

**UNITED STATES MARINE CORPS**  
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Training Command  
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MM1309  
18 Mar 04

**STUDENT OUTLINE**

**BORESIGHT A M224 60MM MORTAR**

**LEARNING OBJECTIVES**

a. **TERMINAL LEARNING OBJECTIVE.** Given a mounted, SL3 complete M224 60mm Mortar and an M115 boresight, boresight an M224 60mm mortar using the sight box method by achieving a zero mil tolerance for deflection and elevation within 5 minutes. (41TR.01.02)

b. **ENABLING LEARNING OBJECTIVES**

(1) Given a list of choices, identify the characteristics of an M115 boresight in accordance with TM 08206A-10/1A. (41TR.01.02a)

(2) Given a list of choices and a diagram of an M115 boresight, identify the nomenclature of an M115 boresight in accordance with TM 08206A-10/1A. (41TR.01.02b)

(3) Given a mounted, SL-3 complete M224 60mm mortar and an M115 boresight mount the boresight to an M224 60mm mortar in accordance with TM 08206A-10/1A. (41TR.01.02c)

1. **BORESIGHT M115**

a. **The M115 Boresight.** The M115 Boresight detects deflection and elevation errors in the sight. The boresight has three plungers that keep it in place when mounted in the muzzle of the barrel. The telescope has the same field of view and magnification as the M64A1 sight unit. The elevation bubble levels only at 0800 mils.

b. **Second Cross-level Bubble.** A second cross-level bubble is used as a self check of the M115. After leveling and cross leveling, the M115 can be rotated 180 degrees in the muzzle until the second cross-level bubble is centered. The image of the boresight target should not vary in deflection. A large deviation indicates misalignment between the cross-level bubble and lenses.

c. The components of the M115 boresight are:

(1) The body.

(a) The boresight has three plungers that hold it in place when mounted over the muzzle of the barrel.

(2) The telescope.

(3) Leveling bubbles. (Two for cross leveling and one for elevation).

d. Tabulated Data. The tabulated data of the M115 boresight are as follows:

- (1) Weight: 5 ounces
- (2) Field of view: 17 degrees
- (3) Magnification: 1.5 power

## 2. PREPARING THE M224 60MM MORTAR FOR BORESIGHTING

a. Mount the mortar with the collar assembly in the upper saddle. This will allow you to attain the necessary elevation.

b. Assure that you have a clear line of sight of at least ten meters. Place the M64A1 sight unit into position in the sight unit dovetail slot.

c. Referring the M64A1, place a deflection of 3200 mils and an elevation of 0800 mils on the scales.

(1) A deflection of 3200 should bring the sight and the barrel parallel to one another.

(2) An elevation of 0800 should place a 45 degrees angle on the barrel. This is the same elevation that is calibrated for the boresight elevation bubble.

d. Install the boresight on the mortar barrel by centering the boresight over the muzzle. Press down until the plungers are locked over the reinforced lip of the barrel. Do not apply excessive force to the boresight when attempting to place it over the muzzle.

3. BORESIGHTING PROCEDURES/SIGHT BOX/DISTANT AIMING POINT METHOD. The sight box method is the most preferred method for boresighting the M224 60mm Mortar.

a. Level the cross-level and elevation bubbles on the M64A1 sight.

(1) Rough level by manipulating the left leg assembly and watching the cross level bubble on the sight.

(2) Level the elevation bubble on the sight by turning the elevation hand crank and watching the elevation bubble on the sight.

(3) Level the cross level bubble by turning the cross leveling nut (minor adjust).

(4) Check both bubbles on the sight for level before proceeding. If they aren't level, level them.

b. Center the cross level vial by rotating the boresight slightly around the outside diameter of the mortar barrel. Slight movements are made by lightly tapping the boresight body.

(1) Look down at the cross level bubble on the sight if it is knocked out of level, relevel it before leveling the cross level on the boresight.

c. Elevate the mortar by turning the elevation hand crank while looking at the elevation bubble on the boresight. When the boresight elevation level vial is centered the mortar is set at 0800 mils (45 degrees) elevation.

d. Using the elevation control knob, elevate or lower the sight unit until the elevation bubble is centered.

(1) If necessary, cross level the sight unit. The cross level on the boresight should level with the sight unit cross-level.

(2) All bubbles should be level.

e. The reading on the coarse elevation scale of the sight unit should be 08 mils and the reading on the elevation fine scale should be 0. If adjustment is necessary, proceed as indicated below.

(1) Turn the elevation-locking knob to lock the elevation down. Loosen the two screws that secure the course elevation scale and slip the scale until the 0800-mil mark on the scale coincides with the reference mark on the housing. Tighten the two screws to secure the scales. (The armory may require this procedure to be done by them.)

