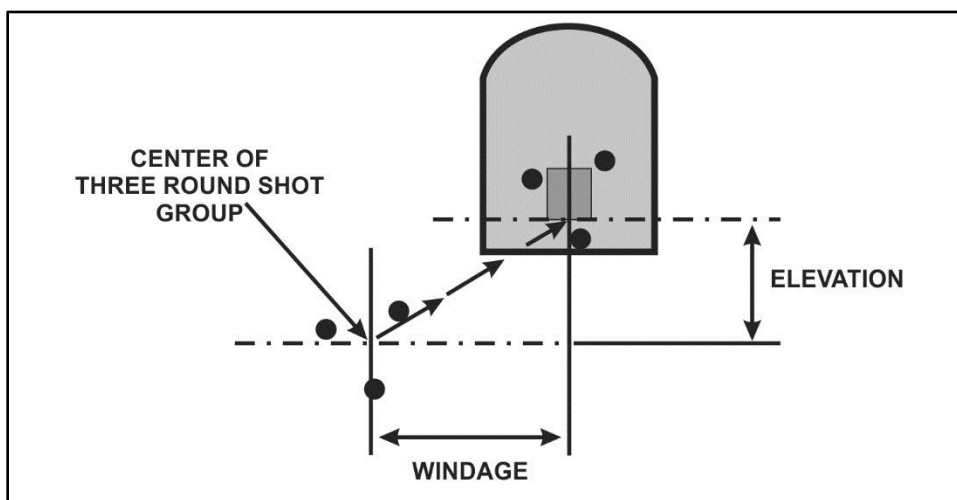
The 10mZ (800) line is to be used with the M240 machine guns when firing the 10-meter exercise as part one of the qualifying course.

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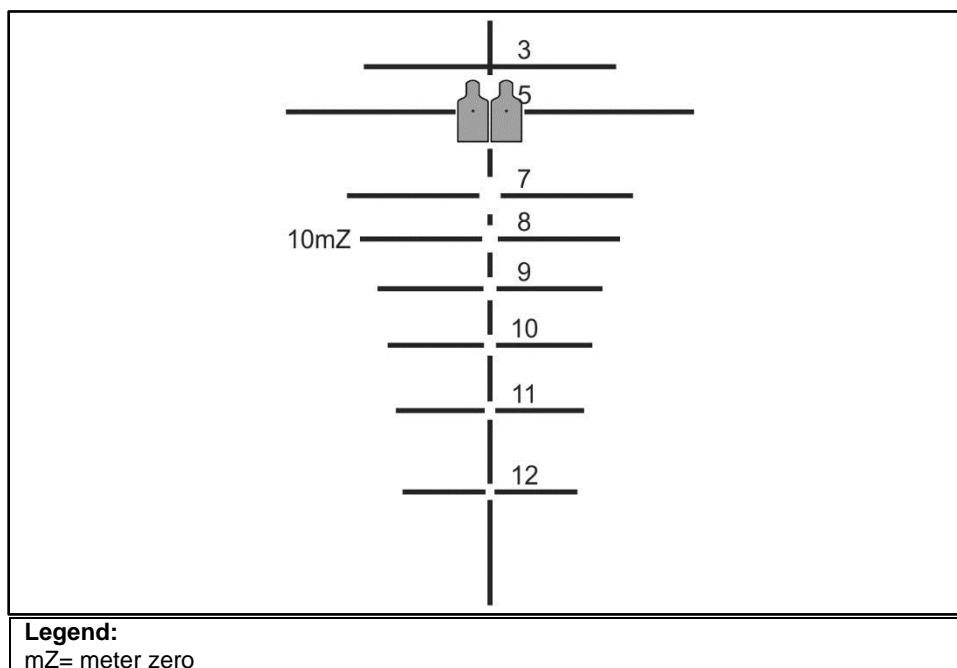
**Figure E-12. Target zeroing.**

1. Look through the telescope and align the reticle's 10mZ zeroing mark on the center base of the aiming points on the basic machine gun marksmanship target.
2. Fire three single rounds loaded individually without making any telescope adjustments.
3. The three-round shot group (figure E-13) should be within a four-centimeter circle to establish the center of shot group in relation to the center base of the aiming paster.
4. Measure the amount of movement required left or right (windage) and up or down (elevation) (figure E-13) to move the three-round shot group onto the center of the aiming paster.
5. Windage correction: Upon completion, return to the firing line to make corrections to the weapon and re-fire a three-round shot group to confirm zero.
6. Repeat steps 1 through 5 until the strike of the round coincides with the center of the target. Close the silver lock. (figure E-7, page E-9 and figure E-10, page E-11) down to prevent any further movement of the elevation adjustment dial (figure E-7, page E-9 and figure E-10, page E-11). The telescope is now 10-meter zeroed.



**Figure E-13. Shot group**

## FIELD ZERO AT 500-METER RANGE



**Figure E-14. 500-meter reticle view**

1. Look through the telescope and align the reticle's 500-meter mark (see figure E-14) on the center of mass of the double "e" silhouette target.
2. When firing a M240 weapon, fire a 6- to 9-round burst.
3. Observe impact of rounds.
4. Determine direction of movement needed for impact (up or down, left or right).
5. Estimate or measure the amount of adjustment required to move the impact of the round to the center of the target (at 500 meters), five inches equal one click of adjustment in both windage and elevation).
6. Repeat steps 1 through 5 until the impact of the round coincides with the center of the target. Close the silver lock down to prevent any further movement of the elevation adjustment dial. The telescope is now zeroed and ready for operational shooting.

## M145 STRAIGHT TELESCOPE RETICLE

E-30. The vertical gap in the stadia lines is for estimating ranges. The height of gaps in the stadia lines represents a 60-inch (152.4-centimeter) high target at the range noted (5, 7, 8, 9, 10, 11, or 1200 meters). (See figure E-15, page E-14.)

