DEPARTMENT OF THE ARMY FIELD MANUAL

OPERATION OF GUN DIRECTION COMPUTER M18 CANNON APPLICATION

HEADQUARTERS, DEPARTMENT OF THE ARMY

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FM 6-3-1 OPERATION OF GUN DIRECTION COMPUTER M18, CANNON APPLICATION—1964

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HEADQUARTERS
DEPARTMENT OF THE ARMY
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OPERATION OF GUN DIRECTION COMPUTER M18
CANNON APPLICATION

CHAPTER I

GENERAL

1. Purpose

This manual provides the detailed instructions for personnel who are required to operate the gun direction computer M18 (FADAC) in the cannon application. Operator instructions, which are not dependent on the cannon trajectory program, are contained in FM 6–3 and TM 9–1220–221–10/1.

2. Scope

a. This manual covers the operation of the gun direction computer M18 in the program associated functions.

b. This manual is applicable to both nuclear and nonnuclear warfare.

c. Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment. Send comments to Commandant, ATTN: AKPSIPL, U.S. Army Artillery and Missile School, Fort Sill, Okla.

CHAPTER 2

EQUIPMENT

3. General

This chapter contains a description and computational sequence for the computer.

4. Description of Tapes

Each program tape for cannon application contains computations for trajectory solution for two cannon calibers for predicted fire, registration corrections, polar and rectangular replot, and survey routine. Specific information is as follows:

a. The first caliber on the program tape is associated with those batteries set up by depressing the "1" button. The second caliber is associated with those batteries set up by depressing the "2" button.

b. The program entered in the computer's memory is determined during the test of the permanent portion of the computer's memory. The computer displays proper entry of the program in memory, the caliber combinations entered, the revision number of the program, and the security classification.

c. The survey routine solves for traverse and intersection, and will give orienting data for the 01–02 base.

5. Computational Sequence

a. The computer solves the gunnery problem by integrating the equations of motion for a projectile in flight. From the battery position and target coordinates, the computer determines the range and azimuth to the target. The computer selects the proper propelling charge (the operator may enter a different charge) and a trial quadrant elevation (1–4, fig. 1).

b. Using the trial quadrant elevation, the computer simulates the trajectory by integrating the equations of motion for a projectile in flight; with gravity, weather, and aerodynamic drag acting on the projectile. The battery position, muzzle velocity and quadrant elevation are used as the initial conditions for the integration. The acceleration of the projectile is integrated to find its velocity. The velocity of the projectile is further integrated to determine its location. At each integration, factors pertaining to the projectile and the weather are applied to determine a new location, acceleration, and velocity for continuing the integration. (5 and 6, fig. 1). At each integration the location of the projectile is compared with the target altitude. When the computed altitude of the projectile passes below the altitude of the target, the integration stops and a miss distance is computed from the initial range. If the miss distance is less than 10 meters, final corrections are applied as indicated in *c* below. If the miss distance is 10 meters or greater the trial quadrant elevation is corrected in the appropriate direction and the trajectory computations are repeated (7, fig. 1).

c. Final range corrections are applied to the quadrant elevation for the computed miss distance; then the lateral displacement of the projectile is considered. Drift, rotation of the earth, registration deflection correction and crosswind are applied to correct the initial gun-target azimuth and deflection relationship. Corrections are made to the time of flight (or fuze setting), roundoffs are applied, and the entire output is displayed by the computer.

d. The computer solves the problem by using the nonstandard conditions entered by the operator. Conditions entered into the computer remain there until changed by operator action. Turning the computer off does not erase information entered. If the operator fails to enter

