Reference
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108.3
A1
FM 6-79
Reference

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FM 6-79

DEPARTMENT OF THE ARMY FIELD MANUAL

RESCINDED Per DA Circular
310-15
30 May 1979

105-MM HOWITZER M108 SELF-PROPELLED

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1963

AGO 7305C

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *7 August 1967*

105-MM HOWITZER, M108, SELF-PROPELLED

FM 6–79, 9 January 1963, is changed as follows:

Page 18, paragraph 19. Line 5, "(aiming posts)" is changed to read "(aiming posts or collimator)."

Page 19, paragraph 19. The following note is added immediately below the last line of text:

Note. See figure 7.1.

Page 19, figure 7.1 is added as follows:

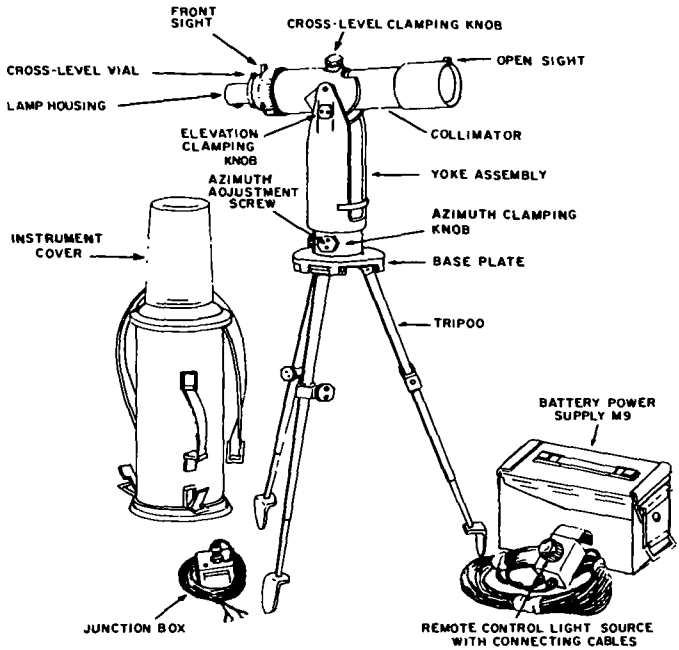

Figure 7.1. Infinity-aiming reference collimator and auxiliary equipment.

Page 23, paragraph 26. Line 3 "aiming posts" is changed to read "aiming posts or collimator."

Page 25. Paragraph 26*d* is added as follows:

d. The infinity-aiming reference collimator is an optical instrument which simulates an azimuth reference target at infinity. When used as the primary aiming point it is alined with the vertical reticle of the panoramic telescope as directed by the gunner.

(1) The collimator is emplaced in any convenient position, from 4 to 17 meters from the left side of the weapon. Best results are obtained from 5 to 12 meters.

(2) While the howitzer is being laid, number 1 alines the optical system of the collimator on the center of the telescope rotating head and cross-levels the reticle pattern.

(3) After the howitzer is laid the gunner directs number 1 in alining the 0 line of the collimator reticle with the vertical reticle of the panoramic telescope.

(4) To lay for direction during firing, the gunner sets the announced deflection on the panoramic telescope and alines any number on the panoramic telescope reticle with the same number on the collimator reticle. This procedure for laying compensates for weapon displacement. See figure 8.1.

Note. For positive location, an area at least 7 mils in diameter must be seen at all times on the collimator reticle.

Page 25, Figure 8.1 is added as follows:

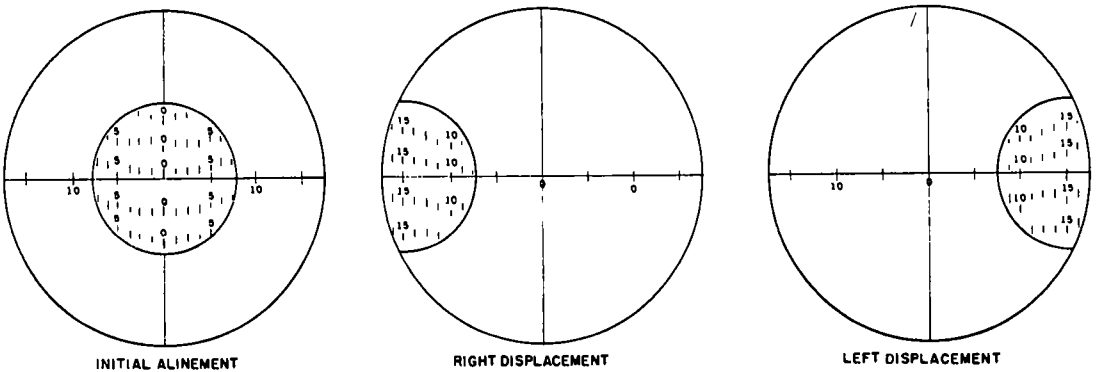

Figure 8.1. Gunners sight picture of collimator when correcting for displacement.

Page 71. Paragraph 83*b*(5) is superseded as follows:

(5) Aiming posts or the collimator will be set out at deflection as determined by unit SOP. Aiming posts will be placed so that the near aiming post is located halfway between the far aiming post and the sight. Usually the far aiming post will be placed approximately 100 meters from sight. The collimator will be emplaced from 4 to 17 meters with best results between 5 to 12 meters.

Page 72, paragraph 83*c*, test No. 1 and 10. Line 7 in Action of Candidate column, is changed to read "aiming posts or alined on the collimator."

Page 72, paragraph 83*c*, test No. 2 and 11. Line 4 is changed to read "Lays on aiming posts or collimator."

Page 74, paragraph 83*d*(3). Line 3, "aiming post" is changed to read "aiming post or appropriate number on the collimator reticle."

Page 77, paragraph 86*b*(4). Line 2 "aiming post" is changed to read "aiming post or collimator."

Page 77, paragraph 86*c*(1). Item 1, line 5, is changed to read "reticle of the telescope or takes up the proper sight picture with the collimator."

Page 78, paragraph 86*c*(2). Examiner Commands column, Line 1, "POSTS" is changed to read "POINT."

Page 78, paragraph 86*d*(1)(*a*). Line 4 is

changed to read "scope, or the collimator, reticle and the panoramic reticle are not properly alined."

Page 78. Paragraph 86*d*(2)(*b*), is superseded as follows:

(*b*) Aiming posts or collimator are not properly alined.

Page 81, paragraph 89*b*(1). Line 2 is changed to read "posts or collimator."

Page 81, paragraph 89*b*(2). Line 2, "aiming posts" is changed to read "aiming posts or collimator."

Located in back of manual: Table III, chief of section column:

Sequence 3, column 3, lines 4 and 6 "CHARGE 8" is changed to read "CHARGE 7."

Sequence 5, lines 9 and 10, "and shell HE M482, Charge 8," is deleted.

Table III.1 is added (located in back of this change).

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12–11 requirements for 105 MM Howitzer, M108, Self-Propelled.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1967—305–584/6166C

Table III.1 Direct Fire Tables, 105-mm Howitzer, M108

SHELL HEP-T					SHELL, HE, Charge 7		
Range meters	Elevation mils	Vertical displacement feet	Trajectory characteristics	Firing data	Range meters	Elevation mils	Vertical displacement feet
100	1	.0	Within these range limits the trajectory is flat enough to prevent an 8-foot tank from passing beneath it. Range shifts of 100 meters will usually be sufficient to bring the rounds on target. Fields of fire and terrain, allowing the upper range limits, are ideal at which to engage the target. This allows maximum time for firing.	1. Start firing at estimated range or 400 meters, whichever is greater. 2. Make 100-meter range changes until a target hit is obtained.	100	2	.0
200	3	.5			200	4	.5
300	4	1.0			300	6	1.5
400	6	1.5			400	8	2.0
500	8	2.0			500	11	3.0
600	9	3.0			600	13	3.5
700	11	3.5	Within these range limits, it is necessary to establish a bracket. This is necessary due to the relatively flat trajectory and the difficulty in estimating the exact range change necessary to place the round on target. Range changes of 200 meters should be made until a bracket is obtained. The bracket then should be split until a target hit is obtained.	1. Start firing at estimated range. 2. Adjustment by bracket (overs and shorts) is necessary. 3. Make 200-meter range changes until a bracket is obtained. 4. Split the bracket until a target hit is obtained.	700	15	4.5
800	13	4.0			800	18	5.5
900	15	5.0			900	20	6.0
1000	17	6.0			1000	22	7.0
1100	19	7.0			1100	25	8.0
1200	21	8.0			1200	27	9.0
1300	24	9.0			1300	30	10.0
1400	26	10.0			1400	33	11.0
1500	28	11.5	At these ranges a target hit is only reasonably possible. Again, a bracket must be established. Range changes of 400 meters should be made until the bracket is obtained. Fire should be opened only if surprise is not important. Beyond 2200 meters direct laying on a moving target is not advisable. The increasing angle of fall of the projectile, the difficulty in estimating ranges and the size of the target in the sight combine to make target hits difficult and unlikely.	1. Start firing at estimated range. 2. Adjustment by bracket (overs and shorts) is necessary. 3. Make 400-meter range changes until a bracket is obtained. 4. Split the bracket until a target hit is obtained.	1500	35	12.0
1600	31	12.5			1600	38	13.0
1700	34	14.0			1700	41	14.5
1800	37	15.5			1800	44	15.5
1900	40	17.0			1900	46	17.0
2000	43	18.5			2000	49	18.0
2100	46	20.0			2100	52	20.0
2200	49	22.0			2200	55	21.0

Ref

CHANGE No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *23 June 1965*

105-MM HOWITZER M108 SELF-PROPELLED

FM 6–79, 9 January 1963, is changed as follows:

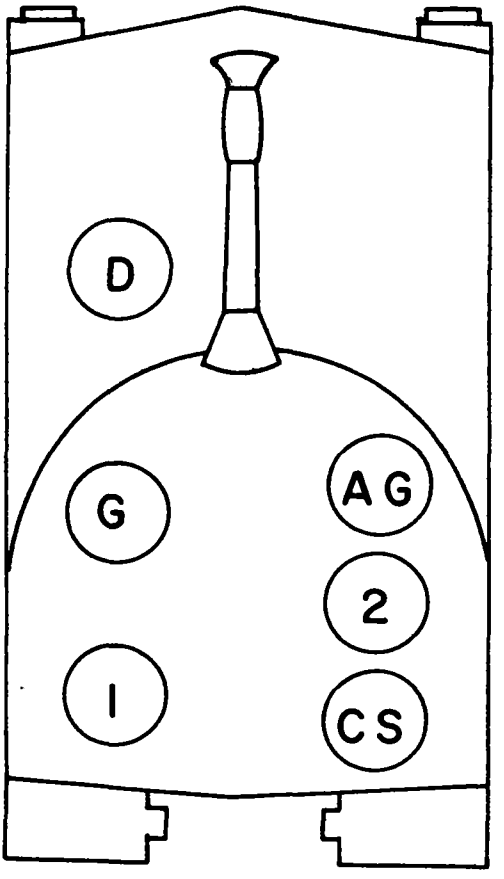

Figure 6. (Superseded) *Posts, mounted.*

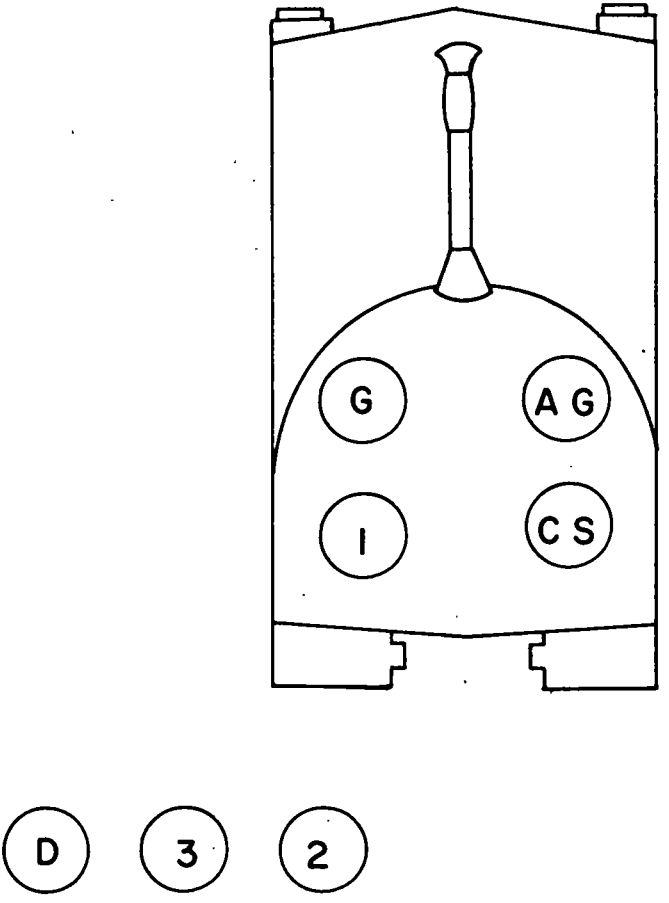

Figure 7. (Superseded) *Posts, prepared for action.*

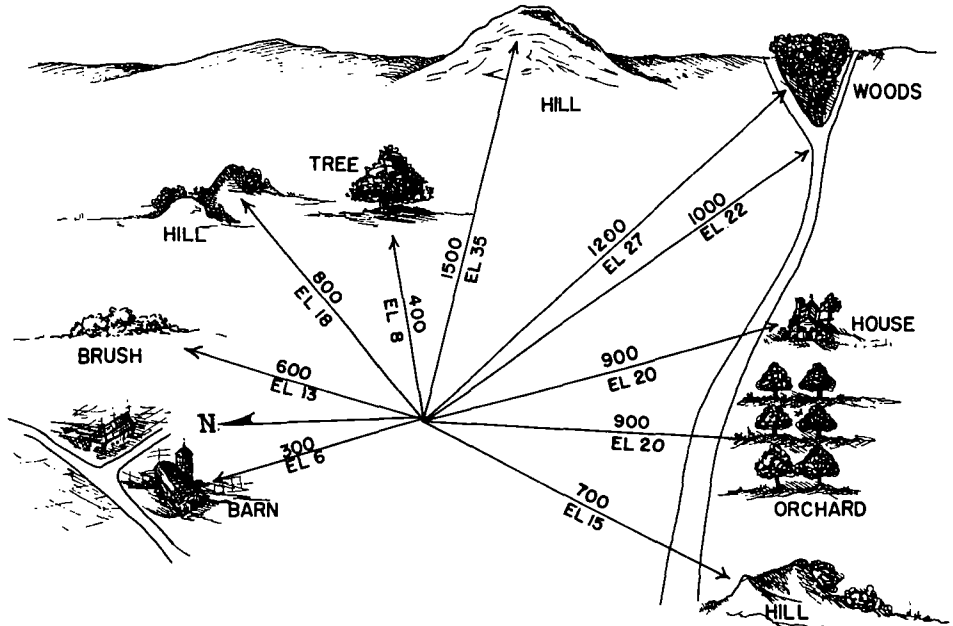

Figure 8. (Superseded) *Range card for direct laying.*

26. Aiming Points

After the howitzer * * * points) as required.

* * * * *

c. The aiming posts * * * by the gunner.

* * * * *

(5) (Superseded) Unit SOP will specify the deflection at which to place the aiming posts.

* * * * *

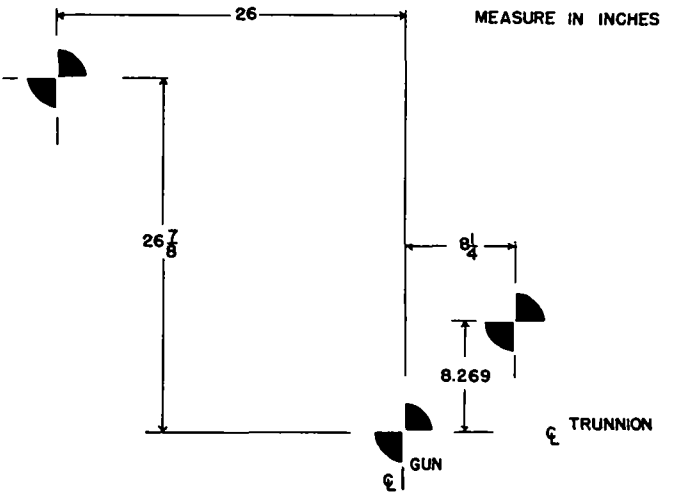

Figure 10.1. (Added) *Test target dimensions.*

45. Micrometer Test

The micrometer test is performed as follows:

* * * * *

d. (Superseded) Reseat the quadrant on the leveling plates; the bubbles should center.

Note. Do not disturb the lay of the tube.

* * * * *

67. Failure To Fire

(Superseded)

If the weapon fails to fire—

a. Keep the weapon trained on the target.

b. Clear unnecessary personnel from the vicinity of the howitzer.

c. Make two additional attempts to fire the weapon.

d. Wait two minutes after last attempt to fire.

e. The assistant gunner opens the breech and number 1 removes the cartridge case.

f. If the primer is dented a faulty primer is indicated and the cartridge case is replaced and the weapon is fired.

g. If the primer is not dented, a faulty firing mechanism is indicated.

***Caution:* The firing mechanism can be recocked without opening or unlocking the breech. Personnel stay clear of the path of recoil when recocking weapon.**

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSPER (2)	Ft Devens (2)
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LOGCOMD (1)	Units org under fol TOE:
Armies (5)	6–345 (5)
Corps (3)	6–347 (5)
Div (2)	6–465 (5)
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Ft Carson (2)	

NG: State AG (3); units—same as Active Army except allowance is one copy to each unit.