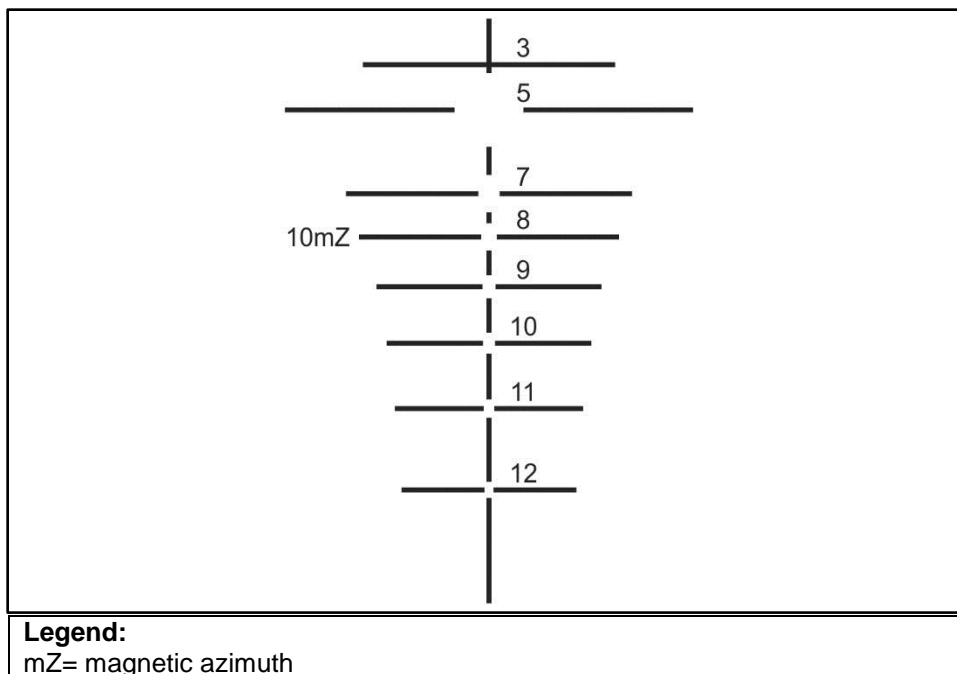


Figure E-15. M145 reticle

E-31. For low light operations, the reticle can be illuminated to show the 300-meter, 500-meter, 700-meter and 800-meter aiming marks. (See figure E-16.)

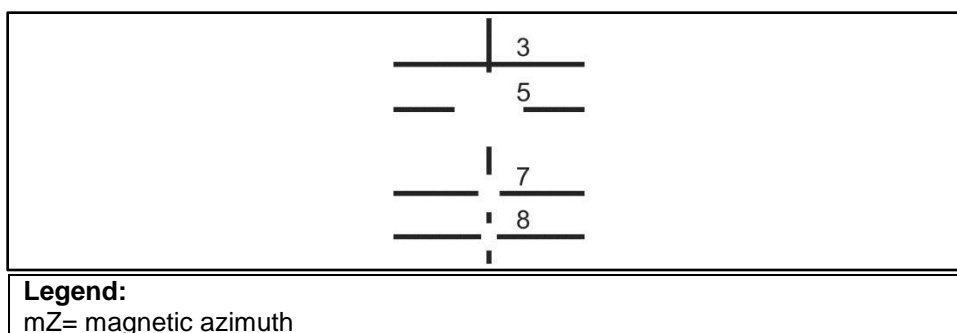


Figure E-16. Illuminated reticle

**Note.** Telescope is equipped with a variable intensity light emitting diode (LED) for illumination of the reticle. It has 10 positions: the OFF position and nine positions for different reticle intensity settings.

1. To make reticle illumination adjustments, turn rotary switch (figure E-7, page E-9) clockwise. The intensity of the illumination increases as the switch is turned.
2. Turn rotary switch (figure E-7, page E-9) to OFF position when the telescope is being used during normal daylight or when illumination is not required.

## DOWNRANGE FEEDBACK

E-32. Feedback must be included in all live-fire training. Soldiers must have precise knowledge of a bullet strike; feedback is inadequate when bullets from previous firings cannot be identified. To provide accurate feedback, trainers ensure that Soldiers triangulate and clearly mark previous shot groups on a zeroing target or receive a hard copy from the tower on an automated range.

**Note.** A common misconception is that wearing combat gear causes the zero to change. Adding combat gear to the Soldier's body does not cause the sights or the reticle to move. The straight line between the center of the rear sight aperture and the tip of the front sight post either intersects with the trajectory at the desired point, or it does not. Soldiers should be aware of their own performance, to include a tendency to pull their burst in a certain direction, across various positions, and with or without combat gear. A shift in point of impact in one shooting position may not correspond to a shift in the point of impact from a different shooting position.

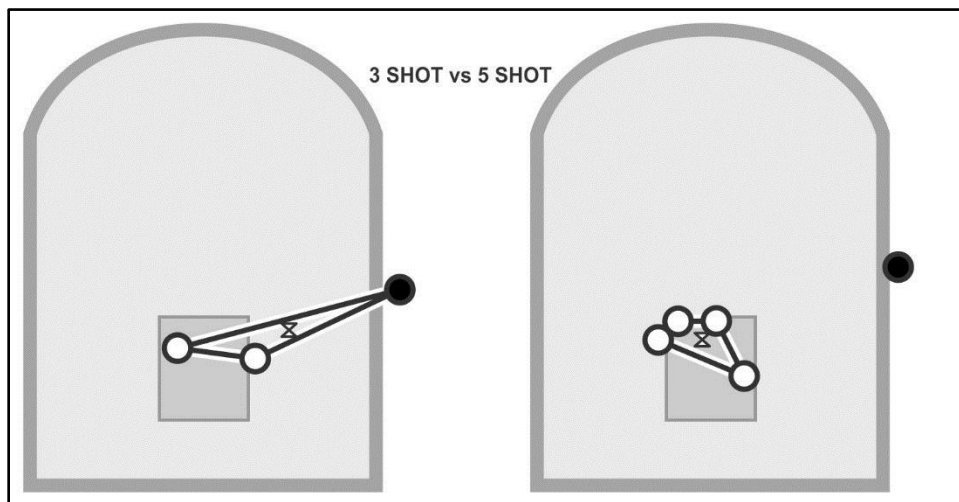
E-33. A good zero is necessary to engage targets accurately. Whenever the Soldier deploys or does training in a new location, he should confirm the zero on his weapon if possible, as elevation, barometric pressure, and other factors affect the trajectory of burst. There are multitudes of factors that can affect a zero, and the only sure way to know where the rounds are going, is to fire the weapon.

E-34. The zero on each assigned machine gun will not transfer to another machine gun. Inputting that same settings from one machine gun on to another machine gun does not make it zeroed. This is due to the manufacturing tolerance difference between the weapons.

E-35. It is recommended that Soldiers setup their equipment and dry practice in position with gear on before coming to the range.

E-36. Standard in Training Commission (STRAC) Department of the Army Pamphlet (DA PAM) 350-38 allocates ammunition to conduct zeroing procedures using three-shot groups. The preferred method is to use a five-shot grouping, allowing the firer to more accurately analyze their shot group. Figure E-17 shows similar three-shot and five-shot groups with one shot on the right edge of the group. If all the shots were taken into account in the three-shot group, the firer would probably adjust their zero from the right edge of the four-cm circle. It is possible that the shot on the right was a poor shot and should not be counted in the group. The five-shot group on right is in the same place as the one on the left with the exception of the one shot out to the right. With four out of five shots in a tight group, the wide shot can be discounted and little or no change to the windage is necessary.

E-37. Part of the grouping (see figure E-17) and zeroing process is the marking and analysis of shot groups.