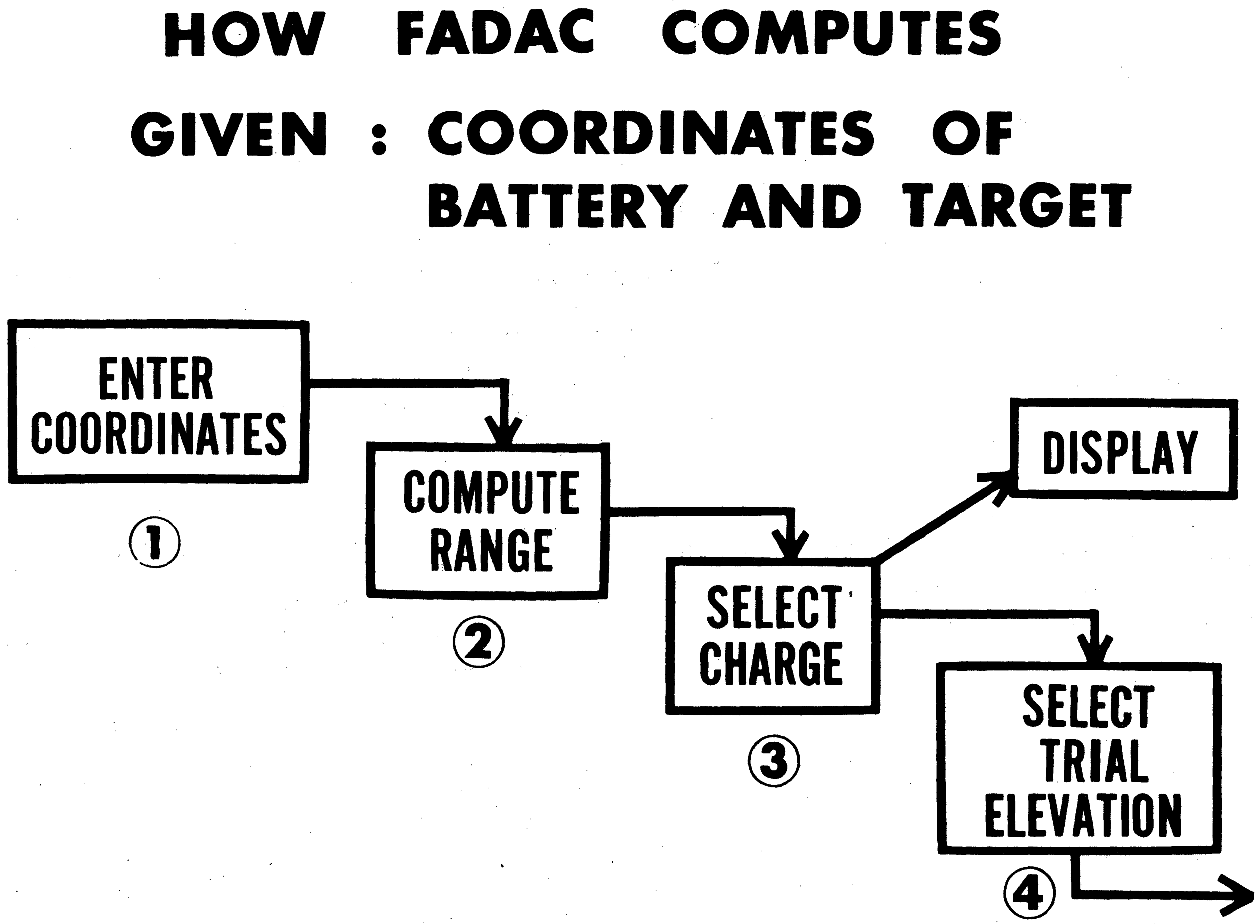

Figure 1. Computational sequence.

non-standard conditions, the computer will automatically solve the problem by using standard conditions for the effects which were not entered.

e. If the operator fails to designate a projectile for the mission, the computer uses shell high explosive (HE) for the mission.

f. The computer automatically solves a mission by using fuze quick unless the operator enters a different fuze type.

g. The computer automatically solves a mission by using the optimum charge unless the operator designates the charge to be used.

h. Table 1 contains a detailed description of the procedures for entering non-standard conditions for the various functions.