USAR: Units—same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320–50.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1965—773-451

FIELD MANUAL
No. 6–79

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *9 January 1963*

105–MM HOWITZER M108, SELF-PROPELLED

CHAPTER 1
GENERAL

1. Purpose and Scope

a. This manual is a guide to assist commanders and chiefs of sections in developing 105-mm howitzer M108, self-propelled sections into teams that will operate effectively in battle.

b. This manual prescribes the duties of the section personnel in—

(1) Section drill.
(2) Preparation for firing and traveling.
(3) Firing.
(4) Tests and adjustments.
(5) Maintenance and inspections.
(6) Decontamination of equipment.
(7) Destruction of equipment.

c. This manual is applicable to both nuclear and nonnuclear warfare without modification.

d. To improve this manual, users are encouraged to submit recommended changes and comments. The procedure is as follows:

(1) Key comments to the specific page, paragraph, and line.
(2) Include supporting reasons with each comment.

(3) Send direct to U.S. Army Artillery and Missile School, ATTN: AKPSIPL, Fort Sill, Okla.

2. Composition of the Howitzer Section

The personnel of the howitzer section are the—

a. Chief of Section (CS).

b. Gunner (G).

c. Assistant Gunner (AG).

d. Three cannoneers numbered 1 through 3.

e. Motor Carriage Driver (D).

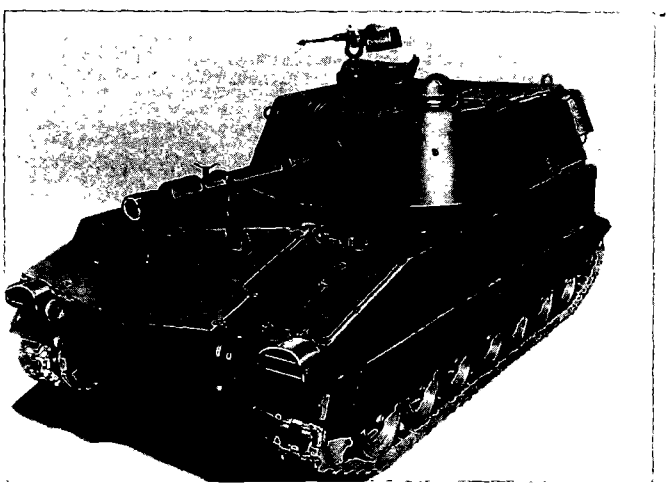


Figure 1. 105-mm howitzer M108, self-propelled.

3. Duties of the Chief of Section

The chief of section is the noncommissioned officer in command of the section. He is responsible for the—

a. Training and efficiency of personnel.

b. Performance of duties in drill, firing, tests and adjustments, inspection, and maintenance.

c. Observance of safety precautions.

d. Preparation of field fortifications.

e. Camouflage discipline; local security; and chemical, biological, and radiological security discipline.

f. Maintenance of Equipment Log Book (TM 38–750).

g. Police and improvement of the section area.

4. Equipment

a. Capabilities and limitations of the howitzer are shown in figure 2.

b. Section equipment is shown in figure 3.

5. References

Publications applicable to the 105–mm howitzer M108, self-propelled, are listed in the appendix.

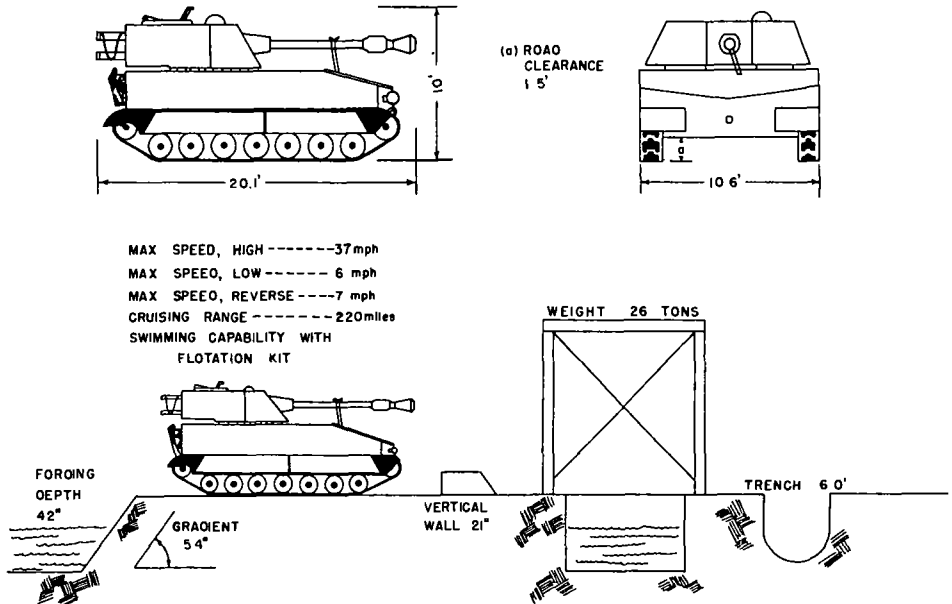


Figure 2. Performance characteristics.

Figure 3. Section equipment.

CHAPTER 2
SECTION DRILL

Section I. GENERAL

6. Purpose

This chapter prescribes the—

a. Objectives and instructions for section drill.

b. Commands and formations for section drill.

7. Objectives

The objective of section drill is the attainment of efficiency: precision coupled with high speed.

8. Instructions

Section drill will be—

a. Conducted in silence except for commands and reports.

b. Repeated until reactions are automatic, rapid and efficient.

c. Supervised so that mistakes are discovered, reported and corrected immediately.

d. Supervised by battery officers to insure uniformity and efficiency.

e. Conducted so that each member of the section can perform all duties within the section.

Section II. COMMANDS AND FORMATIONS

9. Forming the Section

To form the section, the chief of section takes his post and gives one of the following commands:

a. To form the section the command is FALL IN. The section—

(1) Moves at double time.

(2) Forms in single rank at close interval, with the gunner on the right, the assistant gunner, cannoneers in numerical order, and the driver at the left of the rank.

(3) Centers on the chief of section at a distance of 3 paces (fig. 4).

b. To form the section in a particular place, the commands may be 1. IN FRONT (REAR) OF YOUR PIECE, 2. FALL IN. The section—

(1) Moves and forms a single rank as in *a* above.

(2) Faces the direction of fire.

c. To form the section in a particular direction the commands may be 1. ON THE ROAD FACING THE PARK. 2. FALL IN. The section—

(1) Moves and forms a single rank as in *a* above.

(2) Faces the direction indicated in the command.

d. At the first formation for a drill or exercise, the caution "as a section" precedes the command.

10. To Call Off

With the section in formation the command is CALL OFF.

a. All personnel except the gunner execute eyes right.

b. The section calls off in sequence: "Gunner, Assistant gunner, 1, 2, 3, Driver."

c. As each man calls out, he turns his head smartly to the front.

11. To Take Posts

The command is 1. CANNONEERS, 2. POSTS.

a. The command is general and may be given in or out of ranks, at a halt, or marching.

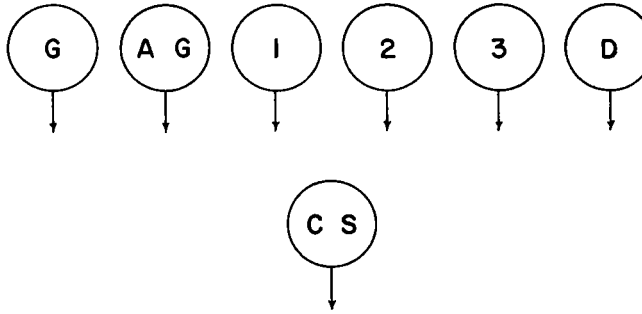


Figure 4. Section in formation.

b. All movements are executed at double time and are terminated at the position of attention.

c. The section moves to posts as shown in—

(1) Figure 5, dismounted.

(2) Figure 6, mounted.

(3) Figure 7, prepared for action.

12. To Change Posts

To train all members of the section in all duties, posts should be changed frequently. With the section in *formation,* the commands are—

a. 1. CHANGE POSTS, 2. MARCH

(1) Number 3 moves at double time to the post of the assistant gunner.

(2) The assistant gunner and numbers 1 and 2 take two left steps each cannoneer taking the position of the next higher numbered cannoneer.

b. 1. SECTION CHANGE POSTS, 2. MARCH.

(1) The left most man moves at double time to the post of gunner.

(2) All other men move as in *a* above.

13. To Mount

To mount, the following commands may be given:

a. 1. PREPARE TO MOUNT, 2. MOUNT.

(1) At the preparatory command, the section moves at double time to positions shown in figure 5.

(2) At the command of execution, personnel mount and take positions as shown in figure 6.

(3) If any member of the section is not to mount, he is designated and cautioned to stand fast. 1. PREPARE TO MOUNT, DRIVER STAND FAST, 2. MOUNT.

b. MOUNT. The section moves directly to the positions shown in figure 6.

Note. Transportation must be provided for cannoneers not mounted in the motor carriage.

14. To Dismount

To dismount the following commands may be given:

a. 1. PREPARE TO DISMOUNT, 2. DISMOUNT.

(1) At the preparatory command, compartment doors are opened, and personnel assume a crouched position in order to dismount rapidly.

(2) At the command of execution, personnel take positions as shown in figure 5.

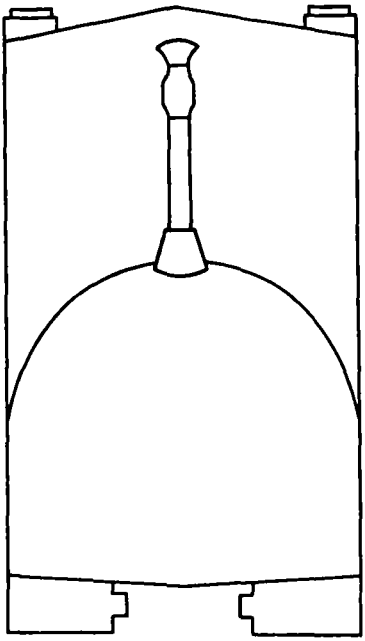
b. DISMOUNT. The section moves without delay to positions as shown in figure 5.

15. To Fall Out

The command FALL OUT is given to provide rest and relief during drill or firing.

a. During Drill—

(1) The command may be given at any time.



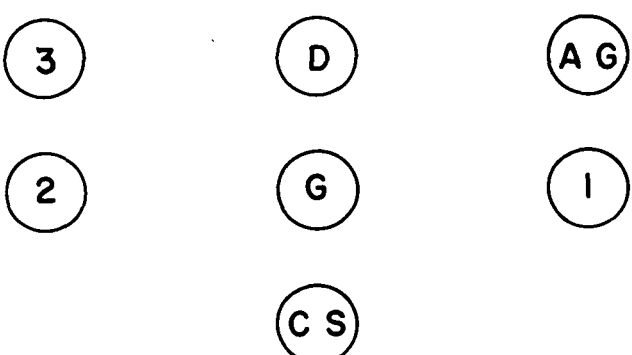


Figure 5. Posts, dismounted.

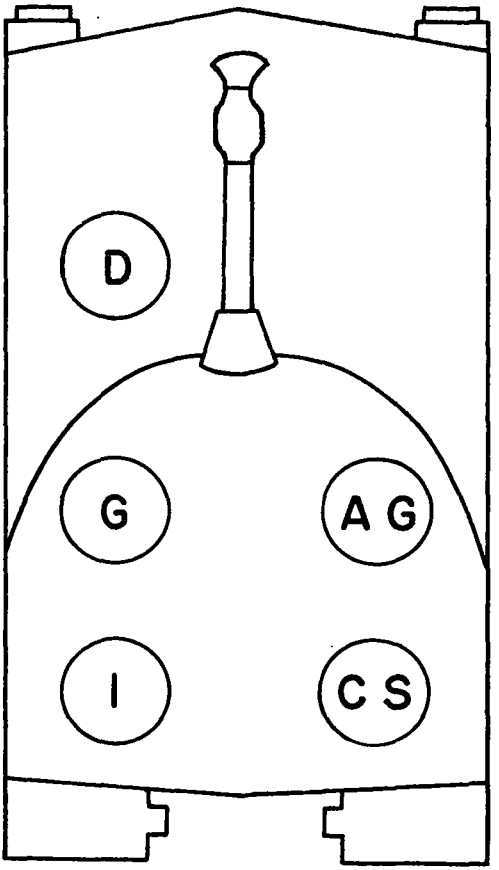


Figure 6. Posts, mounted.

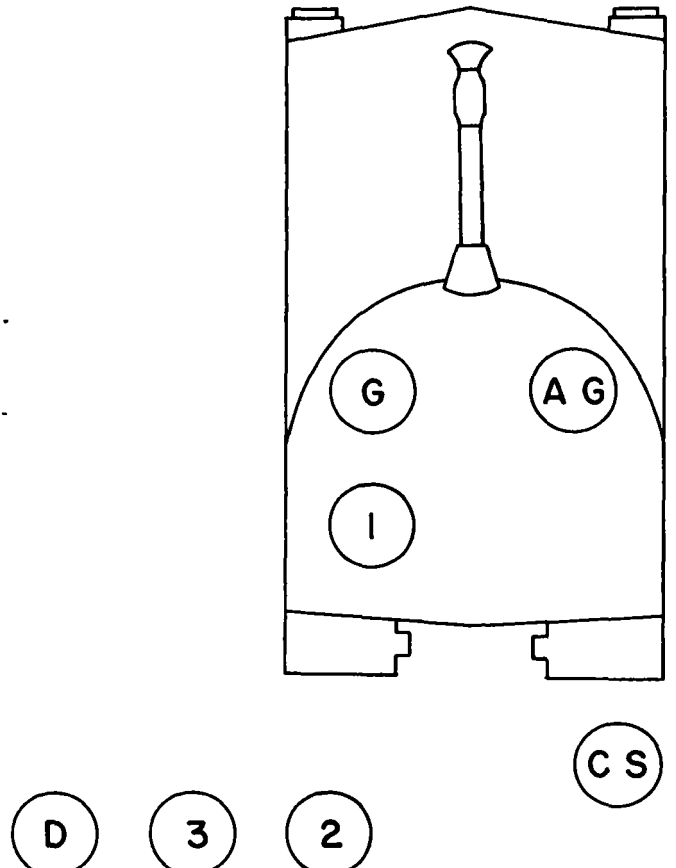


Figure 7. Posts, prepared for action.

(2) The section remains in vicinity of drill area.

b. When Firing—

(1) The command may be given when firing is temporarily suspended.

(2) The section remains in vicinity of, but clear of the piece.

(3) The settings and layings are not disturbed.

CHAPTER 3
DUTIES OF THE HOWITZER SECTION

Section I. PREPARATIONS FOR FIRING

16. Purpose

This chapter prescribes duties for—

a. Preparing the howitzer for firing (table I).

b. Firing by indirect laying (table II).

c. Firing by direct laying (table III).

d. Preparing the howitzer for traveling (table IV).

Note. Tables I, II, III, and IV are located in back of the manual.

17. At the Position

a. The howitzer is emplaced under direct supervision of the chief of section.

b. Preparation of the firing position prior to occupation is governed by time factors and unit SOP. The following preparation will, however, facilitate the occupation.

(1) Mark the position with a stake to indicate where the center of the carriage is to be placed.

(2) Place another stake at a distance of 50 to 100 meters, in the approximate direc-

tion of fire, at which the driver can point the tube.

c. Hand signals are used for guiding the driver.

18. To Prepare for Action

a. The command is PREPARE FOR ACTION.

(1) The command may be given with the howitzer in position or approaching the position.

(2) Duties of individuals are given in table I.

(3) Each man takes his post (fig. 7) when he has completed his duties.

b. Normally the howitzer is partially prepared for action before arriving at the firing position.

c. All duties are conducted at double time.

d. If the howitzer is not to be prepared for action at the firing position, a supplementary command DO NOT PREPARE FOR ACTION must be given.

Section II. FIRING

19. Firing by Indirect Laying

The vast majority of targets will be attacked by indirect laying. Indirect laying is a method of taking targets under fire by placing the line of sight of the panoramic telescope on an aiming point other than the target (aiming posts). To provide timely and accurate fire the section must be indoctrinated with a sense of urgency. Every

effort must be made to execute the timely and effective delivery of fire. A detailed list of duties is contained in table II.

20. Firing by Direct Laying

Some targets may be attacked by direct laying. This is a method of taking the target under fire by sighting directly on the target. Since such targets are usually capable of returning fire, the following factors must be emphasized.

a. Speed and accuracy in laying.

b. High standards of training.

c. Section operation as an independent unit.

21. Methods of Direct Laying

a. Sighting System. The two-man, two-sight system is the principal sighting system to be used with the weapon.

(1) The gunner establishes lead with the panoramic telescope.

(2) The assistant gunner establishes range with the direct fire telescope.

b. One-Man, One-Sight System. The one-man, one-sight system in which the gunner lays for both deflection and elevation may be used if required. However, the two-man, two-sight system provides faster laying, better accuracy, and a greater assurance of first round hits.

c. Laying Method. Central laying is used in conjunction with click sights.

(1) The gunner sets the lead on the azimuth counter.

(2) Traverses the tube until the vertical reticle is on the center of the target.

(3) Subsequent changes in lead are made in 5-mil increments by sound (clicks) and feel when turning the azimuth knob.

d. Tracking the Target. After lead and range are laid on the target, continuous tracking is maintained during the firing sequence.

e. Specific Duties in Firing. Specific duties in firing by direct laying are shown in table III.

22. Range Card

a. The chief of section is responsible for the defense of his assigned sector. He should also be prepared to deliver fire in all sectors (directions).

b. During reconnaissance of the position and shortly after occupation of position the chief of section will—

(1) Measure or estimate the ranges to prominent terrain features and likely avenues or approach.

(2) Establish reference points as required.

(3) Prepare a range card (fig. 8).