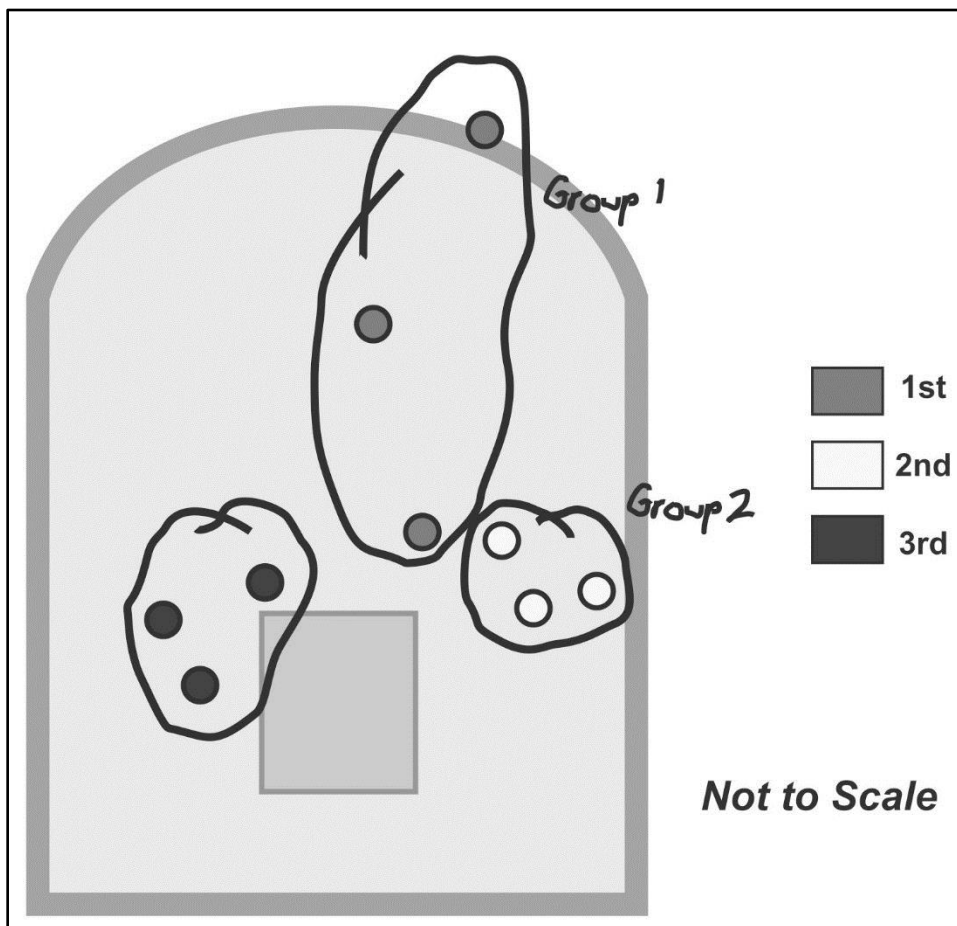
**Figure E-17. Grouping**

## MARKING THE SHOT GROUP

E-38. If possible, shot groups should be marked using different colored markers so the firer can track their progress. Figure E-18 on page E-16 shows a technique for marking shot groups on a zero target. This technique allows the firer and coach to track their progress throughout the grouping and zeroing phase.

E-39. All sight adjustments are from the center of the group, called the mean point of impact (MPI), and not from the location of a single shot. When using five-shot group, a single shot that is outside of the rest of the group should not be counted in the group for sight adjustment purposes.

*Note.* This figure depicts the color variations in shades of gray.



**Figure E-18. Marking shot groups**

E-40. The firer shoots and marks their first shot group with a colored marker. The color of the first group is noted by placing a line with that marker next to the 1 on the right side of the zero target. Groups are fired and marked until they are consistently in the same location.

E-41. Each sight adjustment is annotated in the same color as the group that was just fired.

## COACHING

E-42. Coaching is the process of having another Soldier observe the firer during the firing process to look for shooting errors that the firer themselves may not consciously know they are making.

### TYPES OF COACHES

E-43. Firing the machine gun properly requires the consistent and proper application of the elements of employment. It is about doing the right thing, the same way, every burst. The small arms trainer is also the validation point for any questions during employment training. In most cases, once group training is completed, it will be the firer's responsibility to realize and correct their own firing errors but this process can be made easier through the use of a coach.



E-44. Two types of coaches exist: the experienced coach and the peer coach. Although each should execute coaching the same way, experienced coaches have a more thorough understanding of employment and should have more knowledge and practice in firing than the Soldiers they are coaching. Knowledge and skill does not necessarily come with rank; therefore, Soldiers serving as experienced coaches should be carefully selected for their demonstrated firing ability and their ability to convey information to firers of varying experience levels.

### **Experienced Coaches**

E-45. Experienced coaches are generally in short supply throughout the Army and are generally outnumbered by less skilled firers. This lack of experienced coaches usually leads to one experienced coach watching multiple firers dependent upon the table or period of employment being fired. It often helps the experienced coach to make notes of errors they observed and discuss them after firing that group. It is often difficult for the coach to remember the errors observed in each and every firer.

### **Peer Coaches**

E-46. Using a peer coach, although generally not as effective as using an experienced coach, is still a very useful technique. The advantage of using a peer coach is two-fold: a peer coach may use their limited knowledge of employment to observe the firer when an experienced coach is not available or is occupied with another firer and can either talk the firer through the shooting errors that they have observed or bring any observed shooting errors to the attention of the experienced coach. The other advantage of using a peer coach is that the peer coach themselves, through the act of coaching, may be able to observe mistakes made by the firer and learn from them before making the mistakes themselves. Many people grasp instruction more deeply when they are coaching others than when they are simply told to do something.

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*Note.* Peer coaches can be limited by their level of training.

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E-47. Except for aiming, the coach can observe most of the important aspects of the elements of employment. To determine the unobservable errors of shooting the coach and the firer must have an open dialog and there must be a relaxed environment for learning. The firer cannot be hesitant to ask questions of the coach and the coach must not become a stressor during firing. The coach must have the ability to safely move around the firer to properly observe. There is no one ideal coaching position. The following section discusses the elements of shooting and how best to observe them as a coach.

### **STABILIZE**

E-48. For the coach to observe how stable the firer is, they may have to move to different sides of the firer. To observe the firer's non-firing elbow (to ensure it makes contact with the ground), the coach will need to be on the firer's non-firing side. To observe the cant of the weapon (the sights on the weapon should be pointing towards 12 o'clock position, not 11 or 1 o'clock positions), the coach needs to watch the relationship of the front sight to the barrel from behind the firer. The coach should look for all the other aspects of good positions as outlined in chapter 6 of this publication. The coach should also observe the total amount of weapon movement on recoil. A good stable position will have minimal movement under recoil.