6. Testing Loops

The program tests itself constantly during periods when no computations are required. Detected errors are displayed by the ERROR light flickering.

7. Functions of Panel Controls

The functions of the panel controls (fig. 2) that specifically apply to the cannon trajectory program, with exception of the matrix, are discussed below. The matrix is discussed in detail in chapter 3.

a. SET UP Button. The SET UP button is used in conjunction with the SET UP position (F–7) to associate a cannon caliber with the selected battery button. All constants, which pertain to a given caliber such as muzzle velocity, powder temperature, projectile weight, and ballistic coefficient factor, are set to standard during the process.

b. PROG TEST Button. Depressing the PROG TEST button initiates the program test.

COMPUTE : TRAVEL OF PROJECTILE FOR FIRST FRACTION OF A SECOND IN RANGE (X) AND HEIGHT (Y) ∾

$\boxed{X} = f$ (MV, COSINE$\measuredangle$ ELEV, WT, DRAG, WEATHER, TIME)

$\boxed{Y} = f_2$ (MV, SINE$\measuredangle$ ELEV, WT, DRAG, WEATHER, TIME) $- f_3 (g)$

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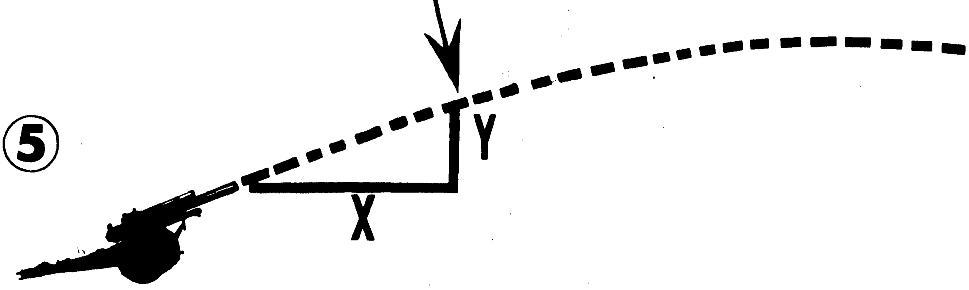


Figure 1—Continued.

Paragraph 11 contains a detailed explanation of the tests controlled by this button.

c. RESET Button. Depressing the RESET button cancels the input which caused the ERROR light to flash and takes the computer out of the input mode.

d. COMPUTE Button. Depressing the COMPUTE button initiates the solution to the gunnery problem as described in paragraph 5.

e. TRIG Button. Depressing the TRIG button initiates computations to apply a trigonometric shift to a previously computed trajectory solution. A solution is provided without simulating the trajectory solution described in paragraph 5 and provides a more rapid but less accurate solution to the problem. The use of the TRIG Button is limited as follows:

(1) If a ballistic trajectory solution has not been made since END OF MISSION instruction was used, depressing the TRIG button automatically causes a ballistic solution. If the muzzle velocity, powder temperature, projectile weight, or ballistic coefficient factor used in the previous ballistic computation are changed, a new ballistic solution will be performed.

(2) If a powder charge, not used in the previous solution, is required, depressing the TRIG button automatically causes a ballistic solution.

(3) If a shift of greater than $\pm$ 400 meters is made, depressing the TRIG button automatically causes a ballistic solution.

f. SEND and RECEIVE Buttons. The SEND and RECEIVE buttons are used only when the computer system equipment such as