(4) As time permits replace estimated ranges with more accurate ranges obtained by pacing, taping, speedometer, maps or survey.

c. The executive officer will assign numbers to certain prominent terrain features to facilitate

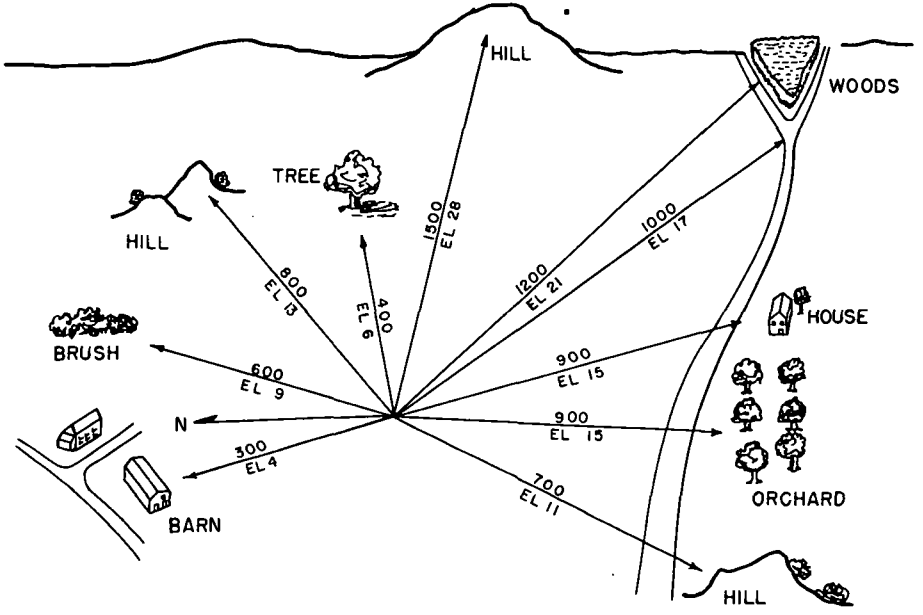


Figure 8. Range card for direct laying.

target location. For example, the executive commands, TARGET, TANKS, POINT NUMBER 2, FIRE AT WILL.

d. As time permits a deflection and a quadrant for each numbered point should be added to the range card to expedite and increase accuracy in firing.

e. The field of fire of the section should, if possible, be cleared of obstruction that might hinder fields of fire or observation. Care must be taken not to expose the location of the position.

23. Trajectory Characteristics

Trajectory characteristics for different ranges must be considered prior to taking a target under fire. Information covering the effective direct fire ranges of the weapon will be published when firing table information is available.

24. Preparations for Traveling

The command is MARCH ORDER.

a. Duties of individuals are given in table IV.

b. Each man takes his post (fig. 5) when he has completed his duties.

CHAPTER 4

TECHNIQUES AND SITUATIONS THAT REQUIRE SPECIAL ATTENTION

25. Precision in Laying

a. Fire control instruments, fuze setters, and elevation and traverse mechanisms must be operated to reduce the effects of lost motion.

b. The gunner and assistant gunner will verify the laying after the breech has been closed.

c. For uniformity and accuracy—

(1) The line of sight for setting and reading a scale or centering a bubble should be at a right angle to the scale or level vial to prevent parallax errors.

(2) The vertical reticle of the panoramic telescope is alined with the left edge of the aiming posts.

26. Aiming Points

After the howitzer has been laid for direction, it is referred to a primary aiming point, normally the aiming posts and alternate aiming points (distant aiming points) as required.

a. An aiming point must be a sharply defined point, or a clearly visible vertical line.

b. Alternate aiming points (distant aiming points) must be at least 2,000 meters distant.

This distance prevents displacement in firing or traverse from causing more than a ½ mil horizontal change in direction with the same settings on the scales.

c. The aiming posts are placed in alinement with the vertical reticle of the panoramic telescope as directed by the gunner.

(1) The *far* aiming post is placed at least 100 meters from the piece. This distance is the most desirable for accuracy, visibility, and control of the aiming post lights.

(2) The *near* aiming post must be set up halfway between the far post and the piece. Equal spacing is accomplished either by pacing, or by measuring with the panoramic telescope and using the aiming post as a stadia rod or by using a wire or cord with the appropriate distances marked in a convenient manner.

(3) If the aiming post is used as a stadia rod, the procedure is as follows:

(*a*) Number 1 stands at the far aiming post and holds the upper section of an aiming post parallel to the ground and perpendicular to the line of sight.

(*b*) The gunner measures the length of the aiming post in mils on the reticle of the panoramic telescope.

(*c*) The gunner directs number 1 to move toward the piece and to emplace the

near aiming post at a point where the upper section measures twice the number of mils it measured at the far aiming post.

(4) For night use, the light on the far aiming post should be placed so that it appears several feet above the light on the near aiming post. The lights placed in this manner establish a vertical line for laying the howitzer.

(5) Unit SOP will specify the deflection at which to place the aiming posts; however, placing the aiming posts at a deflection from 2,400 to 2,600 reduces misalinement and allows for maximum visibility.

(6) Correction for displacement of the aiming posts from the vertical reticle of the panoramic telescope is discussed in table II.

27. Changes in Data During Firing

If it is necessary to change any element of firing data, the executive commands CORRECTION.

a. Piece Unloaded. Set off new data and resume firing when the quadrant is announced.

b. Piece Loaded. Set off new data and resume firing when the quadrant is announced if no change is required in the fuze, time setting, or charge.

(1) If the data requires a change in the fuze, time setting, or charge, the chief of sec-

tion will suspend firing and report to the executive, "Number 2 loaded, charge ( ), fuze ( ), time ( )," stating the elements that are changed.

(2) In continuous fire, changes in data are applied without stopping the fire or breaking its continuity.

28. To Unload the Howitzer

a. Once a completed round is loaded, it should be fired. However, if unloading is required, the command is UNLOAD.

b. If the howitzer has been fired repeatedly and the tube is heated, it should be fired if possible; or if necessary, unload the weapon as quickly as possible.

c. Unloading will be supervised by an officer and the procedure is as follows:

(1) The assistant gunner opens the breech slowly.

(2) Number 1 standing at the breech, receives the ejected round.

d. If the extractor fails to eject the cartridge case, the procedure is as follows:

(1) Number 2 obtains the rammer staff and the unloading rammer head.

(2) The officer inspects the rammer head to insure that it is free from obstruction.

(3) Number 2 inserts the rammer into the bore until the head incloses the fuze and touches the projectile.

(4) Number 2 then pushes on the rammer, and taps the end of the staff lightly with a wooden block if necessary, until the round is dislodged.

(5) Number 1 receives the round as it is pushed out of the breech.

e. If the cartridge case is extracted but not the projectile, the procedure is as follows:

(1) Number 1 fills the chamber with waste and closes the breechblock.

(2) Number 2 dislodges the projectile as in *d* above.

(3) Number 1 opens the breech, removes the waste and receives the projectile as number 2 pushes the projectile to the rear.

29. Care of Ammunition

To insure uniform results in firing, to prolong the life of the tube, and to avoid accidents, great care must be exercised in handling and storing ammunition. The following requirements should be met.

a. Information contained in TM 9–1900 that are applicable to field service should be followed.

b. Protect the ammunition from damage.

(1) Leave in containers until just prior to firing.

(2) Use tarpaulins and dunnage to protect ammunition against weather, dirt, and sun.

(3) Raise ammunition stacked in the open 6 inches off the ground, and dig drainage ditches around the stacks.

(4) Allow six inches air space between the top of the stack and the covering tarpaulin.

Note. Uniform propellant temperatures must be maintained to provide accurate firing.

c. Explosive elements in fuzes are particularly sensitive to shock and high temperature. The precautions to be observed are as follows:

(1) Protect from weather, direct sunlight and rough handling.

(2) Remove protection and safety devices from fuzes just prior to their use.

(3) Do not attempt to disassemble a fuze.

d. Protection against hostile fire may be accomplished by—

(1) Dispersing ammunition in small stacks.

(2) Store ammunition in trenches and dugouts.

(3) Insure that each stack of ammunition does not contain more than 75 rounds, is not more than four layers high.

(4) Placing stacks of ammunition at least 10 meters apart.

e. Ammunition should be sorted into lot numbers as it is stored.

f. For further information on care of ammunition, see FM 6–40, TM 9–1300–203, TM 9–1900 and TM 9–2350–217–10.

30. Amphibious Operation

a. General. The howitzer can be equipped with a flotation device which will enable the vehicle to navigate rivers, lakes, and other water obstacles (fig. 9).

b. Equipment. The flotation device consists of the following:

(1) *Bags.* Four bag-retainer assemblies will be installed on each side of the vehicle, and one bag on the front of the vehicle.

(2) *Water barriers.* Barriers will be installed on each forward side and across the front of the vehicle to reduce water seepage to the power plant compartment.

(3) *Auxiliary equipment.* Auxiliary equipment includes the necessary valves, blowers, hoses, and fittings to inflate the bags.

c. Preparation. Approximately 5 minutes is required to prepare the howitzer for amphibious operation. A detailed list of duties is contained in table V (located in back of manual).

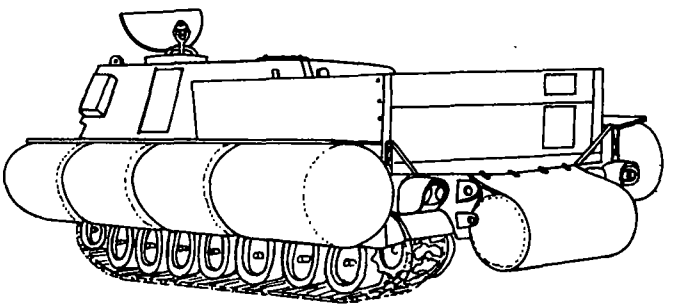


Figure 9. Howitzer prepared for amphibious operation.

CHAPTER 5

BORESIGHTING

Section I. GENERAL

31. Description

Boresighting is—

a. A process to *verify,* and *aline* if required, that the optical axis of the panoramic telescope and the direct fire telescope is parallel to the axis of the tube in deflection and elevation.

b. Conducted prior to firing and, when necessary, during lulls in firing.

c. Performed to insure accuracy in laying for elevation and direction.

32. Methods of Boresighting

a. The two methods of boresighting this howitzer are—

(1) Testing target method (pars. 35–37).

(2) Distant aiming point method (pars. 38–40).

b. The method of boresighting to be used will be determined by the unit SOP and the time available.

33. Equipment

The equipment that is needed for boresighting is described below.

a. Front and Rear Boresight.

(1) Front and rear boresights are used to aline the tube on the testing target or distant aiming point.

(2) If boresights are not available, crosshairs are fastened to the muzzle and the firing pin hole in the breech block is used as the rear sighting guide.

b. Testing Target. The testing target provides accurate aiming diagrams for the tube, panoramic telescope, and direct fire telescope in boresighting and testing. The testing target is prepared as follows:

(1) Mount the testing target on a flat piece of material and fasten it to a stand to provide stability (fig. 10).

(2) Install a plumbline and mil scale for use in leveling or canting the target (fig. 10).

(3) Draw vertical reference lines for use when the trunnions are not level. The testing target must be canted an equal amount and in the same direction (fig. 10).

(4) To facilitate boresighting in darkness, bore a $\frac{1}{16}$-inch hole through the center of each aiming diagram and cover each hole with a piece of heavy cloth. A

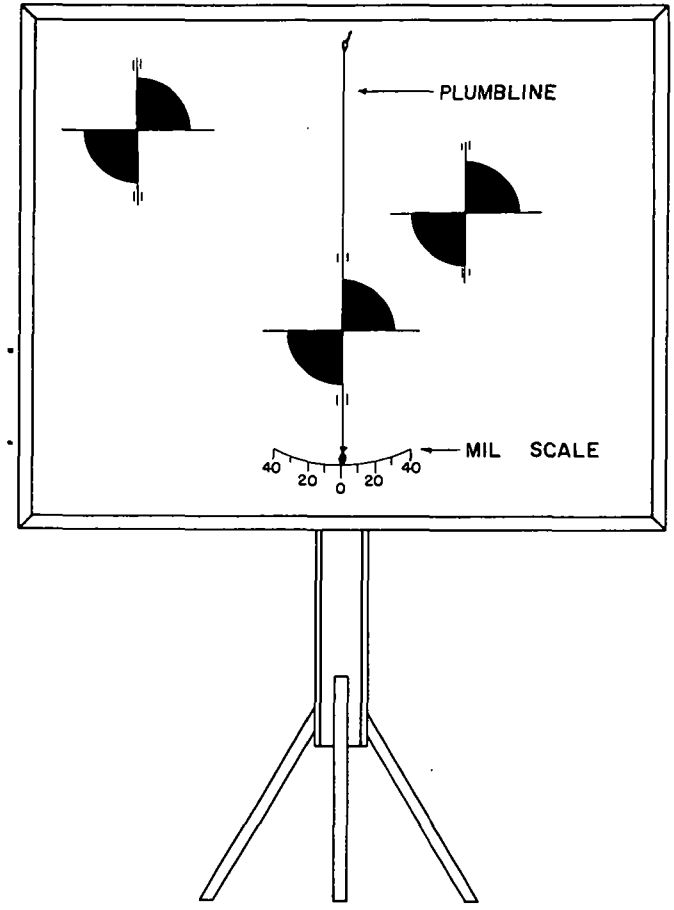


Figure 10. Testing target.

flashlight is held against the material to provide an aiming point for blackout conditions.

c. Tools. Section equipment includes all necessary tools for boresighting and testing.

Caution: **Use the proper tools to prevent damage to fire control equipment.**

d. Plumbline. The plumbline is used to level the trunnions for testing and to boresight the howitzer if time is not a factor. The plumbline is prepared as follows:

(1) Suspend the line from any convenient location so that the muzzle of the howitzer can be placed at a distance of approximately 5 feet from the line. For a more complete test insure that the line is long enough to allow for the highest possible tube elevation.

(2) Attach a weight to the end of the line for tautness and, to prevent the line from swinging, place the weight in a liquid-filled container.

34. Requirements for On-Carriage Fire Control Alinement

Correct alinement exists when—

a. The mounts and instruments are securely attached, and when no binding or excessive backlash exists in the gears.

b. The line of sight of the panoramic telescope is parallel to the axis of the bore throughout elevation limits.

c. The line of sight of the direct fire telescope is parallel to the axis of the bore.

d. The azimuth counter reads 3200.

e. The gunner's aid counter reads zero.

f. The elevation and azimuth slip scales on the direct fire telescope mount read 4.

g. All bubbles are centered.

Section II. TESTING TARGET METHOD

35. General

The testing target method consists of alining the line of sight of the tube, panoramic telescope, and the direct fire telescope with the aiming diagrams on the testing target.

36. Preparations for Boresighting

Preparations for boresighting are as follows:

a. Place the howitzer on level ground.

b. Place the tube in the center of traverse.

c. Install the front and rear boresights (par. 33*a*).

d. Level the trunnions by using a plumbline or a gunner's quadrant. The plumbline method is preferable, and the procedure is as follows:

(1) Install a plumbline (par. 33*d*).

(2) Traverse the cab until the plumbline is alined with the front and rear boresights.

(3) Elevate and depress the tube throughout its limits. The vertical hairline of the front boresight should remain in coincidence with the plumbline.

(4) If coincidence is not maintained, build up the low track or shift the howitzer slightly.

(5) Perform (3) and (4) above until coincidence is maintained throughout the elevation limits.

e. The gunner's quadrant normally will be used to level the trunnions under field conditions when time is critical. The procedure is as follows:

(1) Use gunner's quadrant that has been checked by the end-for-end test (par. 44).

(2) Set the index arm and the micrometer scale on the quadrant at zero.

(3) Place the quadrant on the breechblock on the leveling pads that are perpendicular to the long axis of the tube.

(4) Shift the howitzer slightly or build the low track until the bubble on the gunner's quadrant is centered.

f. Set the tube at zero elevation by using a gunner's quadrant and applying corrections, as determined from the end-for-end test.

g. Center the bubbles in the pitch-level vial and cross-level vial of the panoramic telescope mount.

37. Boresighting Procedures with Testing Target

With the weapon prepared as in paragraph 36, boresight as follows:

a. Testing Target Location. Locate testing target at least 50 meters in front of the howitzer.

b. Testing Target Alinement. Without moving the tube, aline the center aiming diagram of the testing target with the line of sight through the tube. The testing target must be placed perpendicular to the axis of the bore. *The testing target must then be made secure.*

c. Panoramic Telescope Alinement.

(1) Set the gunner's aid counters to zero.

(2) Adjust the azimuth and elevation knobs on the panoramic telescope to lay the reticle precisely on the left aiming diagram.

(3) Check that—

(*a*) The muzzle crosshairs are centered on the center aiming diagram.

(*b*) The telescope mount is level.

(4) The azimuth counter of the panoramic telescope should read 3200 mils. If the reading is not 3200 mils, turn the boresight adjustment shaft until 3200 appears in the counter window.

d. Direct Fire Telescope Alinement.

(1) Rotate the azimuth and elevation knobs on the direct fire telescope to lay the

reticle precisely on the right aiming diagram.

(2) Set the telescope mount slip scales to elevation 4, azimuth 4.

Note. Do not move the elevation or azimuth knobs when setting slip scales.

Section III. DISTANT AIMING POINT METHOD

38. General

The distant aiming point method consists of alining the line of sight of the tube, the panoramic telescope and the direct fire telescope on an aiming point at a distance of at least 2,000 meters.

39. Preparations for Boresighting

a. Select a well-defined point at a distance of not less than 2,000 meters.

b. Preparations prescribed for the testing target method (par. 35) apply except that accurate leveling of the trunnions is not required.

40. Boresighting Procedures with Distant Aiming Point

a. Lay the line of sight of the tube on the distant aiming point.

b. Lay the reticle of the panoramic telescope and the direct fire telescope on the distant aiming point with the same sight picture observed through the tube.

c. Adjust the telescopes as required (par. 37*c* and *d*).