### **AIMING**

E-49. Determining the aspects of the firer's aiming (sight picture, sight alignment, point of focus) requires dialogue between the firer and the coach. Often, a firer will not realize their aiming errors until they discover them on their own. Without the use of a sighting device, the coach must rely on drawings and discussions to determine where the firer is aiming on the target, their focus point during firing (which should be the front sight), and where their front sight was at the moment of firing in relation to the rear sight aperture and the point of aim on the target. The technique of having the firer call their shots should also be used. This technique involves calling the point on the target where the sights were located at the moment of firing and matching the point called with the impact locations on the target. Calling the shot helps the firer learn to focus on the front sight during the entire firing process.

E-50. When optics are being used, the firer can tell the coach where they were holding. This is of particular importance with the MGO. Coaches must ensure the 800-meter aim point is used when zeroing at 10 meters.

**CONTROL**

E-51. The ideal position to observe trigger squeeze is from the non-firing side because the coach has a better view of the speed of pull, finger position on the trigger, and release or pressure on the trigger after firing. The coach can look from behind the firer to observe the barrel for lateral movement caused by slapping the trigger during firing.

**COACHING FACTORS**

E-52. All firing happens at the weapon. This means that the coach should be focused solely on the firer during firing and not on what is happening down range.

E-53. There is no way for a coach to observe only the bullets impact on target and know what errors the firer made. The coach must watch the firer during firing to determine errors and use the impacts to confirm their assumptions.

E-54. For a coach to properly observe all aspects of firing they must be able to observe the firer safely, from both sides and the back. There is no prescribed coaching position.

E-55. Coaching requires a relaxed atmosphere with open communication between the firer and the coach.

**SHOT GROUP ANALYSIS**

E-56. Shot group analysis involves the firer correlating the shots on paper with the mental image of how the shots looked when fired. An accurate analysis of the shot group cannot be made by merely looking at the holes in the paper. It is more important to observe the firer than to try and analyze the target. All firing takes place at the weapon, and the holes in the paper are only an indicator of where the barrel was pointed when the weapon was fired. When coaches are analyzing groups, they must question the firer about the group to make a determination of what caused the placement of the shots.

E-57. For example, if the firer has a tight group – minus one shot that is well outside of the group, the firer should have observed the outlying shot while firing. The firer would discount this shot when marking their group. (See figure E-19 and figure E-20.) If a coach is analyzing the group, the firer would tell them that they performed poorly on the one shot that is out of the group.

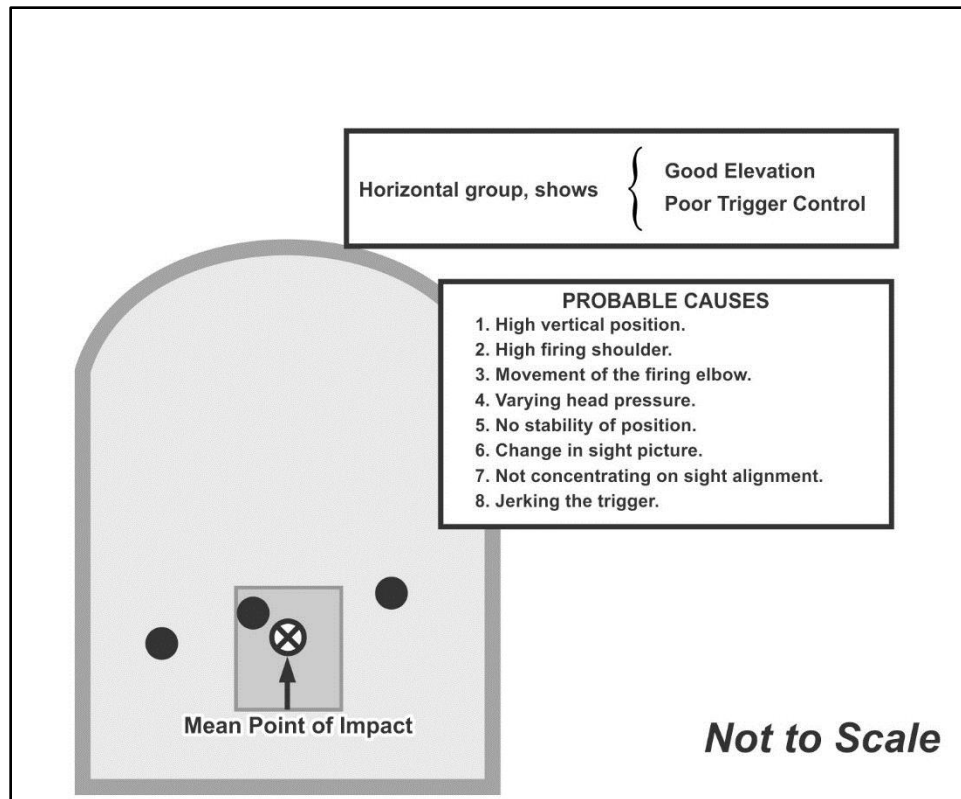


Figure E-19. Horizontal diagnostic shots

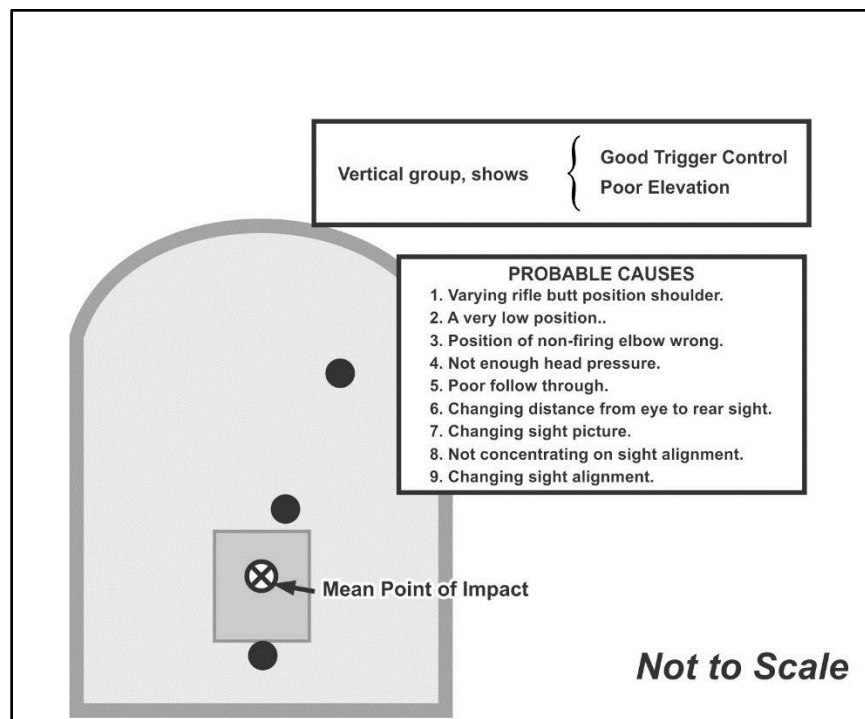


Figure E-20. Vertical diagnostic shots

E-58. Novice firers may benefit from not marking their own shot group. When marking a shot group an inexperienced or stressed Soldier may unintentionally make mental corrections. These mental corrections along with the mechanical corrections to their weapon will cause further issues during follow on shot groups. The experienced Soldier is less likely to make adjustments to their sight placement along with the mechanical changes to the weapon, knowing the zero process is aligning the sights to the location of the impact of the rounds. Having a coach or the employment instructor simply inform the Soldier of mechanical changes needed to the aiming device is an effective way to accomplish this method.