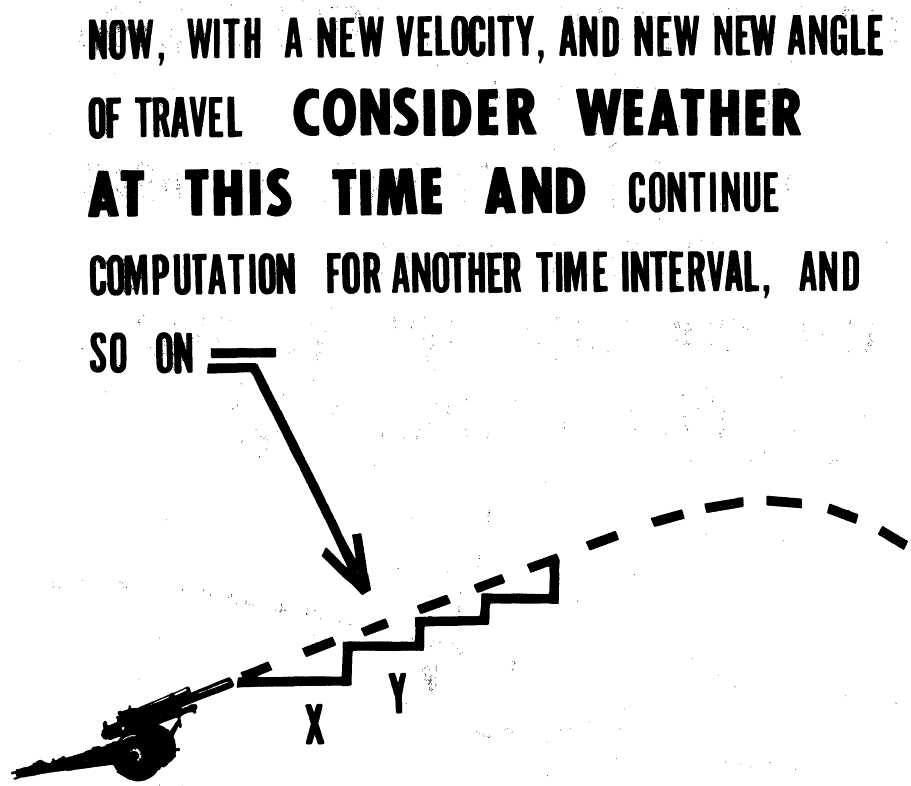


Figure 1—Continued.

the gunnery officer's console is attached to the computer.

g. Input Selection Panel. The input selection panel is located along the right side of the input selection matrix. The panel consists of buttons A, B, C, D, E which are used to select the battery for which data is to be entered or computations made, and buttons 1, 2 which are used to designate the cannon caliber during the set up procedure. Only one lettered button can be depressed at a time. Failure to depress a battery button causes the NO SOLUTION light to flicker. The 1 button refers to the first caliber listed on the program tape and the 2 button refers to the second caliber listed on the program tape as explained in paragraph 4.

8. Function of Panel Lights

The function of lights on the operator's panel (fig. 2) that specifically apply to the cannon trajectory program are described below. TEMP, TRANSIENT, PARITY, and POWER READY lights are not program associated and are described in detail in FM 6-3 and TM 9-1220-221-10/1. Table I, matrix location E-5 (CLEAR MEMORY) describes corrective action if PARITY light flickers.

a. ERROR Light. The ERROR light is normally on and flickers when there is an internal overflow or an error verification. Flickering of this light may be caused by the entry of a number too large for the computer. Flickering is corrected by depressing the RESET button.

b. NO SOLUTION Light. The NO SOLUTION light is normally on and flickers when problem cannot be solved or has been incorrectly entered in the computer. Paragraph 15 contains the specific errors that may be displayed. Flickering may be corrected by depressing the RECALL or SAMPLE MATRIX key.

c. COMPUTE Light. The COMPUTE light normally is off. When the light is on, the computer is in the compute mode.