CHAPTER 6
BASIC PERIODIC TESTS

Section I. GENERAL

41. Purpose

Basic periodic tests are performed—

a. To determine whether the on-carriage sighting equipment, the gunner's quadrant, and the fuze setter are in correct adjustment.

b. By the section and the artillery mechanic under the supervision of the battery executive.

c. At the discretion of the unit commander. Suggested times are—

(1) Once each year if howitzer is used for nonfiring training.
(2) Every 3 months if the howitzer is fired.
(3) As soon as possible after intensive use, accidents, or travel in extremely rough terrain.
(4) When fire is inaccurate for no apparent reason.

42. Preparations for Basic Periodic Tests

The following conditions must be established prior to conducting the tests:

a. Drive the motor carriage to a site that is as near level as possible.

b. Suspend a plumbline (par. 33*d*).

c. Level the trunnions by using the plumbline.

d. Boresight the howitzer by using the testing target.

Section II. TESTS OF GUNNER'S QUADRANT

43. General

The gunner's quadrant *must* be in proper adjustment to conduct the tests and adjustments on other sighting and fire control equipment.

44. End-for-End Test

The end-for-end test is conducted as follows:

a. Inspect the shoes on the gunner's quadrant for dirt, nicks, and burrs.

b. Inspect the quadrant seats on the breech for dirt, nicks, and burrs.

c. Zero the scales on the gunner's quadrant.

d. Place the quadrant on the quadrant seats. Depress and elevate the tube until the bubble in the gunner's quadrant is centered.

e. Reverse the quadrant on the seats and check the bubble. If the bubble recenters, the quadrant is in adjustment, and the test is complete.

f. If the bubble does not center, turn micrometer knob and try to center the bubble.

(1) If the bubble centers, read the black figures on the micrometer scale and divide

by 2. *This is the correction for the gunner's quadrant.*

(2) Place this correction on the micrometer scale, and level the tube.

(3) Reverse the quadrant. The bubble should center.

g. If the bubble does not center as in *f* above, move the gunner's quadrant arm down one graduation (10 mils).

(1) Turn the micrometer knob until the bubble centers.

(2) Take the reading on micrometer scale, add 10 to it and divide the sum by 2. Place the result on the micrometer scale.

(3) With the quadrant arm set at minus 10 and the above result on the micrometer scale, place the quadrant on the quadrant seats and level the tube.

(4) Reverse the quadrant. The bubble should center.

(5) Substract the reading on the micrometer scale from 10 to obtain the error.

Note. If an error is determined during the end-for-end test, it will be used only during the sighting tests and adjustments and will not be carried in fire missions. If the error exceeds 0.4 mil the quadrant must be sent to ordnance.

45. Micrometer Test

The micrometer test is performed as follows:

a. Set the radial arm to read 10 mils on the elevation scale, and set the micrometer at zero.

b. Place the quadrant on the leveling plates with the line-of-fire arrow pointing toward the muzzle, and center the quadrant bubble by elevating the tube.

c. Set the radial arm at zero, and set the micrometer at 10 mils.

d. Reverse the quadrant; the bubbles should center.

Note. Do not disturb the lay of the tube.

e. If the bubble does not center, the *micrometer.* is in error and must be adjusted by ordnance personnel.

46. Comparison Test

The comparison test is conducted in the following manner:

a. Compare the readings as follows:

(1) Take readings at low, medium, and high elevations.

(2) Use *each* gunner's quadrant in the battery.

(3) Use the leveling plates of a *single* piece.

b. Compute the average reading at each elevation.

c. Compare *each* quadrant reading with the average.

d. Any quadrant differing more than 0.4 mil from the average must be adjusted by ordnance personnel.

Section III. TESTS OF ON-CARRIAGE FIRE CONTROL EQUIPMENT

47. Panoramic Telescope Mount

For tests and adjustment of the panoramic telescope mount M145 and linkage, see TM 9–2350–217–10.

48. Elevation Quadrant

For the orientation check of the elevation quadrant M15, see TM 9–2350–217–10.

Section IV. TEST OF FUZE SETTERS

49. General

Examine the fuze setters as follows:

a. Check for burred or dented edges—

(1) The stop that fits into the slot of the movable time ring.

(2) The adjusting pawl which engages the notch in the fixed fuze ring.

b. Depress the adjustable pawl against its spring to determine that the movement of the pawl is freed.

c. Test the fuze setter with the fuze for which it was designed; the time scale on the fuze setter must have the same graduation as the time ring on the fuze.

50. Time Scale Test

The time scale test is performed to verify that the time set on the fuze agrees within prescribed

tolerences with the time setting on the fuze setter. This test may be conducted during firing or as a separate test.

Warning: **Never use a fuze from a dud.**

a. The time set on the fuze should agree with the time setting on the fuze setter within one-fourth of the smallest graduation on the fuze time ring. The tolerances are—

(1) 0.05 second for fuzes having 0.2 second graduation.

(2) 0.125 second for fuzes having 0.5 second graduations.

b. If a fuze setting does not agree with the time set on the fuze setter proceed as follows:

(1) Repeat the test as a check with a different setting.

(2) If the fuzes and the fuze setter still do not agree, refer the instrument to ordnance.

c. Do not set any one live fuze more than twice.

d. When tests are complete, reset all fuzes to SAFE and replace the safety wire or cotter pin.

CHAPTER 7
MAINTENANCE AND INSPECTIONS

51. General

Systematic maintenance and inspection are essential to insure that—

a. The howitzer section is prepared to carry out its mission immediately.

b. Unexpected breakdowns are not experienced at a critical time when maximum performance is essential.

c. Expensive and time-consuming repairs are reduced to a minimum.

52. Disassembly, Assembly, and Adjustment

Authorized adjustments and disassemblies to be performed by battery personnel are prescribed in TM 9–2350–217–10, and appropriate Department of the Army supply manuals. Deviation from these procedures is not authorized, except as permitted by the responsible ordnance officer.

53. Records

The principal records pertaining to the weapon are the Equipment Log Book, DA Form 2404, Equipment Inspection and Maintenance Worksheet, and DA Form 2407, Maintenance Request. For detailed information on the use of these forms, see TM 38–750.

54. Maintenance

Detailed instructions for maintaining the howitzer and the carriage are contained in TM 9–2350–217–10.

55. Inspection

a. The chief of section should inspect his equipment *daily* and take immediate action to correct any deficiencies found.

b. The executive, accompanied by the artillery mechanic, should make a *daily informal command inspection* on *different* parts of the weapon and carriage.

c. The executive should make a thorough mechanical inspection *at least* once a month of the weapons, auxiliary equipment, tools, and spare parts.

d. Detailed instructions for inspecting the howitzer and the carriage are contained in TM 9–2350–217–10.

56. Operational Services

A daily service is performed by the driver and the crew *each day* the vehicle is *operated.* This service is divided into three parts.

a. Before-operation service is a brief service to determine if the vehicle is ready for operation. At this time the chief of section verifies that sufficient ammunition, rations, tools, and equipment are available and secured. A detailed list of duties is contained in table VI (located in back of manual).

b. During-operation service consists of detecting any unsatisfactory performance of the vehicle. A detailed list of duties is contained in table VII (located in back of manual).

c. After-operation service prepares the vehicle to operate again on a moment's notice. This is the basic daily service for the vehicle, and it is particularly important to detect deficiencies that developed during operation. All defects that the driver and crew cannot remedy must be reported at this time. The chief of section will resupply, as required, ammunition and rations and verify that all equipment is present. Procedures for daily preventive-maintenance services are contained in TM 9–2350–217–10. A detailed list of duties is contained in table VIII (located in back of manual).

CHAPTER 8
DECONTAMINATION OF EQUIPMENT

57. General

a. Equipment that has been contaminated with the following agents constitutes a hazard to personnel and must be removed or neutralized:

(1) Chemical.

(2) Biological.

(3) Radiological.

b. Decontamination is the process of covering, removing, destroying, or changing the contaminating agent or agents into harmless substances.

c. Decontamination must be started as soon as possible in order to reduce hazards, and allow safe operation of equipment.

58. Decontamniation of Toxic Chemical Agents

Table IX prescribes the methods for decontaminating for toxic chemical agents.

Table IX. Decontamination for Toxic Chemical Agents

Contaminated Object	Preferred decontamination methods	Alternate decontamination methods	Field expedient methods
Canvas	Boil in soapy water for 1 hour. Use 5 percent solution of household bleach for V-agents. Use 5 percent solution washing soda for G-agents.	Immerse in boiling water for 1 hour. Launder by standard methods. Use DANC[1] solution or DS2[1]. Use slurry.[2]	Aerate (except for V-agents).
Clothing	Immerse in boiling water for 1 hour, stir, add 1 pound of soap to each 10 gallons of water. Use 5 percent solution of bleach for V-agents. Use 5 percent solution of washing soda for G-agents.	Launder by standard methods. Dry clean. Use DS2 for cotton items only.	Rub M5 ointment on small contaminated areas. Aerate (except for V-agents.)
Unpainted Metals.	Use DS2 or DANC, then rinse or wipe with organic solvent,[3] and dry.	Wash with *cool* soapy water[3] and rinse.	Aerate.

Table IX. Decontamination for Toxic Chemical Agents—Continued

Contaminated Object	Preferred decontamination methods	Alternate decontamination methods	Field expedient methods
Painted Metals.	Spray with DS2 or DANC solution.	Wash with hot soapy water and rinse (Slurry may be used if it is removed within 1 hour and the surface is oiled.)	Aerate.
Instruments___	Clean with alcohol (or gasoline) and apply a thin coat oil.	Wipe with rag dampened with DANC or DS2, dry with clean rag, and oil.	Weather.

1 These decontaminants are injurious to plastic and hard rubber and should not be used in the bore.

2 Equal weights of water and chloride of lime.

3 Organic solvents (petroleum products) and water do not neutralize contaminants. Precautions must be taken to dispose of these solvents as contaminated materiel.

59. Decontamination of Biological Agents

Decontaminants and decontamination procedures for toxic chemical agents are usually effective against biological agents.

60. Decontamination of Radiological Agents

a. Radioactive contaminants cannot be made safe by chemical action. They must be removed or shielded if it is impracticable to wait for natural decay.

b. Decontamination is the process of *reducing* the hazard by removing the contaminant or shielding against radiation. Methods are given in table X.

Table X. Decontamination for Radiological Agents.

Method	Contaminated object	Technique	Remarks
Wash and scrub with water.	All nonporous surfaces (metal, paint, plastics).	Work from top to bottom and up wind.	Drainage must be controlled—water is contaminated.
Detergent (soap) solution.	All nonporous surfaces.	Heat water if possible. Rub surface and wipe dry. (Moist application is all that is desired, do not let drip.)	Rags and runoff require disposal.
Organic solvents. (Petroluem products.)	All nonporous surfaces.	Immerse or wash with solvent, then wash in hot soapy water and rinse with clear water.	Vapors are toxic. Fire precautions are required.
Brushing _____	Porous and nonporous surfaces.	Brush, sweep, dust from equipment or clothing.	Limited control of contaminated dust. Wear protective mask.

Hot spots may be reduced by sanding, filing, or grinding. These methods are not practicable for large areas—a protective mask and gloves must be worn.

Launder ----------	Clothing.	Use hot soapy water and rinse with clear water.	Water requires disposal.
Bathing and scrubbing.	Personnel.	Use brushes, running water, and soap.	Continue scrubbing until contamination level is safe.

CHAPTER 9
DESTRUCTION OF EQUIPMENT

61. General

a. Tactical situations may arise in which it is necessary to abandon equipment in a combat zone. In such a situation all equipment must be destroyed to prevent its use by the enemy.

b. Equipment will be destroyed only on the authority delegated by a division or higher commander.

62. Plans

A plan will be prepared by each battery to expedite destruction of equipment. The principles are as follows:

a. The plan must be adequate, uniform, easily executed.

b. Destroy essential parts first.

c. Destruction must be as complete as possible.

d. Destroy the *same* essential parts throughout the battery.

e. Destroy spare parts and accessories with the same priority as those installed on equipment.

63. Methods

a. The most generally applicable methods of destruction are—

(1) *Mechanical*—Requires ax, pick, sledge or similar equipment.

(2) *Burning*—Requires gasoline, oil, or other flammables.

(3) *Demolition*—Requires ammunition or explosives.

(4) *Gunfire*—Requires artillery, rocket launchers, rifle grenades, or hand grenades.

b. In general, destruction of essential parts, followed by burning is sufficient to render the weapon useless.

64. Reference

Detailed information on destruction of the equipment is contained in TM 9–2350–217–10.

CHAPTER 10
SAFETY PRECAUTIONS

65. General

Safety precautions to be observed in training are prescribed in AR 385–63. Additional information is given in FM 6–40, FM 6–140, TM 9–2350–217–10, and TM 9–1900. The more important safety precautions are summarized in this chapter.

66. Ammunition

The following precautions must be observed when handling ammunition:

a. Store ammunition in the firing area so that it is protected against accidental explosions.

b. Keep fire and flammables out of the area.

c. Protect ammunition from direct rays of the sun.

d. Do not disassemble fuzes.

e. All ammunition prepared for firing and not fired must be checked to insure that—

(1) Powder increments are present and in proper order and in good condition, and of the proper lot number.

(2) Lot number of the ammunition corresponds to the lot number on the container.

(3) Time fuzes are reset to SAFE and the safety wires are replaced.

67. Failure to Fire

If the weapon fails to fire—

a. Keep the weapon trained on the target.

b. Clear unnecessary personnel from the vicinity of the howitzer.

c. Make two additional attempts to fire the weapon.

d. Wait 10 minutes after the last attempt to fire.

e. The executive command UNLOAD.

f. The assistant gunner opens the breech and number 1 removes the cartridge case.

g. If the primer is dented, a faulty primer is indicated, and the cartridge case is replaced.

h. If the primer is not dented, a faulty firing mechanism is indicated.

i. For detailed procedures refer to TM 9–2350–217–10.

68. Drill and Firing

a. Load the weapon only when firing is imminent.

b. Personnel move in rear of the piece when going from side to side.

c. Personnel stay clear of recoil path.

d. Crewmembers should use earplugs or cotton to protect eardrums.

e. A safety officer will be present during all firing in training exercises. Specific duties for the safety officer are listed in FM 6–40.

CHAPTER 11
TRAINING

Section I. GENERAL

69. Purpose

The purpose of this chapter is to present the minimum requirements for training the howitzer section. It includes—

a. Information for conduct of training.

b. Minimum training schedule.

c. Gunner's qualification tests.

70. Conduct of Training

Section training is *conducted* by the section chief. Battery officers are responsible for preparing the training plans and for supervising their execution. The chief of section—

a. Trains *each* member of his section to function smoothly and efficiently in *all duties* in the section.

b. Welds the section into an effective, coordinated team, capable of functioning efficiently in combat.

c. Emphasizes the application of prior instruction to current training.

d. Maintains a progress card on each man to show—

(1) Instruction attended.

(2) Tests taken.

(3) Remarks pertaining to progress.

e. References—AR 611–201, ATP 6–100, FM 21–5, and FM 6–125.

Section II. MINIMUM TRAINING SCHEDULE

71. Training Periods

a. The principles that should be followed in scheduling and preparing training periods are listed below:

(1) Arrange periods in service of the piece drill along with other battery training to provide a balanced training program.

(2) Section drill should not exceed 30 minutes and be conducted in a vigorous manner.

(3) Precede and follow howitzer drill with logically related subject. For example, precede the drill period with tests and adjustments and follow with inspection and maintenance.

b. Army Subject Schedule 6–3 provides uniform guidance for connoneer training.

c. Operational and maintenance characteristics of the weapon are referenced in TM 9–2350–217–10.

d. The traininng schedule outlined in paragraph 72 is a guide to meet minimum training requirements.

72. Schedule

Method	Hours	Subject	Text reference	Training aids and equipment
C, D, PW____	1	Organization and composition of howitzer section, general duties of individuals, and formation of howitzer section.	Pars. 2, 3, 9.	Howitzer and motor carriage.
C, D, PW____	1	Posts and posting, changing posts, and mounting and dismounting.	Pars. 9–15.	Do.
C, D, PW____	2 (1-hour periods).	Prepare for action_____ March order_____	Par. 18. Par. 24.	Do.
C, D, PW____	24 (½-hour periods).	Howitzer drill, duties in firing by indirect laying.	Par. 19.	TOE equipment.
C, D, PW____	9 (½-hour periods).	Howitzer drill, duties in firing by direct laying.	Pars. 20–23.	Do.

C, D, PW____	6 (1-hour and ½-hour periods).	Tests and adjustments of sighting and fire control equipment.	Pars. 31–50.	Do.
C, D, PW____	2 (½-hour periods).	Aiming post displacement correction.	Par. 26.	TOE equipment, blackboard, and chalk.
C, D, PW____	4 (1-hour periods).	Inspections and maintenance drills.	Pars. 51–56.	TOE equipment.
C, D, PW____	1	Decontamination of materiel_	Pars. 57–60.	Decontamination and TOE equipment.
C, D, PW____	1	Destruction of materiel to prevent use by the enemy.	Pars. 61–64.	Demolition and TOE equipment.
C, D_____	1	Safety precautions_____	Pars. 65–68.	TOE equipment.
PW_____	16 (4-hour periods).	Service practice, firing by indirect laying.	Par. 19.	Do.

C—Conference, D—Demonstration, Pw—Practical Work

Method	Hours	Subject	Text reference	Training aids and equipment
PW	4	Service practice, firing by direct laying.	Pars. 20–23.	TOE equipment.
C, PW	6 (1-hour periods).	Review and tests of subjects previously covered.	All previous references.	Do.

C—Conference, D—Demonstration, PW—Practical Work

Section III. GUNNER'S QUALIFICATION TESTS

73. Purpose and Scope

This section prescribes the tests to be given in the qualification of gunners. The purpose of the tests is to—

a. Determine the relative proficiency of the *artillery soldier* while performing the duties of gunner, 105-mm howitzer M108, self-propelled. *The tests are not a basis for determining the relative proficiency of batteries or higher units.*

b. Serve as an adjunct to training.