E-59. Observing the firer must be accomplished before analyzing the target can become effective. Bullets strung vertically do not necessarily mean a breathing issue, nor do bullets strung horizontally absolutely indicate a trigger squeeze problem. Coaches must learn to identify firer's errors during firing and use the bullet impacts on target to confirm their observations. There are often several firing errors that can be the cause of certain misplacements of impacts. The coach has to realize that bullets only go where the barrel is pointed, so they have to determine what happened that caused the barrel to be pointed in those directions, and those causes can be many.

E-60. The key to proper coaching is becoming a shooting detective. The coach needs to observe the firer, question the firer, look at the evidence downrange, question the firer again, make assumptions based upon the evidence available, and then act upon his assumptions. The coach and firer must have a free and open dialog with each other in a relaxed atmosphere. Remember if a Soldier learns to shoot poorly they will only be capable of shooting poorly.

### **DISPLACEMENT OF SHOTS WITHIN A SHOT GROUP (FLYERS)**

E-61. The capability of the weapon to shoot groups varies dependent on the number of rounds fired through the barrel over its lifetime. The average expected group size is in a four-centimeter circle or smaller at 10 meters; some weapon may shoot slightly larger than this. If a firer is firing groups larger than a normal group size, the next step should be to have a known skilled firer attempt to fire and group with the original firer's weapon. If a proven skilled firer is able group off of the normal size it is most likely an issue with the original firer. If, however, the skilled firer cannot fire within the accepted group size there may be something wrong with the gun or barrel.

E-62. When looking at groups where there are one to two shots away from the group body (one shot away for a three round group, one or two shots away for a five-round group), the coach must look objectively at the overall consistency of group placement. A bad shot or group might not indicate a poor grasp of the elements; every firer will have an occasional bad shot, and some may even have an occasional bad group. Coaches need to use their experience and determine whether or not the firer had a bad shot, a bad group, or doesn't have a clear grasp of the elements and take the necessary steps to get the firer to the end-state. The coach may have the firer shoot again and ignore the bad group or bad shot, instead hoping that the new group matches up with the previous shot groups or the coach may need to pull the firer off the line and cover the basic elements. Contrary to popular belief, having a firer shoot over and over again in one sitting, until the firer "get it right" is not a highly effective technique.

### **BULLETS DISPERSED Laterally ON TARGET**

E-63. Bullets displaced in this manner could be caused by a lateral movement of the barrel due to an unnatural placement of the trigger finger on the trigger. Reasons for this could include—

- The firer may be misaligning the sights to the left and right slightly.
- The firer may have the sights aligned properly but may have trouble keeping the target itself perfectly centered on the tip of the front sight.
- The firer may be closing their eyes at the moment of firing or flinching.

### **BULLETS DISPERSED Vertically ON TARGET**

E-64. Bullets displaced in a vertical manner could be caused by the following:

- Firer may be misaligning the front sight in the rear sight aperture vertically. It may be caused by the firer watching the target instead of the front sight.

- Firer may have trouble seeing the target and keeping the tip of the front sight exactly centered vertically on the target. Coach may consider using a larger target or a non-standard aiming point. Many firers find it easier to find the center of a circle than a man-shaped target.
- Firer may not have a good support, which causes the firer to readjust their position during every shot and may settle with the sights slightly misaligned.
- Firer may be flinching or closing their eyes at the moment of firing.
- Firer may be breathing while firing the weapon. (This is not normally the case, most firers instinctively hold their breath just before the moment of firing.)

## **LARGE GROUPS**

E-65. Large groups are most commonly caused by the firer looking at the target instead of the front sight. This causes the firer to place the front sight in the center of the target without regard for its location in the rear sight aperture. A small misalignment of the sights results in a large misplacement of shots downrange. Most shooters do not fire when their properly aligned sights are pointed all over the target, so a large group is most likely not a point of aim issue.

## **GOOD GROUPS THAT CHANGE POSITIONS ON THE TARGET**

E-66. When the firer has good groups but they are located at different positions on the target, there can be a number of reasons. These include the following:

- The firer may be properly aligning sights during shooting but picking up a different point of aim on the target each time.
- The firer may be settling into a position with the front sight on target but the sights misaligned. The firer maintains the incorrect sight picture throughout the group but aligns the sights incorrectly and in a different manner during the next group. Tell the firer to focus on the front sight and check natural point of aim before each group.

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## **Appendix F**

# **Qualification**

Appendix F assists trainers with preparing and conducting machine gun marksmanship training. Marksmanship begins with proficiency achievement in nonfiring individual skills and ends with collective proficiency in firing under demanding conditions.

### **OBJECTIVES**

F-1. The objective of machine gun marksmanship training is to produce gunners who can fire an accurate initial burst, adjust fire, and develop speed. Each of these functions are described in the paragraphs below.

#### **FIRE AN ACCURATE INITIAL BURST**

F-2. Obtaining an accurate initial burst of fire on the target is essential to good marksmanship. The gunner estimates the range to the target, sets the sights, and applies marksmanship skills while engaging targets to achieve an accurate initial burst of fire.

#### **ADJUST FIRE**

F-3. The assistant gunner must observe the strike of the rounds when the initial burst is fired. If the gunner misses the target, then they manipulate the T&E mechanism until they hit the target. The assistant gunner must be proficient in observing the strike of rounds and in observing and using tracers. The assistant gunner's proficiency helps the gunner relay the machine gun back on target.

#### **DEVELOP SPEED**

F-4. Speed is essential to good marksmanship also. Practicing dry-fire and live-fire exercises increases the gunner's speed. Speed develops through extensive training that combines other skills when delivering fire. However, speed is less important than accuracy.

### **BASIC MACHINE GUN TARGET**

F-5. The basic machine gun target (FSN 6920-078-5128 and NSN 6920-00-078-5123) is used for the 10-meter firing exercise (see figure F-1, page F-2). 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 four centimeters wide and five centimeters high. The black aiming paster within the numbered scoring spaces is one-centimeter square. The target is used to score two gunners. One gunner uses sections A and B and the other C and D.