(2) Loosen the two screws on the elevation control knob and slip the elevation fine scale until the 0 mark on the fine scale coincides with the reference mark on the housing. Tighten the two screws to secure the fine scale.

f. Check all level vials. Level them if necessary.

g. Check again to ensure that the sight setting reads 3200 deflection.

h. Call the ammo man up to place the sight box 10 meters forward of the gun. The black circle on the sight box will be facing the gun.

i. Look into the boresight and use hand and arm signals to direct the ammo man.

(1) The ammo man will respond to the hand and arm signals by adjusting the sight box left or right until the right edge of the circle is aligned to the sighting line in the boresight. The line in the boresight appears as an opaque white line. This line is commonly referred to as a "ghost line". The boresight sighting line will touch the right edge of the aiming point (the black circle) as illustrated in figure 1.

(2) Call the ammo man back in by reeling your hands in front of your chest.

j. Refer your vertical crosshair on your M64A1 sight to the left edge of the circle. The vertical hairline of the M64A1 sight will touch the left edge of the aiming point as illustrated in figure 2.

k. The course deflection index arrow should align to the "32" on the course deflection scale. If it does not align, the course deflection scale will be slipped.

(1) Lock the deflection down by turning the deflection-locking knob.

(2) Press down on the course deflection scale.

(3) Rotate the course deflection scale left or right until the "32" line is aligned to the course deflection index arrow.

l. Loosen the two screws on the deflection control knob. Slip the deflection fine scale to read "0" zero.

m. Press the scalloped rim of the deflection control knob towards the sight body.

n. While holding the scalloped rim back, index the "0" on the deflection fine scale.

o. Align the boresight index line to the boresight index arrow.

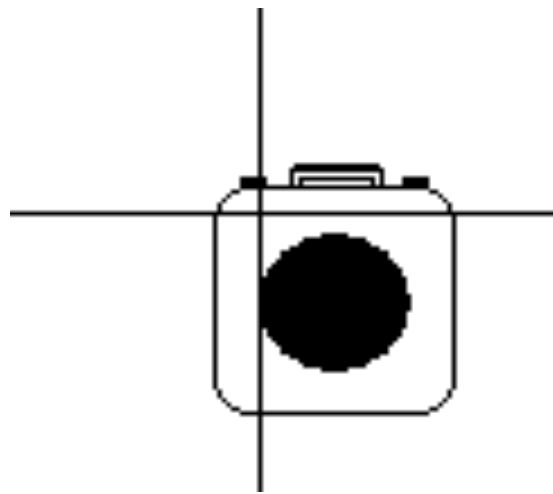
p. Release the scalloped rim of the deflection control knob.

q. Check the sight picture to assure that it is still on the left edge of the circle. If it is correct, tighten the screws on the deflection control knob.

r. If the sight picture is off slightly, look through the boresight and send the ammo man back out to move the box again. An alternative way is to look through the boresight and just traverse back over to the right edge of the circle. Check all bubbles before calling your boresight complete.



**FIGURE 1**



**FIGURE 2**

**REFERENCES.** TM 08206-10/1A Operator's Manual for Lightweight Company Mortar, 60mm M224 pages 0005 00-9 through 0005 00-18 and FM 23-90 Mortars pages 2-26 thru 2-27.

**EXAM TITLE:** Boresight a M224 60mm Mortar Performance Examination

**EXAM ID:** MM1309P

**TLO/ELO:** 41TR.01.02

**STUDENT INSTRUCTIONS:**

1. You are an infantry mortarman and must boresight a M224 60mm mortar using the sight box method.
2. You have 5 minutes to mount the boresight and boresight the mortar.
3. To achieve mastery, you must perform each of the performance steps correctly.

**PERFORMANCE STEPS AND/OR PERFORMANCE STANDARDS:**

Performance Steps	Master	Non-Master	Remarks
1. Mount the M115 boresight to the mortar.			
2. Ensure the sight data reads 3200 for the deflection scale and 0800 for the elevation scale.			
3. Level both bubbles on the M64A1 sight.			
4. Cross-level the boresight.			
5. Level the elevation on the boresight.			
6. Level the M64A1 sight for elevation by turning the elevation control knob.			
7. Loosen the screws on the elevation control knob and slip the scale to zero mils.			
8. Move the sight box 10 meters forward and left or right as required.			
9. Ensure the boresight sighting line is on the right side of the circle.			
10. Refer the vertical hairline of the M64A1 sight to the left side of the circle.			
11. Slip the deflection fine scale to zero mils.			
12. Loosen the screws on the deflection fine scale and align the boresight index line to the boresight index arrow.			
13. Tighten the screws on the deflection control knob.			
14. Ensure the 3200 on the deflection course scale is aligned to the course deflection index arrow.			