74. Standards of Precision

The following standards are required of the candidate:

a. Counter settings must be exact.

b. Leveling bubbles must be centered exactly.

c. Vertical reticle in the panoramic telescope must be alined on the left edge of the aiming post or on the same part of the aiming point or target each time the howitzer is laid.

d. Final motions must be made in the appropriate direction.

(1) *Counter settings* are made from lower to higher numbers.

(2) *Elevation* should be in the direction of the more difficult movement.

(3) *Traverse* is from left to right.

(4) *Vertical reticle* of the panoramic telescope is moved from left to right.

75. Assistance

a. The candidate will receive no unauthorized assistance.

b. The candidate may select assistants as authorized in the tests.

c. If an assistant or the examiner causes the candidate to fail a test, the test will be disregarded and another test of the same nature will be administered.

76. Time

a. The time allowed for each test is from the last word of the command to the last word of the candidate's report.

b. The candidate may begin the test after the first word of the first command.

77. Scoring

a. Scoring will be in accordance with the headings entitled Penalties and Credit.

b. No penalty will be assessed in excess of the maximum credit allowed for each test.

78. Preparation for Tests

a. The howitzer will be prepared for action and the candidate will be posted in the position corresponding to the test or as indicated by the heading entitled Special Instructions.

b. Examiner will insure that the candidate understands the requirements of the test.

c. Candidate reports, "I am ready," before each test.

79. Qualification Scores

Minimum scores required for qualification in the courses are as follows:

Individual Classification	*Points*
Expert gunner	90
First-class gunner	80
Second-class gunner	70

80. Outline of Tests

Par.	Subject	No. of tests	Points each	Maximum credit
81	Direct laying, panoramic telescope	4	2	8
82	Direct laying, direct fire telescope	4	2	8
83	Indirect laying, deflection only	18	2	36
84	Laying for quadrant with the elevation counter	3	2	6
85	Laying for quadrant with the gunner's quadrant	3	2	6
86	Displacement correction	2	--	4
	Part I	(1)	3	(3)
	Part II	(1)	1	(1)
87	Measuring site to the mask	1	4	4
88	Measuring quadrant	1	4	4
89	Measuring deflection	1	4	4
90	Tests and adjustments of sighting and fire control equipment	5	--	10
	Tests 1 and 2	(2)	1	(2)
	Test 4	(1)	2	(2)
	Tests 3 and 5	(2)	3	(6)
91	Materiel	3	--	10
	Test 1	(1)	3	(3)
	Test 2	(1)	3	(3)
	Test 3	(1)	4	(4)
	Total credit	--	--	100

81. Direct Laying Panoramic Telescope

a. Scope of Tests.

(1) Four tests (two groups of two tests each) will be conducted.

(2) Tests 1 and 2 (and tests 3 and 4) will be executed as one series of commands.

b. Special Instruction.

(1) Place a stationary target approximately 600 meters from the howitzer.

(2) Set azimuth counter to 3,200 mils, and set the gunner's aid counter to zero.

(3) Point howitzer so that a 100-mil shift is required for tests 1 and 3.

(4) Post the candidate as the gunner.

(5) The laying of the piece will not be disturbed after tests 1 and 3.

(6) The examiner will reverse the assumed direction of movement for test 3.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1 and 3	TARGET; THAT TANK, SHELL HE, CHARGE 8, FUZE QUICK, LEAD RIGHT 10, RANGE 800.	Sets lead on the azimuth counter. Traverses tube until vertical reticle is on the center of the target mass. Centers the pitch and cross-level bubbles. Commands FIRE and steps clear.
2 and 4	RIGHT (LEFT) 10, ADD (DROP) 200.	Sets off change in lead by using click sights. Traverses the tube until the vertical reticle is on the center of the target. Commands FIRE and steps clear.

d. Penalties. No credit will be allowed if, after each test—

(1) The incorrect lead is set on the azimuth counter.

(2) The vertical reticle is not centered on the mass of the target.

(3) The pitch and cross-level bubbles are not centered.

e. Credit.

Time in seconds, exactly or less than	5	6	7
Credit	2.0	1.5	1.0

82. Direct Laying, Direct Fire Telescope

a. Scope of Tests.

(1) Four tests (two groups of two tests each) will be conducted.

(2) Tests 1 and 2 (and tests 3 and 4) will be executed as one series of commands.

(3) The candidate will be tested as the assistant gunner in the two-man, two-sight system.

b. Special Instructions.

(1) A stationary target will be placed approximately 600 meters from the howitzer.

(2) For tests 1 and 3, the correct range line as viewed through the telescope will be placed more than 100 meters away from the target.

(3) The laying of the piece will not be disturbed after tests 1 and 3.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1 and 3	TARGET; THAT TANK, SHELL HE, CHARGE 8, FUZE QUICK, LEAD LEFT 5, RANGE 600.	Places proper range line on the center of the visible mass of the target. Checks and adjusts for cant as required. Calls "Set" and steps clear.
2 and 4	ADD (DROP) 200	Same as test 1 above.

d. Penalties. No credit will be given if after each test—

(1) The correct range line is not on the center of the visible mass of the target.

(2) The bubble in the cant-level vial is not centered.

e. Credit.

Time in seconds, exactly or less than	2	2½	3
Credit	2	1.5	1.0

83. Indirect Laying, Deflection Only

a. Scope of Tests.

(1) Eighteen tests (two groups of nine tests each) will be conducted.

(2) Tests 1 through 9 (and tests 10–18) will be executed as one series of commands.

b. Special Instructions.

(1) The examiner will identify an aiming point for the candidate.

(2) Special corrections will be given *only* in the tests indicated in *c* below.

(3) The deflection limits for each test are as follows:

Test No.	*Maximum change (mils)*	*Minimum change (mils)*
2 and 11	180	140
3 and 12	90	70
7 and 16	100	60
8 and 17	50	30
9 and 18	20	10

(4) The howitzer will be laid with the correct deflection at the conclusion of each test.

(5) Aiming posts will be set out at the deflection as determined by unit SOP, and the far aiming post will be 100 meters from the sight.

(6) The examiner will designate the section number and special corrections in deflection to be applied by the candidate.

(7) The candidate will be posted as gunner.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1 and 10	SPECIAL CORRECTIONS, DEFLECTION 3200, NUMBER 1 LEFT 7.	Sets deflection and applies special correction. Centers cross-level and pitch level bubbles. Traverses the piece until the vertical reticle is on the left edge of the aiming posts. Checks centering of bubbles. Re-lays if necessary. Calls "Ready" and steps clear.
2 and 11	DEFLECTION 3050.	Sets deflection. Leaves correction on gunner's aid counter. Lays on aiming posts. Checks centering of bubbles. Re-lays if necessary. Calls "Ready" and steps clear.
3 and 12	DEFLECTION 3130.	Same as test 2 above.

4 and 13	NUMBER 1 RIGHT 4.	Same as test 2, except he sets *right 4* on the gunner's aid counter.
	CEASE FIRE, END OF MISSION. (Operation is not timed.)	Sets gunner's aid counter to zero.
5 and 14	AIMING POINT, CHURCH STEEPLE, REFER.	Refers telescope to church steeple. Uncovers azimuth counter. Reads deflection and calls "Number 1, deflection ( )."
6 and 15	DEFLECTION 3200 REFER.	Rotates azimuth knob until reset counter reads 3200. Verifies that the vertical reticle is on the church steeple. Calls "Number 1, deflection 3200 and steps clear."
7 and 16	SPECIAL CORRECTIONS, DEFLECTION 3129 NUMBER 1 LEFT 6.	Same as test 1 above.
8 and 17	DEFLECTION 3069.	Same as test 2 above.
9 and 18	DEFLECTION 3071.	Same as test 2 above.

d. Penalities. No credit will be given if, after each test—

(1) The deflection is not set correctly.

(2) The cross-level and pitch-level bubbles are not centered.

(3) The vertical reticle of the telescope is not on the aiming point or on the left edge of the aiming post.

(4) Last motion in traverse is not from left to right.

e. Credit. Time in seconds, exactly or less than—

Tests 1, 10, 6, and 15	12	13	15
Other tests	8	9	10
Credit	2.0	1.5	1.0

84. Laying for Quadrant with the Elevation Counter

a. Scope of Tests. Three tests will be conducted.

b. Special Instructions.

(1) Each test will require a change from 20 to 40 mils.

(2) Commands in tests 2 and 3 will not be in multiples of 5.

(3) Candidate will be posted as assistant gunner.

(4) The setting on the elevation counter will be within 40 mils of the initial elevation.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1	QUADRANT 375_____	Sets quadrant on the elevation counter. Centers pitch and cross-level bubbles. Calls "Ready" and steps clear.
2	QUADRANT 342_____	Same as test 1 above.
3	SPECIAL CORRECTIONS, NUMBER 1 UP 2, QUADRANT 363.	Same as test 1 above, except he sets *up 2* on the gunner's aid counter.

d. Penalties. No credit will be allowed if, after each test—

(1) The quadrant is not set accurately.

(2) The cross-level and pitch-level bubbles are not centered.

(3) The last movement of the tube is not in the direction in which it is more difficult to elevate.

e. Credit.

Time in seconds, exactly or less than	4	5⅔	6⅔
Credit	2.0	1.5	1.0

85. Laying for Quadrant with the Gunner's Quadrant

a. Scope of Tests. Three tests will be conducted.

b. Special Instructions.

(1) Gunner's quadrant will be set at zero for the first test.

(2) Tests 2 and 3 will require changes from 30 to 60 mils.

(3) Candidate will be posted to the left of, and facing the breech, and will be holding the gunner's quadrant.

(4) An assistant will elevate or depress the tube as directed by the candidate.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1	QUADRANT 210_____	Sets quadrant elevation on the gunner's quadrant. Seats the quadrant. Directs his assistant to elevate or depress the tube until the quadrant bubble is centered. Calls "Ready" and awaits verification of the laying.
2	QUADRANT 257_____	Same as test 1 above.
3	QUADRANT 193_____	Same as test 1 above.

d. Penalties. No credit will be allowed if, after each test—

(1) Quadrant elevation is not set correctly.

(2) Quadrant is not properly seated.

(3) Quadrant bubble is not properly centered.

(4) Last movement of the tube was not in the direction in which it is more difficult to elevate.

e. Credit.

Time in seconds, exactly or less than	6	6⅔	7
Credit	2.0	1.5	1.0

86. Displacement Correction

a. Scope of Test. One test, consisting of two parts, is conducted.

b. Special Instructions.

(1) Aiming posts will be set out at prescribed distances.

(2) An assistant will be stationed by the far aiming post.

(3) The examiner will require the candidate to lay the piece on an announced deflection and report "I am ready."

(4) The motor carriage will be moved so that a 5- to 10-mil aiming post displacement occurs.

(5) The lay of the howitzer at the end of part I will not be disturbed for part II.

c. Outline of Test.

(1) *Part I.*

Examiner commands	Action of candidate
CORRECT FOR DISPLACEMENT.	Lays howitzer so that the far aiming post appears midway between the near aiming post and the verticle reticle of the telescope. Checks centering of bubbles. Re-lays if necessary. Calls "Ready" and steps clear.

(2) *Part II.*

Examiner commands	Action of candidate
ALINE AIMING POSTS	Records deflection on the turret and announces "Deflection ( ), recorded." Directs assistant in alining aiming posts. Calls "Ready" and steps clear.

d. Penalties.

(1) *Part I.* No credit will be allowed if—

(*a*) The far aiming post does not appear midway between the near aiming post and the vertical hairline of the telescope.

(*b*) Cross-level and pitch-level bubbles are not centered.

(*c*) Final motion of traverse was not from left to right.

(2) *Part II.* No credit will be allowed if—

(*a*) Deflection is other than the announced deflection.

(*b*) Aiming posts are not properly alined.

(*c*) Vertical hairline of the telescope is not on the left edge of the aiming posts.

e. Credit.

Part I, time in seconds, exactly or less than	3	3⅓	3⅔	4
Credit	3	2.0	1.5	1.0
Part II, no time limit				
Credit	1.0			

87. Measuring Site to the Mask

a. Scope of Test. One test will be conducted.

b. Special Instructions.

(1) The howitzer, prepared for action, will be placed 200 to 400 meters from a mask of reasonable height.

(2) The tube will be pointed 100 to 150 mils above the crest and 100 to 150 mils to the right or left of the highest point on the crest.

(3) The candidate will be posted at the rear of the breech.

(4) An assistant will traverse and elevate the tube as directed by the candidate.

c. Outline of Test.

Examiner commands	Action of candidate
MEASURE SITE TO MASK.	Sights along lowest element of the bore, and directs the movement of the tube until the line of sight just clears the highest point of the crest. Centers the cross-level and pitch-level bubbles. Reads the elevation from the elevation counter. Reports "Number ( ), sight to mask ( )."

d. Penalties. No credit will be allowed if—

(1) The line of sight along the lowest element of the bore does not just clear the highest point of the crest.

(2) The cross-level and pitch-level bubbles are not properly centered.

(3) Site is not announced correctly.

(4) Last movement of the tube was not in the direction in which it is more difficult to elevate.

e. Credit.

Time in seconds, exactly or less than	14	15	16	17
Credit	4.0	3.0	2.0	1.5

88. Measuring Quadrant

a. Scope of Test. One test is conducted.

b. Special Instructions. Prior to the test the examiner will lay the tube at a selected quadrant and will set the gunner's quadrant to zero.

c. Outline of Test.

Examiner commands	Action of candidate
MEASURE THE QUADRANT.	Places gunner's quadrant on the quadrant seats on the breech ring. Levels the bubble on the gunner's quadrant by raising the index arm and turning the micrometer knob. Announces "NUMBER ( ) Quadrant ( )" and hands quadrant to examiner.

d. Penalties. No credit will be allowed if—

(1) The quadrant bubble is not centered when the quadrant is properly seated.

(2) The quadrant is not announced correctly.

e. Credit.

Time in seconds, exactly or less than	8	9⅝	10⅜
Credit	4.0	3.0	2.0

89. Measuring Deflection

a. Scope of Test. One test is conducted.

b. Special Instructions.

(1) The piece will be laid on the aiming posts.

(2) An aiming point within 200 mils left or right of the aiming posts will be designated and will be identified by the candidate.

c. Outline of Test.

Examiner commands	Action of candidate
NUMBER 1, AIMING POINT THAT (MARKER) REFER.	Centers the cross-level and pitch-level bubbles. Refers to aiming point. Reads deflection from the azimuth counter and reports "Number 1, Deflection ( )," and steps clear.

d. Penalties. No credit will be allowed if—

(1) The cross-level and pitch-level bubbles are not centered properly.

(2) Vertical reticle of the telescope is not on the aiming point.

(3) Deflection is not announced correctly.

(4) The weapon is traversed.

e. Credit.

Time in seconds, exactly or less than	5	5⅔	6	6⅔
Credit	4	3	2.0	1.5

90. Tests and Adjustments of Sighting and Fire Control Equipment

a. Scope of Tests. Five tests will be conducted in which the candidate will be required to—

(1) Demonstrate the testing methods and authorized adjustments of sighting and fire control equipment.

(2) Describe the action taken (send to ordnance) if adjustment is not authorized by the user.

b. Special Instructions.

(1) The piece will be prepared for tests as indicated in paragraph 44.

(2) Necessary items of equipment are boresights, testing target, gunner's quadrant, and plumbline.

(3) An assistant will elevate or depress the tube at the direction of the candidate during tests 1 and 2, and will aline the testing target for test 5.

(4) Tests will be conducted in numerical order.

(5) The gunner's quadrant used for tests 1 and 2 will be used for tests 3 and 4 with the correction determined in test 1, pro-

vided the correction does not exceed 0.4 mil.

(6) Adjustments on the telescope mount M145 and linkage are as prescribed in TM 9–2350–217–10.

(7) Tube will be leveled after test 2 and will not be disturbed thereafter.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1	PERFORM END-FOR-END TEST ON THE GUNNER'S QUADRANT.	Performs test as prescribed in paragraph 44. Calls "Correction ( ) mils, quadrant serviceable, (unserviceable)" and hands the quadrant to the examiner.
2	PERFORM MICROMETER TEST ON THE GUNNER'S QUADRANT. *Note.* Level the tube at conclusion of test 2.	Performs test as prescribed in paragraph 45. Calls "Quadrant micrometer is (is not) in error."
3	TEST PANORAMIC TELESCOPE MOUNT AND LINKAGE.	Performs tests and makes adjustments as prescribed in TM 9–2350–217–10. Calls "Ready" when tests and adjustments are complete.
4	PERFORM ORIENTATION CHECK ON THE ELEVATION QUADRANT M15.	Performs check as prescribed in TM 9–2350–217–10. Calls "Ready" when check is complete.

Test No.	Examiner commands	Action of candidate
5	BORESIGHT THE HOWITZER.	Performs tests and makes adjustments as prescribed in paragraphs 35 through 37. Calls "Ready" and steps clear.

d. Penalties. The tests are not essentially speed tests. The prescribed times are to insure that the candidate performs the tests without wasted effort.

(1) *Test 1.* No credit will be allowed if—

(*a*) The bubble in the gunner's quadrant does not center when checked by the examiner.

(*b*) The error (one-half of the angle that was indicated when the quadrant was first reversed and the bubble was centered, using the index arm and the micrometer knob) is not announced correctly by the candidate.

(*c*) The candidate fails to declare the quadrant unserviceable if the error exceeds 0.4 mil or fails to declare the quadrant serviceable if the error is 0.4 mil or less.

(*d*) The time to complete the test exceeds 2 minutes.

(2) *Test 2.* No credit will be allowed if—

(*a*) The procedure is not followed correctly.

(*b*) The time to complete the test exceeds 1 minute.

(3) *Test 3.* No credit will be allowed if—

(*a*) The procedure is not followed correctly.

(*b*) The checks and adjustments are not accomplished at quadrants 416,858 and 1,300 mils in sequence.

(*c*) The candidate does not declare the telescope mount unserviceable if the readings disagree more than 0.5 mil.

(*d*) The candidate does not adjust linkage within prescribed limits.