#### **POINT TARGETS**

F-6. 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**

F-7. 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.

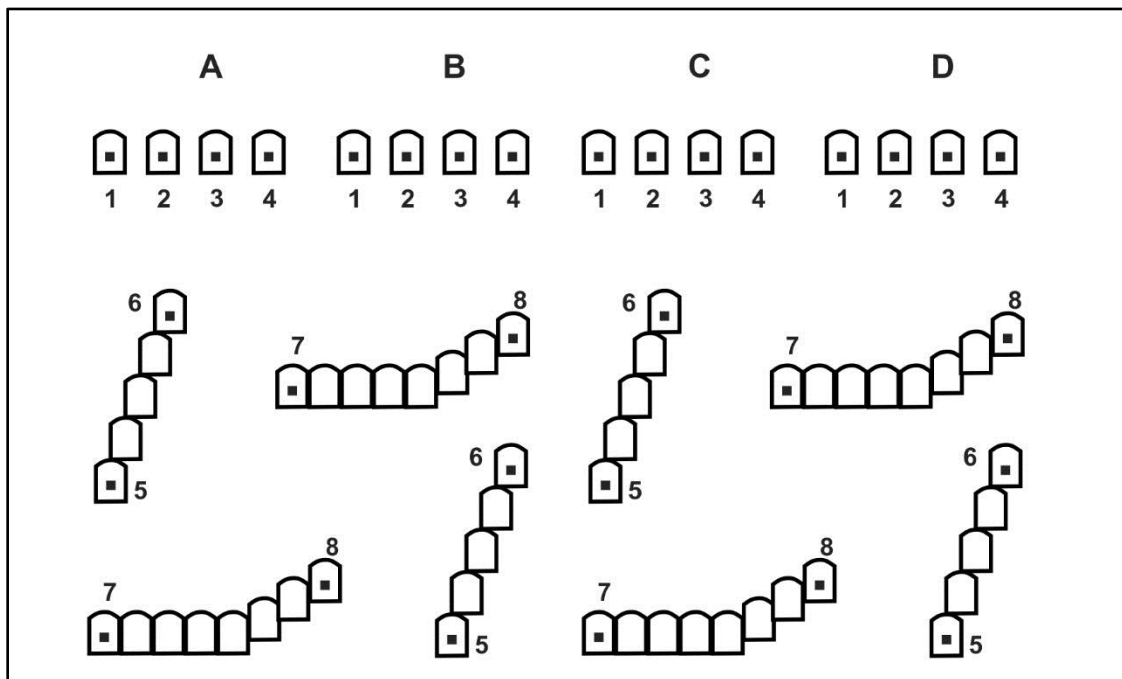


Figure F-1. Basic machine gun target

## TEN-METER FIRE

F-8. The 10-meter firing exercise trains the gunner to apply the functional elements of the shot process 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 firing 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 using Firing Table I (table F-1).



**Table F-1. Firing Table 1, all weapons, basic (10-meter) fire**

TASK	TIME	ROUNDS		TARGET	TYPE FIRE
		QTY	TYPE		
1	No Limit	12	Ball/tracer	Pasters A1 and A2	1 to 2 single rounds (zero)
2	No Limit	6	4:1	Pasters A3 and A4	5- to 7-round burst each paster
3	No Limit	15	4:1	Pasters A5 through A6	5- to 7-round burst each paster, traverse and search
4	No Limit	24	4:1	Pasters A7 through A8	5- to 7-round burst each paster
5 <sup>a</sup>	45	12	4:1	Pasters B1 through B4	5- to 7-round burst each paster
6 <sup>a</sup>	30	24	4:1	Pasters B7 through B8	5- to 7-round burst each paster
<b>Notes.</b> The gunner fires pasters on sections A and B and the assistant gunner fires on sections C and D. <sup>a</sup> Qualification task.					

**TASK 1: ZERO, TRIPOD**

F-9. 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 in figure F-1, page F-2).

**TASK 2: CONTROLLED-BURST FIRE, TRIPOD**

F-10. Task 2 exposes the gunner to automatic fire and the action of the weapon and at the same time introduces trigger control (A3 through A4 on figure F-1, page F-2). Using point targets, the gunner fires a burst of 5 to 7 rounds.

**TASK 3: TRAVERSE AND SEARCH FIRE**

F-11. Task 3 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 on figure F-1, page F-2).

**TASK 4: TRAVERSE AND SEARCH FIRE**

F-12. Task 4 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 on figure F-1, page F-2).

**TASK 5: TRAVERSE AND SEARCH FIRE, QUALIFICATION**

F-13. Task 5 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 on figure F-1, page F-2).

**TASK 6: TRAVERSE AND SEARCH FIRE, QUALIFICATION**

F-14. Task 6 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 on figure F-1, page F-2).

**ASSISTANT GUNNER: TEN-METER PRACTICE AND QUALIFICATION**

F-15. 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 on figure F-1, page F-2.

## TEN-METER CONDUCT OF FIRE

F-16. The gunners are instructed on the objectives 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: ZERO, TRIPOD

F-17. The gunner should zero his weapon in nine rounds. The gunner should use the other three rounds to confirm the zero. If the gunner cannot zero in 12 rounds, the gunner 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 ROUN. 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. The gunner adjusts as needed.
- The gunner repeats steps 3 through 10 until they have zeroed or fired 12 rounds. If they have not zeroed after 12 rounds, they are removed from the firing line for retraining. Once they zero, they fire the remaining rounds at paster A2 to confirm the zero.

### TASK 2: TRIPOD, CONTROLLED-BURST, TRAVERSE

F-18. 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**

F-19. The tower operator instructs the 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 A4, firing a 5- to 7-round burst at each paster, using traverse and search technique.

### **TASK 4: TRIPOD, CONTROLLED-BURST FIRE, TRAVERSE AND SEARCH**

F-20. 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 traverse and search technique.
- The gunner and assistant gunner move downrange to observe and analyze the targets

### **TASK 5: TRIPOD, QUALIFICATION, TRAVERSE AND SEARCH FIRE**

F-21. 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 traverse and search technique. The gunner has 45 seconds to engage as many pasters as they can during the time allowed.

**TASK 6: TRIPOD, QUALIFICATION, TRAVERSE AND SEARCH FIRE**

F-22. 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 their 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. They use traverse and search. They have 30 seconds to engage as many pasters as they 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).

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**Gunner Notes:** Throughout the firing exercise, perform the appropriate tasks during each element of the fire command. Use the number of rounds fired instead of the rate for the METHOD OF FIRE. This improves control. However, omitting the rate specifies RAPID fire, which is undesirable for these tasks.

If you zero in nine rounds, then use the other three to confirm the zero. If you cannot zero in 12 rounds, leave the firing line and go through remedial training.