(*e*) No time is prescribed for this test.

(4) *Test. 4.* No credit will be allowed if—

(*a*) The procedure is not followed correctly.

(*b*) Candidate fails to notify the examiner if the reading on the gunner's quadrant disagrees more than 0.5 mil with the elevation quadrant.

(*c*) No time is prescribed for this test.

(5) *Test 5.* No credit will be allowed if—

(*a*) The candidate fails to make indicated adjustments.

(*b*) The candidate does not adjust azimuth counter to read exactly 3,200.

(*c*) Direct fire telescope mount slip scales are not set at elevation 4, aximuth 4.

(*d*) The time to complete tests and adjustments exceeds 4½ minutes.

e. Credit. If tests and adjustments are within prescribed limits, maximum credit will be given as follows:

Test	*Points*
1	1
2	1
3	3
4	2
5	3
Maximum Credit	10

91. Materiel

a. Scope of Tests. Three tests are performed.

b. Special Instructions.

(1) *Tests 1 and 2.* A paulin will be placed on the compartment floor for layout of disassembled parts. The candidate will be allowed to select the tools prior to the test. The candidate may have an assistant to aid him in moving the breechblock.

(2) *Test 3.* A complete set of lubrication equipment, and lubricants authorized for use by battery personnel will be made available. Lubricants will be clearly marked.

c. Outline of Tests.

Test No.	Examiner commands	Action of candidate
1	DISASSEMBLE BREECH MECHANISM AND FIRING LOCK.	Performs operation as prescribed in TM 9–2330–217–10. Identifies all parts to the examiner.

Test No.	Examiner commands	Action of candidate
2	ASSEMBLE BREECH MECHANISM AND FIRING LOCK.	Performs operation as prescribed in TM 9–2350–217–10
3	PERFORM DAILY AND QUARTERLY LUBRICATION.	Selects proper lubricants and equipment. Shows *how*, *when*, and with which lubricant is used at each point. (Actual lubrication is not performed.) Checks *all* lubricant levels.

d. Penalties.

(1) The tests are not speed tests; however, times are prescribed to insure that the candidate performs the tests without wasted effort.

(2) No credit will be given if the following time limits are exceeded:

Test	*Time (mins.)*
1	8
2	12
3	5

(3) One-half point will be assessed for each component incorrectly identified in test 1. There are no prescribed times for identifying the components. However, the examiner may reduce the grade if the candidate demonstrates obvious unfamiliarity with the components.

(4) One-half point will be assessed for each lubrication point missed, each lubricant improperly selected, and each lubricating device improperly selected.

e. Credit.

Test	*Points*
1	3
2	3
3	4
Maximum Credit	10

APPENDIX
REFERENCES

AR 320–5	Dictionary of United States Army Terms.
AR 320–50	Authorized Abbreviations and Brevity Codes.
AR 385–63	Regulations for Firing Ammunition for Training Target Practice, and Combat.
AR 611–201	Manual of Enlisted Military Occupational Specialities.
AR 672–5–1	Awards.
AR 750–5	Organization Policies and Responsibilities for Maintenance Operation.
DA Pam 108–1	Index of Army Motion Pictures, Film Strips, Slides and Phono-Recordings.
DA Pam 310-series	Index of Military Publications.
FM 5–15	Field Fortifications.
FM 5–20	Camouflage, Basic Principles and Field Camouflage.
FM 5–25	Explosives and Demolitions.
FM 6–20–2	Field Artillery Techniques.

FM 6–40	Field Artillery Cannon Gunnery.
FM 6–125	Qualification Tests for Specialists Field Artillery.
FM 6–140	The Field Artillery Battery.
FM 17–50	Armor Logistics.
FM 21–5	Military Training.
FM 21–30	Military Symbols.
FM 21–40	Small Unit Procedures in Nuclear, Biological, and Chemical Warfare.
FM 21–60	Visual Signals.
FM 22–5	Drills and Ceremonies.
FM 31–70	Basic Cold Weather Manual.
ATP 6–100	Army Training Program for Field Artillery Units.
ATT 6–117	Training Test for Field Artillery Howitzer Battery, Light or Medium Towed and Self-Propelled.
TM 3–220	Chemical, Biological, and Radiological Decontamination.
TM 9–238	Deep Water Fording of Ordnance Materiel.
TM 9–500	Ordnance Corps Equipment Data Sheets.
TM 9–575	Auxiliary Sighting and Fire Control Equipment.
TM 9–1527	Ordnance Maintenance: Gunner's Quadrants M1

	and M1918 and Machine Gun Clinometer M917.
TM 9–1590	Ordnance Maintenance: Fuze Setters, M14, M22, M23, M25, and M27.
TM 9–1900	Ammunition, General.
TM 9–2350–217–10	Operator's Manual, Howitzer, Light, Self-Propelled: 105-mm, T195E1 and Howitzer, Medium, Self-propelled: 155-mm, T196E1.
TM 9–2350–217–20	Organizational Maintenance, Howitzer, Light, Self-Propelled 105-mm, T195E1, and Howitzer, Medium, Self-Propelled: 155-mm, T196E1.
TM 11–206	Interphone Controls C–980/U and C–981/U and Intercommunication Set Control C–980 A/U.
TM 11–2643	Intercommunication Sets AN/UIC–1 and AN/UIC–IX.
TM 21–301	Driver Selection, Training and Supervision; Tracked Vehicles.
TM 21–306	Manual for the Tracked Vehicle Driver.
TM 38–750	The Army Equipment Records System and Procedures.

LO 9–2350–217–10	Part IV. Lubrication Instructions.
SM 9–5–1315	Ammunition, 75-mm Through 125-mm.
SM 9–5–1390	Ammunition and Explosives, Fuzes and Primers.

INDEX

By Order of the Secretary of the Army:

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Chief of Staff.

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COA (1)	USAAMS (1250)
CINFO (1)	USA Ord Sch (1)
TIG (1)	USAFS (1)
CNGB (2)	USAQMS (1)
USCONARC (5)	USATSCH (1)
ARADCOM (2)	USASCS (1)
ARADCOM Rgn (1)	USACMLCSCH (1)
USA Cbt Dev Comd (2)	USACHS (1)
Armies (5)	Units org under fol TOE:
LOGCOMD (1)	6-37 (5)
Corps (3)	6-125 (5)
Div (2)	6-127 (5)
Div Arty (1)	6-315 (5)
Ft Carson (2)	6-317 (5)
Ft Devens (2)	6-345 (5)
Ft Hood (2)	6-347 (5)
Ft Lewis (2)	17-22 (1)

NG: State AG (3).

USAR: Same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320-50.

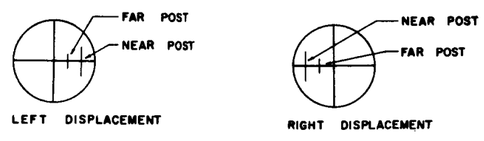
☆ U. S. GOVERNMENT PRINTING OFFICE: 1962—650566

Table VII. Duties in During Operations Service

Sequence	Chief of section	Gunner (left side)	Assistant gunner (right side)	Number 1 (left side)	Driver
1	Supervises the section during the service.	Check presence, security, and condition of sighting equipment. Check security of ammunition and all equipment inside the vehicles.	Check track tension and condition of track shoes, pads, and guides. Check for leaks and condition of the hydraulic track adjuster. Check for loose or damaged drive sprockets. Check for loose or damaged road wheels. Check for loose track pin bolts. Check for loose or damaged idler wheels. Check hubs for excessive heat. Check for broken welds and missing parts.		Checks radiator water level. Checks engine oil level and adds oil if necessary. Refuels vehicle if required. Checks transmission oil level and adds oil if required. Check batteries and cables.
2		Check condition and completeness of all exterior mounted equipment. Check for broken welds and missing parts.			Checks foot controls. Checks instruments and warning lights for normal indication. Checks vehicle steering action. Checks hand controls. Checks periscopes.
3		Reports "Ready."	Reports "Ready."	Reports "Ready."	Reports "Ready."
4	Reports "Sir, number ( ) in order" or any defects the section cannot remedy without delay.				

Table II. (Superseded) *Duties in Firing, Indirect Laying*

Sequence	Chief of section	Gunner	Assistant gunner	Number 1	Number 2	Number 3	Driver
1	Commands the section during firing and insures an efficient and safe operation.						
2	Follows fire commands and repeats commands to the section as required to insure efficiency and safety.	Sets and lays for deflection: 1. The command is, DEFLECTION ( ). 2. Sets announced deflection on the reset counter by turning the azimuth knob. *Note.* Final deflections are set in increasing direction on the reset counter. 3. Traverse piece until vertical line of telescope is on left edge of aiming point. *Note.* Final motion of traverse is from left to right. 4. Center pitch- and cross-level bubbles.	Sets and lays for quadrant: 1. The command is QUADRANT ( ). 2. Sets the announced quadrant on the elevation counter with the elevation knob. 3. Elevates tube until elevation level vial bubble is centered. 4. Centers cross—level bubble with cross-level knob.	Loads the howitzer: 1. Receives the prepared round from Number 3: a. Grasps the base of cartridge case with the right hand. b. Grasps the projectile in front of the rotating band with the left hand. 2. Loads at the command QUADRANT: a. Inserts round in the breech. *Note.* Avoid striking the fuze against any part of the howitzer. b. Pushes home with the right fist. ***Warning.* A fist must be used to protect fingers from being crushed by the closing breechblock.**	Fuzes projectiles: 1. The command is FUZE ( ). 2. Selects the announced fuze. 3. Inspects fuze socket for rust or dirt. 4. Removes or replaces supplementary charge as required. 5. Screws in designated fuze, using authorized fuze wrench. ***Caution:* Do not hammer on a fuze wrench or use an extension handle.** With fuze setter M26, sets fuzes TSQ M54; TSQ M55, MT 67, TSQ M500, TSQ M501, TSQ M520. 1. Removes safety pull wire from time fuzes. 2. Seats upper lug of fuze setter in the upper recess of the fuze. 3. Loosens wingnut on fuze setter, sets announced time on the appropriate time band. 4. Locks wingnut, places handle to horizontal, turns counterclockwise until a stop is felt and a click is heard. 5. Raises handle, removes setter, verifies setting. With fuze setter M28, sets fuze VT M513-series: 1. Seats stationary lug of setter into top recess of fuze. 2. Sets announced fuze setting on the fuze setter. 3. Turns setter clockwise until setter stops or a click is heard. 4. Removes setter and verifies setting. Sets selective super quick and delay fuzes: On fuze quick, verifies that letters S.Q. are alined with the slot on the setting sleeve. On fuze delay, turns setting sleeve with screwdriver until the slot is alined with the word DELAY. Combination time and super quick fuzes: For impact the command is FUZE M500 (or other fuze). QUICK. Verifies that the letter S on the setting ring is alined with the index on the fixed ring. ***Caution:* A time fuze should be returned to ordnance after passing safe (S) twice.** Note. The wrench type fuze setter M27, may be used to set time fuzes. Engage setter in fuze notch and rotate in the direction of increasing readings until the time setting is opposite the index mark on the fuze. This type of setter should be used only when mechanical setters are not available. When directed reads and announces the time set on the fuze.	Prepares propellant charge: 1. The command is CHARGE ( ). 2. Verifies the number of increments. 3. Removes increments that are higher numbered than the charge commanded. 4. Replaces remaining charges in the cartridge case in their numerical order. Holds cartridge case while projectile is fitted. *Note.* Care must be exercised to prevent damage to the lip of the cartridge case. Passes prepared round to Number 1 with his left hand under the cartridge case and his right hand under the projectile so that Number 1 can grasp the base of the cartridge case. *Note.* Insure that the projectile and the cartridge case do not separate.	Removes ammunition from containers: 1. Removes the tape from the cartridge end of the container and tilts it so that the cartridge case can be taken by Number 3. 2. Reverses container, removes the tape, and tilts it so that Number 2 can receive the projectile. Inspects and cleans projectiles: 1. Examines rotating band to see that it is free from all dirt and burrs. *Note.* Projectile with burred rotating band will be put aside until the burrs can be removed with a file. 2. Examines entire projectile for defects. 3. Stands projectile on end and cleans it thoroughly. *Note.* Any sand, dirt, oil, or grease on the projectile will cause wear, scratches or gouges in the bore. Selects proper projectile with proper fuze or removes nose plug if necessary. 1. Holds projectile upright for fuzing. 2. Holds projectile firmly while Number 2 fuzes and sets the fuze.
3	Indicates that the howitzer is ready to fire, after the assistant gunner calls "Set" and the gunner calls "Ready" by extending his right hand vertically and reporting "Number ( ), Ready."	Calls "Ready," and raises right hand after the piece is laid for direction and the assistant gunner calls *"Set."	Release safety. Calls "Set." *Note.* Unit SOP will dictate the use of the safety.	*Notes.* Care and proper handling of ammunition must be insured. It is imperative that— 1. There be no smoking in vicinity of ammunition. 2. Only flashlights be used in vicinity of charges. 3. Rough handling of projectile, cartridge cases, and fuzes be prevented. 4. Projectiles and cartridge cases not strike together. 5. Ammunition not become dirty, wet, or over heated.			
4	Gives the command to fire by dropping his arm sharply to his side and commanding FIRE.		At the command of the chief of section, fires the howitzer by pressing the firing button or with a quick strong pull on the lanyard.				

Sequence	Chief of section	Gunner	Number 1
5	Observes and checks functioning of materiel during firing: Reports promptly to the executive any mistakes, unusual incidents, equipment malfunctions, and any reason the howitzer may not be fired.		Recovers expended cartridge cases and throws them out the right turret door. Inspects the bore and chamber after each round is fired to see that it is free from residue left by the charge and calls "Bore clear." Calls out number and quadrant for each round in volley fire.
6 (These duties performed as required.)	Lays for quadrant with gunner's quadrant: 1. The command is USE GUNNER'S QUADRANT. 2. The announced quadrant is set on the gunner's quadrant. *Note.* Increments of 10 mils are set on the quadrant frame arc. Mil and 0.1 mil increments are set with the micrometer knob. The same side of the quadrant must be used for settings on the quadrant frame arc and micrometer. 3. After the howitzer is loaded and laid for direction— Stands squarely opposite quadrant seats. Places and holds gunner's quadrant firmly on the seats. Insures that the words *line-of-fire* are on the bottom of the quadrant and the line of fire arrow is pointed toward the muzzle and is on the same side of the quadrant as the scale used. 4. Directs the assistant gunner to elevate the tube until the bubble is centered. Cautions the assistant gunner when the bubble is approaching center so that the final centering may be expedited. *Not.* For subsequent settings, the chief of section will take the same position, hold the quadrant in the same manner, and view the quadrant bubble from the same angle to insure consistency in leveling. Measures the quadrant: 1. The command is MEASURE THE QUADRANT. 2. With the piece laid, directs the assistant gunner to center the cross-level bubble and turn the elevation knob until the bubble in the elevation level vial is centered. 3. Reads the quadrant in the elevation counter window. 4. Reports to executive officer "Number ( ) quadrant ( )." *Note.* For subsequent settings, the chief of section will take the same position, hold the quadrant seat and centering the bubble by moving the index arm and turning the micrometer knob. Conducts prearranged fires in conformity with prescribed data (e.g., barrages, harassing, and interdiction fires). Commands CEASE FIRING. 1. Command may be given by anyone. 2. All firing will stop immediately. 3. If the howitzer is loaded reports that fact to the executive, who will acknowledge with "Number ( ) loaded." 4. The executive will then investigate the cause, correct it, and resume firing by announcing the quadrant. 5. If CEASE FIRE is commanded by the fire direction center, fire is resumed by announcing the quadrant. C/S notifies and receives permission from the XO to realine aiming post.	Corrects ffor aiming post displacement when the vertical reticle in the panoramic telescope is displaced from the line formed by the aiming posts. He lays the howitzer so that the far aiming post appears exactly midway between the near aiming post and the vertical reticle.  *Figure 11. Correction for aiming post displacement.* *Note.* If displacement is caused by traversing, lay as described above. If displacement is caused by shifting of the carriage due to firing shock— 1. Lay as above until there is a lull in firing. 2. Notify chief of section for permission to realine the aiming posts. 3. After receiving permission from XO. 4. Lay howitzer as described above. 5. Direct Number 1 to move the far post into alinement with the vertical reticle and then aline the near aiming post. Lays for quadrant: When one-man, one-sight system is used— 1. Places the announced quadrant on the elevation counter with the elevation handwheel (knob). 2. Elevates the tube until the elevation level bubble is centered. 3. Checks the cross-level, and pitch level bubbles. 4. Calls "Ready" and raises his right hand when piece is laid for direction and quadrant. Refers the piece: 1. The executive commands AIMING POINT THIS INSTRUMENT (or other point) REFER. 2. Does not disturb the lay of the tube. 3. Checks centering the bubbles. 4. Refers sight until the vertical reticle is on the designated point. 5. Opens the azimuth counter door. 6. Reads from the azimuth counter and reports to the executive "Sir Number ( ), deflection ( )." *Notes.* 1. Each time the weapon is traversed, the gunner must center the pitch- and cross-level bubbles on the panoramic telescope mount, and the assistant gunner must insure that the elevation-level bubble and the cross-level bubble are centered each time the weapon is elevated or depressed. 2. Individual piece corrections will normally be added to the common deflection and quadrant, and the total deflection and quadrant are announced to each piece (e.g., deflection number 1 3030, quadrant, numbers 1, 357.) The gunner's aid counter and correction counter windows should, therefore, normally read zero. However, it may be necessary for the assistant gunner to carry a correction on the correction counter of the elevation quadrant due to errors found while performing end-for-end test. (See TM 9-2350-217-10.)	

Note. Steps 2 through 5 may be accomplished after PREPARE FOR ACTION and prior to firing depending on unit SOP or instructions from the executive officer. The type and number of rounds to be fuzed prior to firing depends on unit SOP or instructions.

Table I. (Superseded) *Duties in Prepare for Action*

Sequence	Chief of section	Gunner	Assistant gunner	Number 1	Number 2	Number 3	Driver
1	Commands PREPARE FOR ACTION. Supervises work of cannoneers during all activities.	Opens left turret door.	Opens right turret door.	Opens rear hull doors.	Assists Number 3 in spreading paulin.	Secures paulin from left rear turret storage rack and spread to the left rear of the howitzer.	Positions carriage as directed by the chief of section, and cuts the engine.
2		Deflates cab race ring seal and releases cab traverse lock. Assists driver to disengage howitzer traveling lock. Checks functioning of traversing and elevating mechanism.	Deflates gun shield seal. Checks functioning of elevation mechanism.		Procures fuze setter and other tools as required and places them on the paulin to the left rear of the howitzer.	Lays communication cable from the howitzer to the MX-155/GT, prepare telephone for use, and assure operation of communication equipment.	Assisted by the gunner lowers and secures the howitzer traveling lock. Removes the muzzle plug and tosses it in the driver's hatch. Removes the direct fire telescope cover and places it in the driver's hatch.
3	Checks recoil system for proper amount of oil; that no leaks exist; services as required.	Depresses telescope cover latches, and informs driver to lift the cover. Installs panoramic telescope, uncovers azimuth 6,400-mil counter. Sets azimuth counter to 3,200 mils. Zeros the gunner's aid counter. Levels telescope mount.	Sets elevation counter to zero. Sets correction counter to zero. Center cross-level and elevation bubbles. Operates firing mechanism. Checks functioning of breech mechanism. 1. Places safety lever in safe position. 2. Grasp breech operating handle with the right hand and releases breech operating handle catch. 3. Pushes down on handle until breechblock locks in the open position. 4. Returns operating handle to latched position. Assisted by Number 1, thoroughly dries the chamber and bore.	Assembles aiming posts and places near left front of motor carriage. Assembles rammer staff and head as directed by the chief of section. Assists Assistant Gunner in drying the chamber and bore.			Removes aiming posts and rammer staff section and hand to Number 1. Lifts and secures panoramic telescope cover when directed by the gunner.
4		*Lays howitzer for direction: 1. When the command is given identifying the aiming point, identifies aiming point, and announces "Number ( ) aiming point identified." 2. Executive commands NUMBER ( ) DEFLECTION ( ). Gunner announces "NUMBER ( ) DEFLECTION ( )." 3. Sets announced deflection on the azimuth counter (top window). 4. Traverses cab until reticle pattern of telescope is centered on objective lens of aiming circle. 5. Checks that pitch- and cross-level bubbles are centered. 6. Reports to executive "Sir, number ( ) ready for recheck." 7. Gunner repeats each subsequent command announced by the executive and announces the number of mils difference until executive announces, "Number ( ) is laid." (Lay of tube will not be disturbed until an aiming point is established.)	*Note.* The breechblock must be opened for initial round. For subsequent rounds the breechblock opens automatically.	Assisted by Numbers 2, 3, and the driver, unloads and arranges ammunition as directed by the chief of section.	Unpacks fuzes, and ammunition as directed by the chief of section. *Note.* During the initial phases of firing, it may be necessary to utilize ammunition from inside the howitzer. When ammunition from the ammunition section is available, the basic load of the howitzer will be replenished.	Assists Number 2 in unpacking and arranging ammunition.	Assists Number 2 in unpacking and arranging ammunition.
5	*Measures site to the mask, assisted by the gunner and assistant gunner: 1. Sights along lowest element of bore. 2. Directs the assistant gunner to elevate or depress the tube until the lowest element of the bore just clears the highest crest in the field of fire. 3. Directs the assistant gunner to center cross-level and elevation bubbles. 4. Reads elevation on elevation counter and reports to the executive "Sir, number ( ) site ( )." (Gunner's quadrant may be used.) 5. Records and announces minimum elevation for each charge to the gunner and assistant gunner.	Assists chief of section in measuring site to mask.	Assists chief of section in measuring site to mask.				
6	*Indicates alternate aiming point to the gunner when one is designated by the executive. If an alternate aiming point is not designated, the chief of section should select a clearly defined point at a distance of at least 2,000 meters. This aiming point is to be used as directed by the executive or at such times when the aiming posts are rendered useless. Deflections read from the azimuth counter are recorded and reported to the executive and are used to maintain parallelism, until the aiming posts are reemplaced.	*Directs alinement of aiming posts. 1. Refers telescope to the far aiming post previously set out by number 1. 2. Directs Number 1 by hand signals to aline near aiming post with the far aiming post and the vertical reticle. 3. Pushes in and turns reset knob and sets reset counter to 3200. 4. Records reading in azimuth counter window and closes the window. *Note.* The azimuth counter is used to lay the howitzer. The reading in this window reflects the angle required to place the tube parallel to the direction of fire. The reset counter is then used to establish a common deflection of 3,200. Lays on alternate aiming point: 1. The piece has been laid. 2. The executive may command AIMING POINT, LEFT FRONT, LONE TREE, REFER. 3. Without moving the tube, refers the sight to the aiming point. 4. Reads deflection from the azimuth counter and reports "Number ( ), deflection ( ). *Note.* The executive may record the referred deflection for future use, or he may proceed as follows: 5. Commands COMMON DEFLECTION, 3200. 6. Pushes on reset knob and turns counterclockwise until 3,200 appears on the reset counter. 7. Verifies that the line of sight is on the aiming point. 8. Closes window over azimuth counter. 9. Reads and sets subsequent deflections from reset counter.	Checks direct fire telescope: 1. Adjusts eyepiece arm to a convenient viewing angle. 2. Adjusts light control knob for optimum reticle illumination. 3. Adjusts level - vial mirror for convenient viewing. 4. Centers cant correction bubble by turning the red cant correction knob. 5. Verifies that elevation and azimuth slip scales are set at 4.	Sets out aiming post as directed by the gunner. The far aiming post is placed approximately 100 meters from the piece and the near aiming post 50 meters from the piece. *Note.* If for any reason the far aiming post is put out at any other distance than 100 meters, the near aiming post should be one-half the distance of the far aiming post.		Assists chief of section in measuring site to mask.	
7	Verifies that the howitzer is prepared for action. Reports to executive "Sir number ( ) in order" or reports any defects that the section cannot remedy without delay.	*Note.* All cannoneers take posts after they have performed their specific duties.					

*These steps may be omitted during training when drill does not include laying of the piece.

Table I. Duties in Prepare for Action

Sequence	Chief of section	Gunner	Assistant gunner	Number 1	Number 2	Number 3	Driver
1	Commands PREPARE FOR ACTION. Supervises work of cannoneers during all activities.	Opens left turret door.	Opens right turret door.	Opens rear hull doors.		Secures paulin from left rear turret storage rack and spread to the left rear of the howitzer.	Positions carriage as directed by the chief of section, and cuts the engine.
2		Deflates cab race ring seal and releases cab traverse lock. Assists driver to disengage howitzer traveling lock. Checks functioning of traversing and elevating mechanism.	Deflates gun shield seal. Checks functioning of elevation mechanism.		Procures fuze setter and other tools as required and places them on the paulin to the left rear of the howitzer.	Lays communication cable from the howitzer to the MX–155/GT, prepare telephone for use, and assure operation of communication equipment.	Assisted by the gunner lowers and secures the howitzer traveling lock. Removes the muzzle cover, and tosses it in drivers hatch. Opens and locks direct fire telescope window.
3	Checks recoil system for proper amount of oil; that no leaks exist; services as required.	Depresses telescope cover latches, and informs driver to lift the cover. Installs panoramic telescope, uncovers azimuth 6,400-mil counter. Sets azimuth counter to 3,200 mils. Zeros the gunner's aid counter. Levels telescope mount.	Sets elevation counter to zero. Sets correction counter to zero. Center cross-level and elevation bubbles. Procures lanyard and operates firing lock. Checks functioning of breech mechanism. 1. Places safety lever in safe position. 2. Grasp breech operating handle with the right hand and releases breech operating handle catch. 3. Pushes down on handle until breechblock locks in the open position. 4. Returns operating handle to latched position. Assisted by Number 1, thoroughly dries the chamber and bore.	Assembles aiming posts and places near left front of motor carriage. Assembles rammer staff and head as directed by the chief of section. Assists Assistant Gunner in drying the chamber and bore.			Removes aiming posts and rammer staff section and hand to Number 1. Lifts and secures panoramic telescope cover when directed by the gunner.
4	Verifies the adjustments of the sighting and fire control equipment.	Tests and alines (boresight)	fire control equipment. *Note.* The hreechhlock must be opened for initial round. For suhsequent rounds the hreechhlock opens automatically.	Assisted by Numbers 2, 3, and the driver, unloads and arranges ammunition as directed by the chief of section. Emplaces and holds the testing target if required.	Unpacks fuzes, and ammunition as directed by the chief of section. *Note.* During the initial phases utilize ammunition from inside the the ammunition section is availahle, be replenished.	Asists Number 2 in unpacking and arranging ammunition. of firing, it may be necessary to howitzer. When ammunition from the basic load of the howitzer will	Assists Number 2 in unpacking and arranging ammunition.
5	*Measures site to the mask, assisted by the assistant gunner: 1. Sights along lowest element of bore. 2. Directs the assistant gunner to elevate or depress the tube until the lowest element of the bore just clears the highest crest in the field of fire. 3. Directs the assistant gunner to center cross-level and elevation bubbles. 4. Reads elevation on elevation counter and reports to the executive "Sir, number ( ) site ( )." (Gunner's quadrant may be used.) 5. Records and announces minimum elevation for each charge to the gunner and assistant gunner.	*Lays howitzer for direction: 1. When the command is given identifying the aiming point, identifies aiming point through telescope, and announces "Number ( ) aiming point identified." 2. Executive commands NUMBER ( ) DEFLECTION ( ): 3. Sets announced deflection on the azimuth counter (top window). 4. Traverses cab until reticle pattern of telescope is centered on objective lens of aiming circle. 5. Checks that pitch- and cross-level bubbles are centered. 6. Reports to executive "Sir, number ( ) ready for recheck." 7. Repeats steps in 3 through 6 above until executive announces, "Number ( ) is laid." (Lay of tube will not be disturbed until an aiming point is established.)	Assists chief of section in measuring site to mask.	Sets out the far aiming post to the left front of the howitzer at a deflection between 2,400 and 2,600 mils and approximately 100 meters from the piece.			
6	*Indicates alternate aiming point to the gunner when one is designated by the executive. If an alternate aiming point is not designated, the chief of section should select a clearly defined point at a distance of at least 2,000 meters. This aiming point is to be used as directed by the executive or at such times when the aiming posts are rendered useless. Deflections read from the azimuth counter are recorded and reported to the executive and are used to maintain parallelism, until the aiming posts are reemplaced.	*Directs alinement of aiming posts. 1. Refers telescope to the far aiming post previously set out by number 1. 2. Directs number 1 by hand signals to aline near aiming post with the far aiming post and the vertical reticle. 3. Pushes in and turns reset knob and sets reset counter to 3200. 4. Records reading in azimuth counter window and closes the window. *Note.* The aximuth counter is used to lay the howitzer. The reading in this window reflects the angle required to place the tube parallel to the direction of fire. The reset counter is then used to establish a common deflection of 3,200. Lays on alternate aiming point: 1. The piece has been laid. 2. The executive may command AIMING POINT, LEFT FRONT, LONE TREE, REFER. 3. Without moving the tube, refers the sight to the aiming point. 4. Reads deflection from the azimuth counter and reports "Number ( ), deflection ( )." *Note.* The executive may record the referred deflection for future use, or he may proceed as follows: 5. Commands COMMON DEFLECTION, 3200. 6. Pushes on reset knob and turns counterclockwise until 3,200 appears on the reset counter. 7. Verifies that the line of sight is on the aiming point. 8. Closes window over azimuth counter. 9. Reads and sets subsequent deflections from reset counter.	Checks direct fire telescope: 1. Adjusts eyepiece arm to a convenient viewing angle. 2. Adjusts light control knob for optimum reticle illumination. 3. Adjusts level - vial mirror for convenient viewing. 4. Centers cant correction bubble by turning the red cant correction knob. 5. Verifies that elevation and azimuth slip scales are set at 4.	Places the near aiming post midway between the piece and the far aiming post and sets it as directed by the gunner.			
7	Verifies that the howitzer is prepared for action. Reports to executive "Sir number ( ) in order" or reports any defects that the section cannot remedy without delay.	*Note.* All cannoneers take posts after they have performed their specific duties.					

*These steps may be omitted during training when drill does not include laying of the piece.

Table II. Duties in Firing, Indirect Laying

Sequence	Chief of section	Gunner	Assistant gunner	Number 1	Number 2	Number 3	Driver
1	Commands the section during firing and insures an efficient and safe operation.						
2	Follows fire commands and repeats commands to the section as required to insure efficiency and safety.	Sets and lays for deflection: 1. The command is, DEFLECTION ( ). 2. Sets announced deflection on the reset counter by turning the azimuth knob. *Note.* Final deflections are set in increasing direction on the reset counter. 3. Traverse piece until vertical line of telescope is on left edge of aiming point. *Note.* Final motion of traverse is from left to right. 4. Center pitch- and cross-level bubbles.	Sets and lays for quadrant: 1. The command is QUADRANT ( ). 2. Sets the announced quadrant on the elevation counter with the elevation knob. 3. Elevates tube until elevation level vial bubble is centered. 4. Centers cross - level bubble with cross-level knob.	Loads the howitzer: 1. Receives the prepared round from Number 3: *a.* Grasps the base of cartridge case with the right hand. *b.* Grasps the projectile in front of the rotating band with the left hand. 2. Loads at the command QUADRANT: *a.* Inserts round in the breech. *Note.* Avoid striking the fuze against any part of the howitzer. *b.* Pushes home with the right fist. ***Warning:*** **A fist must be used to protect fingers from being crushed by the closing breechblock.**	Fuzes projectiles: 1. The command is FUZE ( ). 2. Removes fuze or closing plug. 3. Inspects fuze socket for rust or dirt. 4. Removes or replaces supplementary charge as required. 5. Screws in designated fuze, using authorized fuze wrench. ***Caution:*** **Do not hammer on a fuze wrench or use an extension handle.** 6. Removes safety pull wire from time fuzes. With fuze setter M26, sets fuzes TSQ M54; TSQ M55, MT 67, TSQ M500, TSQ M501, TSQ M520. 1. Seats upper lug of fuze setter in the upper recess of the fuze. 2. Loosens wingnut on fuze setter, sets announced time on the appropriate time band. 3. Locks wingnut, places handle to horizontal, turns counterclockwise until a stop is felt and a click is heard. 4. Raises handle, removes setter, verifies setting. With fuze setter M28, sets fuze VT M513-series: 1. Seats stationary lug of setter into top recess of fuze. 2. Sets announced fuze setting on the fuze setter. 3. Turns setter clockwise until setter stops or a click is heard. 4. Removes setter and verifies setting. Sets selective super quick and delay fuzes: On fuze quick, verifies that letter S.Q. are alined with the slot on the setting sleeve. On fuze delay, turns setting sleeve with screwdriver until the slot is alined with the word DELAY. Combination time and super quick fuzes: For impact the command is FUZE M500 (or other fuze) QUICK. Verifies that the letter S on the setting ring is alined with the index on the fixed ring. ***Caution:*** **A time fuze should be returned to ordnance after being set twice.** *Note.* The wrench type fuze setter, M27, may be used to set time fuzes. Engage setter in fuze notch and rotate in the direction of increasing readings until the time setting is opposite the index mark on the fuze. This type of setter should be used only when mechanical setters are not available.	Prepares propellant charge: 1. The command is CHARGE ( ). 2. Verifies the number of increments. 3. Removes increments that are higher numbered than the charge commanded. 4. Replaces remaining charges in the cartridge case in their numerical order. Fits projectile into its cartridge case. *Note.* Care must be exercised to prevent damage to the lip of the cartridge case. Passes prepared round to Number 1 with his left hand under the cartridge case and his right hand under the projectile so that Number 1 can grasp the base of the cartridge case. *Note.* Insure that the projectile and the cartridge case do not separate.	Removes ammunition from containers: 1. Removes the tape from the cartridge end of the container and tilts it so that the cartridge case can be taken by Number 3. 2. Reverses container, removes the tape, and tilts it so that Number 2 can receive the projectile. Inspects and cleans projectiles: 1. Examines rotating band to see that it is free from all dirt and burrs. *Note.* Projectile with burred rotating hand will be put aside until the burrs can be removed with a file. 2. Examines entire projectile for defects. 3. Stands projectile on end and cleans it thoroughly. *Note.* Any sand, dirt, oil, or grease on the projectile will cause wear, scratches or gouges in the bore. Holds projectile upright for fuzing and fuze setting. 1. Selects proper projectile as commanded. 2. Holds the projectile firmly while Number 2 fuzes and sets the fuze. When directed reads and announces the time set on the fuze.
3	Indicates that the howitzer is ready to fire, after the assistant gunner calls "Set" and the gunner calls "Ready," by extending his right arm vertically and reporting "Number ( ), Ready."	Calls "Ready," and raises right hand after the piece is laid for direction and the assistant gunner calls *"Set."	Calls "Set."	*Notes.* Care and proper handling of ammunition must be insured. It is imperative that— 1. There be no smoking in vicinity of ammunition. 2. Only flashlights be used in vicinity of charges. 3. Rough handling of projectile, cartridge cases, and fuzes be prevented. 4. Projectiles and cartridge cases not strike together. 5. Ammunition not become dirty, wet, or over heated.			
4	Gives the command to fire by dropping his arm sharply to his side and commanding FIRE.		At the command of the chief of section fires the howitzer by pressing the firing button or with a quick strong pull on the lanyard.				