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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.**

**TEN-METER QUALIFICATION FIRE**

F-23. 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**

F-24. 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

F-25. After correcting for elevation and windage, the gunner fires a confirming burst. If they miss the target, they repeat the procedures.

- If a stoppage occurs that the gunner cannot reduce by immediate action, then they raise their hand and awaits assistance.
- Once they reduce the stoppage, the gunner completes firing, beginning with the next task.
- If gunner error causes a stoppage, additional time is disallowed. They receive whatever score they 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

F-26. 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, they lose the points for those rounds. A gunner whose target was fired upon by another gunner is permitted to refire the exercise.

## SCORING

F-27. 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). They award one point for each round that impacts within the scoring space. The most points they can give the gunner for each paster is seven points for the 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

F-28. When firing B/D5 through B/D6, the gunner engages five scoring pasters with 35 rounds (M240B). They can earn up to 35 points for either the M240B.

### Sections B/D7 to B/D8

F-29. When firing pasters B/D7 through B/D8, the gunner engages eight scoring pasters with 56 rounds (M240B). They can earn up to 56 points for the M240B.

## POSITION

F-30. For practice and qualification, the gunner will use either a tripod-supported prone or tripod-supported fighting position.

## FIRERS

F-31. The gunner and the assistant gunner both fire Table I.

## TRANSITION FIRE

F-32. 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. They use the adjusted aiming-point method of fire adjustment. Transition fire occurs on a machine gun transition range or the multipurpose range complex (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 (See table F-2, page F-8).

Table F-2. Firing Table II, all weapons, tripod transition fire

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	14	4:1 <sup>b</sup>	Single E	400	Fixed, 5- to 7-round burst
3 <sup>a</sup>	15	14	4:1 <sup>b</sup>	Double E	500	Fixed, 5- to 7-round burst
4 <sup>a</sup>	20	14	4:1 <sup>b</sup>	Double E	600	Fixed, 5- to 7-round burst
5 <sup>a</sup>	30	14	4:1 <sup>b</sup>	Double E	800	Fixed and area, 5- to 7-round burst
6 <sup>a</sup>	30	28	4:1 <sup>b</sup>	Single E Double E	400 600	Fixed, 5- to 7-round burst
7 <sup>a</sup>	45	28	4:1 <sup>b</sup>	Double E Double E	700 800	Fixed and area, 5- to 7-round burst
8 <sup>a</sup>	45	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 position.

<sup>a</sup>Qualification task.

<sup>b</sup>Ball-to-tracer ratio (mix), that is, four ball rounds are loaded for every tracer round loaded.

## RANGE FACILITIES

F-33. 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

F-34. 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 F-2). The targets are at various ranges that the gunner might engage. All targets are plainly visible from the firing positions. Electrical targets are desirable.



Figure F-2. Single and double E-type silhouette targets

## STOPPAGE

F-35. Firing Table I criteria are used.

## PENALTIES

F-36. Firing Table I criteria are used.

## SCORES

F-37. Ten points are given for each target hit, whether hit on the first or second burst. The total possible points is 110. The gunner must hit at least seven targets (70 points) out of 11 exposures to qualify. Trainers use DA Form 85, *Scorecard for M249 and M240 Machine Guns*, to record scores. (See figure F-2.) The form may be downloaded at <https://www.apd.army.mil>.

## FIRING POSITION

F-38. Transition fire should be fired from the tripod, but the commander may specify that the gunner should fire it from the bipod. The gunner and assistant gunner both fire Table II.

## TRANSITION CONDUCT OF FIRE WITH TRIPOD

F-39. 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

F-40. 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 they check the front sight blade. They set the range to the zero target on the range scale. The preferred range is 500 meters.
- The 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, they adjust windage and elevation.
- After adjusting, the gunner repeats steps 10 through 11 with the remaining rounds until the rounds impact on the target. They record their zero.

## **TASK 2: 400-METER, SINGLE E-TYPE SILHOUETTE**

- F-41. 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, they fire another 5- to 7-round burst. To adjust fire, they use the adjusted aiming point method.

## **TASK 3: 500-METER, DOUBLE E-TYPE SILHOUETTE**

- F-42. 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, they use the adjusted aiming point method.

## **TASK 4: 600-METER, DOUBLE E-TYPE SILHOUETTE**

- F-43. 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, they use the adjusted aiming point method.

## **TASK 5: 800-METER DOUBLE E-TYPE SILHOUETTE**

- F-44. The gunner and assistant gunner continue to scan the sector.
- An 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, they fire 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**

- F-45. 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, they fire 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**

F-46. 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, they fire 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**

F-47. 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, they fire another 5- to 7-round burst at each target using the adjusted-aiming-point method of fire adjustment.

## **TRANSITION FIRE, LIMITED VISIBILITY**

F-48. Night or limited visibility firing requires the Soldier to apply the shot process while using nightsights. This training instills confidence in the machine gunner. Each Soldier learns how to engage targets using a nightsight. The Soldier learns to mount the sight, boresight the weapon at 10-meters, and zero the vision devices (Use the appropriate TM for that device.) at 10-meters using a 25-meter (M16A2) zero target. Finally, the Soldier 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 an assigned night thermal / vision device 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 also are used. Firing Table III (table F-3, page F-12) provides ammunition requirements.

## **SCORING**

F-49. Rather than points, the gunner receives only a hit or a miss when they hit the target on the first or second hit. They 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. It may be downloaded at Army Knowledge Online (<https://www.apd.army.mil>).

## **CONDITIONS**

F-50. Firing Table III (table F-3, page F-12) 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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Table F-3. Firing Table III, all weapons, transition fire, limited visibility

TASK	TIME	ROUNDS		TARGET	RANGE	TYPE FIRE
		QTY	TYPE			
1	No Limit	6	4:1 <sup>b</sup>	25-meter zero	10	6 single rounds
2	No Limit	15	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	14	4:1 <sup>b</sup>	Single E	200	14 single rounds
5 <sup>a</sup>	10	14	4:1 <sup>b</sup>	Single E	400	Fixed and area, 5- to 7-round burst
6 <sup>a</sup>	10	14	4:1 <sup>b</sup>	Single E	100	Fixed, 5- to 7-round burst
7 <sup>a</sup>	15	14	4:1 <sup>b</sup>	Single E	300	Fixed, 5- to 7-round burst
8 <sup>a</sup>	25	28	4:1 <sup>b</sup>	Single E	200	Fixed, 5- to 7-round burst
				Single E	400	Fixed, 5- to 7-round burst
9 <sup>a</sup>	25	28	4:1 <sup>b</sup>	Single E	100	Fixed, 5- to 7-round burst
				Single E	300	Fixed, 5- to 7-round burst
10 <sup>a</sup>	30	42	4:1 <sup>b</sup>	Single E	100	Fixed, 5- to 7-round burst
				Single E	200	Fixed, 5- to 7-round burst
				Single E	400	Fixed, 5- to 7-round burst

**Notes.** Unit commander determines position.

<sup>a</sup>Qualification task.