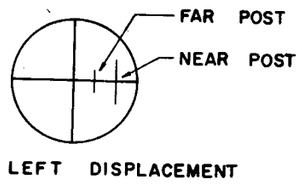
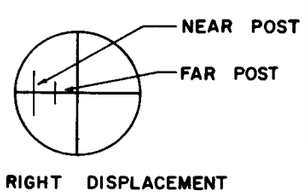
Sequence	Chief of section	Gunner	Number 1
5	Observes and checks functioning of materiel during firing: Reports promptly to the executive any mistakes, unusual incidents, equipment malfunctions, and any reason the howitzer may not be fired.		Recovers expended cartridge cases and throws them out the left turret door. Inspects the bore and chamber after each round is fired to see that it is free from residue left by the charge and calls "Bore clear." Calls out number and quadrant for each round in volley fire.
6 (These duties performed as required).	Lays for quadrant with gunner's quadrant: 1. The command is USE GUNNER'S QUADRANT. 2. The announced quadrant is set on the gunner's quadrant. *Note.* Increments of 10 mils are set on the quadrant frame arc. Mil and 0.1 mil increments are set with the micrometer knob. The same side of the quadrant must be used for settings on the quadrant frame arc and micrometer. 3. After the howitzer is loaded and laid for direction— Stands squarely opposite quadrant seats. Places and holds gunner's quadrant firmly on the seats. Insures that the words *line-of-fire* are on the bottom of the quadrant and the line of fire arrow is pointed toward the muzzle and is on the same side of the quadrant as the scale used. 4. Directs the assistant gunner to elevate the tube until the bubble is centered. Cautions the assistant gunner when the bubble is approaching center so that the final centering may be expedited. *Note.* For subsequent settings, the chief of section will take the same position, hold the quadrant in the same manner, and view the quadrant bubble from the same angle to insure consistency in leveling. Measures the quadrant: 1. The command is MEASURE THE QUADRANT. 2. With the piece laid, directs the assistant gunner to center the cross-level bubble and turn the elevation knob until the bubble in the elevation level vial is centered. 3. Reads the quadrant in the elevation counter window. 4. Reports to executive officer "Number ( ) quadrant ( )." *Note.* The quadrant can also be measured by placing the gunner's quadrant on the breech quadrant seat and centering the bubble by moving the index arm and turning the micrometer knob. Conducts prearranged fires in conformity with prescribed data (e.g., barrages, harassing, and interdiction fires). Commands CEASE FIRING. 1. Command may be given by anyone. 2. All firing will stop immediately. 3. If the howitzer is loaded reports that fact to the executive, who will acknowledge with, "Number ( ) loaded." 4. The excutive will then investigate the cause, correct it, and resume firing by announcing the quadrant. 5. If CEASE FIRE is commanded by the fire direction center, fire is resumed by announcing the quadrant.	Corrects for aiming post displacement when the vertical reticle in the panoramic telescope is displaced from the line formed by the aiming posts. He lays the howitzer so that the far aiming post appears exactly midway between the near aiming post and the vertical reticle.  LEFT DISPLACEMENT  RIGHT DISPLACEMENT *Figure 11. Correction for aiming post displacement.* *Note.* If displacement is caused by traversing, lay as described above. If displacement is caused by shifting of the carriage due to firing shock— 1. Lay as above until there is a lull in firing. 2. Notify chief of section for permission to realine the aiming posts. 3. Lay Howitzer as described above. 4. Direct Number 1 to move the far post into alinement with the vertical reticle and then aline the near aiming post. Lays for quadrant: When one-man, one-sight system is used— 1. Places the announced quadrant on the elevation counter with the elevation handwheel. 2. Elevates the tube until the pitch-level bubble is centered. 3. Checks the cross-level bubble. 4. Calls "Ready" and raises his right hand when piece is laid for direction and quadrant. Refers the piece: 1. The executive commands AIMING POINT THIS INSTRUMENT (or other point) REFER. 2. Does not disturb the lay of the tube. 3. Checks centering the bubble. 4. Refers sight until the vertical reticle is on the designated point. 5. Opens the azimuth counter door. 6. Reads from the azimuth counter and reports to the executive "Sir Number ( ), deflection ( )." *Notes.* 1. Each time the weapon is traversed, the gunner must center the pitch- and cross-level bubbles on the panoramic telescope mount, and the assistant gunner must insure that the elevation-level bubble and the cross-level bubble are centered each time the weapon is elevated or depressed. 2. Individual piece corrections will normally be added to the common deflection and quadrant, and the total deflection and quadrant are announced to each piece (e.g., deflection number 1 3030, quadrant, numbers 1, 357.) The gunner's aid counter and correction counter windows should, therefore, normally read zero. However, it may be necessary for the assistant gunner to carry a correction on the correction counter of the elevation quadrant due to errors found while performing end-for-end test. (See TM 9-2350-217-10.)	

Table III. Duties in Direct Laying

Sequence	Chief of section	Gunner	Assistant gunner	Numbers 1 through 3	Motor carriage driver
1	Conducts fire of howitzer: 1. Takes control of his section and fires the howitzer when the executive commands TARGET, TANK, RIGHT (LEFT) FRONT, FIRE AT WILL or simply FIRE AT WILL. 2. Alerts section to prepare for direct fire.	Prepares panoramic telescope for direct laying: 1. Uncovers window on azimuth counter. 2. Sets azimuth counter to 3200. 3. Verifies gunner's aid counter is zero. 4. Actuates click sight mechanism. 5. Centers pitch- and cross-level bubbles.	Prepares direct fire telescope: 1. Checks reticle for optimum illumination. 2. Check level vial mirror for convenient viewing.	Perform the same duties as in indirect laying.	Performs same duties as in indirect laying.
2	Identifies or selects target: 1. Identifies target designated by executive. 2. If target is a group of vehicles, selects the target that is the greatest threat to his position or the supported position based on this priority. *a.* Tanks at short range threatening to overrun the position. *b.* Hull down stationary tanks covering the advance of other tanks. *c.* Area containing personnel threatening to overrun the position. 3. Repeats target designation to the section "Lead tank," "Moving tank." Takes post to the flank and slightly to the rear of the piece where his observation will not be obscured by muzzle blast and smoke. Estimates range to target: 1. A range card (fig. 8) with accurate measurements to key points provides the most accurate ranges. 2. Estimated ranges are used if accurate measurements are not available. Determines lead in mils: Lead is based on target speed, range, direction of travel, and ammunition used. Approximate initial leads are as follows: *Lead (mils)* *Speed (MPH)* / *Target traveling perpendicular to line of fire* / *Target traveling 45° to line of fire* Slow 5 — 5 — 5 10 — 10 — 5 Medium 15 — 15 — 10 20 — 20 — 15 Fast 25 — 20 — 15 30 — 30 — 20				
3	Gives initial commands: *Sequence* / *Element* / *Example* 1. Target designation — TARGET (TANK, etc.) 2. *Projectile, charge and fuze — SHELL HEP–T (no charge or fuze required) SHELL HE, CHARGE 8 FUZE QUICK or SHELL HE, CHARGE 8, FUZE DELAY. 3. Lead — LEAD, RIGHT (LEFT) 10. 4. Method of fire — Fire is continuous unless otherwise commanded. 5. Range — RANGE 600.	Sets initial lead on the azimuth counter. Traverses howitzer until the vertical reticle is centered on the target and maintains this sight picture by continuous tracking of the target. Commands FIRE, after the assistant gunner calls "Set."	Elevates or depresses the piece until the target is on the appropriate range line in the reticle. Checks the level-vial mirror and adjusts for *cant*, as required, to center the bubble. Maintains target on appropriate range line by continuous tracking. Calls "Set." *Note.* A canted reticle in the direct fire telescope introduces an unacceptable range error and prevents satisfactory direct fire on moving targets. *Note.* The gunner and assistant gunner track the target in deflection and elevation as a team, while adjusting for the correct sight picture. They will continue tracking after the round is fired and make corrections as directed by the chief of section.		
4	Gives subsequent commands based on observed effect: 1. Change in lead (given in 5-mil increments) — RIGHT (LEFT) 5 2. Change in range — ADD (DROP) 100	Actions taken for subsequent commands. While the gunner and assistant gunner continue to track the target, the chief of section gives commands based on observed effects. When the chief of section commands— RIGHT (LEFT) ( ). 1. Turns azimuth knob in 5-mil increments to set the lead change as directed. *Note.* With the click sights, the gunner can determine by sound and feel the appropriate change has been made without moving his eye from the telescope eyepiece. 2. Traverses the piece until the vertical reticle is again centered on the mass of the target. 3. Checks that the pitch- and cross-level bubbles are centered. 4. Commands FIRE, after the assistant gunner has called "Set."	When the chief of section commands— ADD (DROP) ( ). 1. Elevates or depresses the piece until the appropriate range line is centered on the mass of the target. 2. Checks the level-vial mirror and adjusts for cant as required. 3. Calls "Set." *Note.* During the laying sequence, checks the direction of the lead as set by the gunner.		
5	Commands END OF MISSION when target is destroyed or neutralized: New targets will be selected and taken under fire as outlined above. *Ammunition and fuze selection. Ammunition and fuze combinations are as follows: 1. Shell HEP–T is designed for, and is highly effective against tanks and armored vehicles. 2. Shell HE M1, Charge 7, and Shell HE M482, Charge 8, is ideally suited for antipersonnel fire and is also effective against tanks and vehicles. 3. Shell, white phosphorous, may be used to set stalled tanks and other vehicles afire and produce casualties. 4. Fuze delay may be used for richochet effect. The point of impact is adjusted 10 to 30 meters in front of the target. If less than 50 percent of the bursts ricochet, change to fuze quick. 5. Fuze time is the least desirable and should be used at ranges of 1,000 meters or greater. Areas effectively covered by air and ricochet bursts are similar.				
	ONE-MAN, ONE-SIGHT SYSTEM 1. Fire commands are the same as above except range will be given in the form of a quadrant, QUADRANT ( ). 2. Elevations are listed in table V for gun-target ranges of approximately the same altitudes. If altitude differences are apparent, it will be necessary to compute the angle value by the mil relation formula and apply it to the elevation. 3. Subsequent commands for range changes are converted to quadrant and expressed as ADD (DROP) ( ).	Lays for both deflection and range: 1. Deflection is layed the same as the two-man, two-sight system. 2. Range is announced as "Quadrant ( )" and is set on the elevation quadrant. 3. Elevates howitzer until the bubble in the pitch-level vial is centered. 4. Checks centering of cross-level bubble. 5. Tracks the target and places the vertical reticle on the center of the mass of the target. 6. Commands FIRE.			

Table IV. Duties in Preparing for Traveling

Sequence	Chief of section	Gunner	Assistant gunner	Number 1	Number 2	Number 3	Driver
1	Commands MARCH ORDER. Inspects the chamber to verify that the piece is not loaded. Supervises work of cannoneers during all activities.	Sets azimuth counter to 3,200 mils, and closes window. Sets gunner's aid counter to zero. Covers bubbles on the telescope mount. Removes panoramic telescope from its mount and stows in its case.	Sets elevation counter to zero and sets correction counter to zero. Covers bubbles on the elevation quadrant. Inspects the chamber to see that it is clear.	Recovers and disassembles the aiming posts and hands to the driver. Disassembles and secures the rammer staff and hands to the driver.	Repacks fuzes and ammunition as directed by the chief of section. Replaces fuze setter and tools in stowage compartments. Folds paulin and replaces in	Secures communication equipment. left rear turret storage rack.	Starts engine and checks gages. Replaces the muzzle cover. Secures the aiming posts. Secures rammer staff sections. Closes telescope cover.
2		Traverses the tube to the center of traverse and assists the driver to engage the howitzer traveling lock.	Closes the breech by tripping the extractors with the base of an expended cartridge case or other appropriate tool. *Warning:* Never trip the extractors by hand. The hand may be crushed by the closing breechblock.	Repacks fuzes, ammunition, and equipment as directed by the chief of section.		Under direct supervision of the chief of section, replaces powder increments in cartridge cases. Insure that all increments are present, in proper order, of proper lot number and in good condition.	Lifts the howitzer traveling lock, and assisted by the gunner, secures the tube in the traveling position. Closes direct fire telescope window.
3		Locks cab traverse lock. Inflates cab race ring seal. (prevents entrance of dust and water)	Inflates gun shield seal.				Takes post in drivers compartment.
4		Verifies all section equipment is present and secure. Closes left turret door.	Closes right turret door.	Closes real hull doors after chief of section has taken his post.			
5	Verifies that the howitzer is prepared for traveling.	Takes post.	Takes post.	Takes post.	Takes post.	Takes post.	
6	Reports to executive "Number ( ) in order," or reports any defect the section cannot remedy without delay.						

Table V. Duties in Amphibious Operations

Sequence	Chief of section	Gunner	Assistant gunner	Number 1	Number 2	Number 3	Driver
			Preparing the Vehicle for Amphibious Operation				
1	Commands PREPARE FOR AMPHIBIOUS OPERATION. Supervises the section during the operation. *Note.* The duties performed by numbers 2 and 3 will have to be accomplished by the remaining section members in the event the ammunition vehicle is not present.	Engages cab traverse lock. Elevates tube to allow installation of barriers. Removes air inlet cover. Installs front bag.	Assists gunner to install front bag.	Installs barriers.	Releases side bag latches on the right side of the howitzer. Assists number 1 to install barriers.	Releases side bag latches on the left side of the howitzer. Assists number 1 to install barriers.	Lowers and secures howitzer traveling lock. Installs muzzle plug. Removes engine exhaust deflector. Verifies battery cell vent caps are tight.
2				Attaches bilge pump hose to hull outlet.	Removes window cover from barrier.	Verifies that bag supports are engaged.	Opens and secures dipstick cover with spring retainer. Closes hull drain plugs. Closes personnel air duct.
3	Verifies that the howitzer is prepared for amphibious operation. Insures that all personnel are wearing life preservers.	Insures that cab and hull doors are securely closed.					Places inflation-deflation lever to the inflate position, turns on blower switch and inflates the flotation bags. Shifts transmission lever to "2" range and starts bilge pump.
4	Commands the driver to enter the water.						At the command of the chief of section, enters the water slowly at right angles to the bank.
			Stowing the Flotation Device				
1	Supervises the section during the operation.						Approaches bank slowly at a right angle, and reduces track speed. Drives vehicle to level ground. Opens drain valve in the driver's compartment. Operates bilge pump until all water is drained from the engine compartment. Deflates flotation bags.
2		Removes front bag and replaces air inlet cover.	Assists gunner to remove front bag.	Removes bilge pump hose from hull outlet.	Replaces window cover on the barrier. Secures side bag latches on the right side of the howitzer.	Secures side bag latches on the left side of the howitzer.	
3				Removes and secures barriers.	Assists number 1 to remove barriers.	Assists number 1 to remove and secure barriers.	Closes dipstick cover. Replaces engine exhaust deflector.
4	Inspects the vehicle to insure that the flotation device is secure.	Depresses the tube.					Raises and secures howitzer travel lock. Checks transmission and final drive oil levels for water contamination.
5	Reports "Sir, Number ( ) in order," or any defects the section cannot remedy without delay.						

Table VI. Duties in Before Operation Service

Sequence	Chief of section	Gunner	Assistant gunner	Number 1 (left side)	Number 2 (right side)	Number 3 (left side)	Driver
1	Supervises the section during the service.	Checks panoramic telescope and mount for damage, operation, and cleanliness.	Checks direct fire telescope and mount for damage, operation, and cleanliness. Checks elevation quadrant for damage, operation, and cleanliness.	Check track tension and condition of track shoes, pads, and guide. Check for leaks and condition of the hydraulic track adjuster. Check for loose or damaged drive sprockets. Check for loose or damaged road wheels. Check for loose track pin bolts. Check for loose or damaged idler wheel. Check for broken welds.		Check hydraulic shocks for leaks and support arms for water contamination. Check oil level in road wheel hubs. Bubbles and yellow discoloration of the oil in the sight plugs indicate water contamination.	Checks radiator water level and adds water if required. Checks engine oil level and adds oil if required. Refuels vehicle as required. Checks transmission oil level and adds oil if required. Checks batteries and cables for corrosion.
2	Checks for proper supply of gasoline, water, and emergency rations. Verifies that the technical manual equipment logbook, driver's accident report form, vehicle accident identification card, and lubrication order are present.	Checks gunner's elevation and traversing controls for ease of operation. Checks cab traverse lock for proper operation. Checks intercommunications system for proper operation. Checks all hydraulic connections on recoil mechanism and replenisher. Check replenisher tape for proper fluid level. Checks counterrecoil buffer fluid level.	Checks number 1 man's elevation controls for proper operation. Checks elevating and cab race ring gears for dirt and burrs. Checks gun shield seal and cab race ring seal inflation air pump, and air gage for proper operation. Checks portable fire extinguishers. Checks recoil mechanism drain plug for leakage.	Checks fixed fire extinguisher actuating handle for damage and corrosion. Check condition and security of the flotation device. Cleans all exterior lights and checks for power operation. Checks all doors and hatches for proper operation and condition of seals. Checks condition and completeness of all exterior mounted equipment. Checks for broken welds and missing parts.		Checks gun travel lock for secure mounting. Checks off-set periscope for damage. Checks muzzle brake and evacuator for corrosion and damage. Checks machinegun and mount for operation and cleanliness. Checks stowage of machinegun ammunition. Cleans and lubricates fuze setters.	Checks foot controls. Checks instrument and warning lights for normal indication. Checks vehicle steering action. Checks hand controls. Checks periscopes.
3	Inspects ammunition for proper lot number, condition, and stowage.		Checks operation of the breechblock and cleans with a dry cloth. Checks operation of the percussion mechanism and cleans as required.	Clean bore and chamber with clean dry cloth. Loads ammunition and equipment as directed.			
4	Inspects loading of section equipment for completeness and security.	Reports "Ready," and takes post.	Reports "Ready," and takes post.	Reports "Ready," and takes post.	Reports "Ready," and takes post.	Reports "Ready," and takes post.	Reports "Ready," and takes post.
5	Reports "Sir No. ( ) in order," or any defects the section cannot remedy without delay.						