<sup>b</sup>Ball-to-tracer ratio (mix), that is, four ball rounds are loaded for every tracer round loaded.

## TARGETS

F-51. Firers use single and double E-type silhouettes.

## FIRING POSITION

F-52. For the limited visibility transition firing table, the firers use the tripod, unless the commander directs that they use the bipod.

## FIRERS

F-53. Both the gunner and assistant gunner fire the limited visibility transition table.

## THERMAL / NIGHT VISION DEVICE ZEROING PROCEDURES

F-54. Use the appropriate TM for installing and zeroing your device.

## QUALIFICATION STANDARDS

F-55. Qualification with the M240B machine gun requires the achievement of minimum standards for 10-meter and transition day firing tables (see appendix D). For ammunition allocation refer to DA PAM 350-38.

## FIRING TABLE I

F-56. Allow one point for each round that impacts within the scoring space, up to a maximum of seven points for each space. The firer must score between 63 and 91 points to qualify.

**FIRING TABLE II**

F-57. 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**

F-58. 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**

F-59. The firer must earn a total (combined) score (all firing tables added together) for each weapon as follows, and as shown in table F-4: The ammunition requirements for all firing tables are shown in table F-5.

**Table F-4. Machine gunner ratings**

<b>QUALIFICATION</b>	<b>POINTS</b>
EXPERT	186-212
GUNNER 1 <sup>ST</sup> CLASS	157 to 185
GUNNER 2 <sup>ND</sup> CLASS	139 to 156
UNQUALIFIED	0 to 126

**Table F-5. Ammunition requirements, all weapons, machine gun role**

<b>FIRING TABLE</b>	<b>ROUNDS (ALL WEAPONS)</b>	
	<b>QTY</b>	<b>TYPE</b>
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

**SCORECARD**

F-60. The trainer uses DA Form 85-R 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 U.S. Army e-forms website, <https://www.apd.army.mil>. Table F-5 shows ammunition requirements by table. DA Pam 350-38 provides STRAC ammunition requirements. Figure F-3 on page F-14 shows an example completed DA Form 85-R. Complete this form as follows (Blocks 1 through 4, 11, and 14 through 17 are self-explanatory):

- 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.
- 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.
- 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.
- Block 8--Table I Points. Enter the sum of the points earned in Tasks 5 and 6.
- Block 9--Table II Points. Enter total qualifying hits multiplied by 10.
- Block 10--Table III Points. Enter total qualifying hits (no multiplication factor).
- Block 12. Enter the total from each table, and then add them to obtain TOTAL POINTS.
- Block 13. Using the TOTAL POINTS in Block 12, determine the firer's RATING.

SCORECARD FOR M249 AND M240 MACHINE GUNS																														
For use of this form, see TC 3-22.249 or TC 3-22.240; the proponent agency is TRADOC.																														
1. ID CODE*				2. UNIT		3. LANE		4. DATE (YYYYMMDD)																						
Troop, Gene I.				A CO 3/81		3		20170314																						
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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	10	N/A	N/A	N/A	N/A	N/A													
3	10	N/A	N/A	3	500	15 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	3	500	N/A	N/A	N/A	N/A	N/A													
4	10	N/A	N/A	4	600	20 SEC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	4	200	10 SEC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>													
5	10	45 SEC	56	5	800	30 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5	400	15 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>													
6	10	30 SEC	35	6	400	30 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	6	100	10 SEC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>													
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11. REMARKS				8	800	45 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	8	200	25 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>													
				8	500	45 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	9	100	25 SEC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>													
				8	600	45 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10	300	25 SEC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>													
				9. TABLE II POINTS (TOTAL HITS X 10):	80							10	100	30 SEC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>													
				* 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):																										
				9																										
12. RATING CALCULATOR				13. RATING SCALE																										
<table border="1" style="width: 100%;"> <tr> <td>91</td> <td>TABLE I POINTS (BLOCK 8)</td> </tr> <tr> <td>80</td> <td>TABLE II POINTS (BLOCK 9)</td> </tr> <tr> <td>9</td> <td>TABLE III POINTS (BLOCK 10)</td> </tr> <tr> <td>180</td> <td>TOTAL POINTS</td> </tr> </table>				91	TABLE I POINTS (BLOCK 8)	80	TABLE II POINTS (BLOCK 9)	9	TABLE III POINTS (BLOCK 10)	180	TOTAL POINTS	<table border="1" style="width: 100%;"> <tr> <th>TOTAL POINTS</th> <th>RATING</th> </tr> <tr> <td>186 - 212:</td> <td>EXPERT <input type="checkbox"/></td> </tr> <tr> <td>157 - 185:</td> <td>FIRST CLASS <input checked="" type="checkbox"/></td> </tr> <tr> <td>139 - 156:</td> <td>SECOND CLASS <input type="checkbox"/></td> </tr> <tr> <td>BELOW 139:</td> <td>UNQUALIFIED <input type="checkbox"/></td> </tr> </table>									TOTAL POINTS	RATING	186 - 212:	EXPERT <input type="checkbox"/>	157 - 185:	FIRST CLASS <input checked="" type="checkbox"/>	139 - 156:	SECOND CLASS <input type="checkbox"/>	BELOW 139:	UNQUALIFIED <input type="checkbox"/>
91	TABLE I POINTS (BLOCK 8)																													
80	TABLE II POINTS (BLOCK 9)																													
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139 - 156:	SECOND CLASS <input type="checkbox"/>																													
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IAS				20170314				GIT				20170314																		

DA FORM 85, MAR 2017      PREVIOUS EDITIONS ARE OBSOLETE.      APD LC v1.00

Figure F-3. Example completed DA Form 85-R

# Glossary

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. Terms for which TC 3-22.XX is the proponent are marked with an asterisk. The proponent manual for other terms is listed in parentheses after the definition.

## SECTION I – ACRONYMS AND ABBREVIATIONS

<b>ATPIAL</b>	advanced target pointer illuminator aiming light
<b>CoVM</b>	center of visible mass
<b>DBAL-A2</b>	dual beam aiming laser-advanced2
<b>FOV</b>	field of view
<b>I2</b>	image intensifier
<b>IR</b>	infrared
<b>LCD</b>	liquid crystal display
<b>LOS</b>	line of sight
<b>METT-TC</b>	mission, enemy, terrain and weather, troops and support-time available, and civil considerations
<b>MOA</b>	minute of angle
<b>NATO</b>	North Atlantic Treaty Organization
<b>NSN</b>	national stock number
<b>SOP</b>	standard operating procedure
<b>TC</b>	training circular
<b>TM</b>	technical manual
<b>TWS</b>	thermal weapon sight

## SECTION II – TERMS