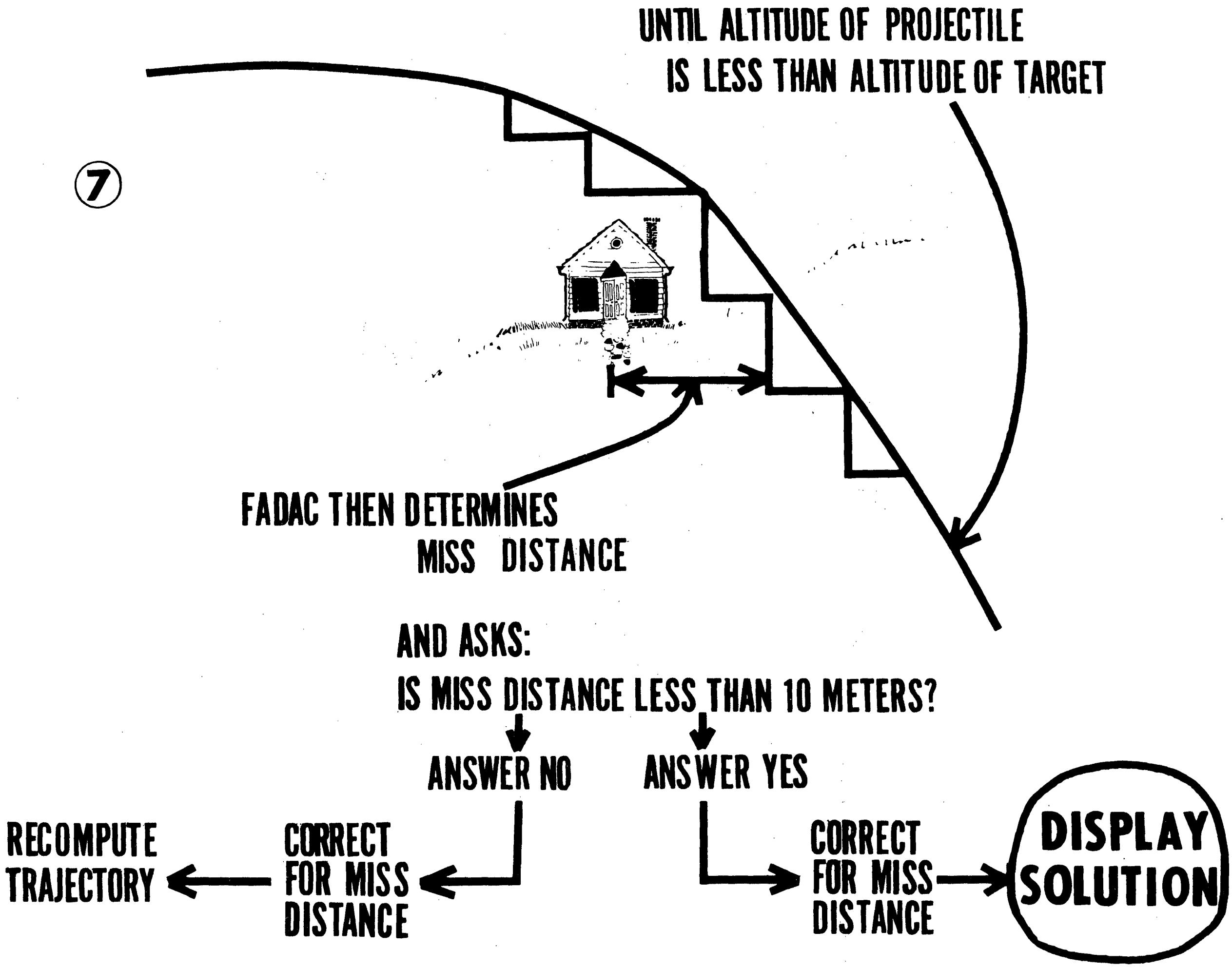


Figure 1—Continued.

d. KEYBOARD Light. The KEYBOARD light is normally off. When the light is on, the computer is demanding an entry through the keyboard.

e. IN OUT Light. The IN OUT light are used in conjunction with the SEND-RECEIVE buttons when the computer is connected to an external device.

9. Keyboard

The keyboard keys are nonprogram associated, and their functions are described in FM 6–3 and TM 9–1220–221–10/1.

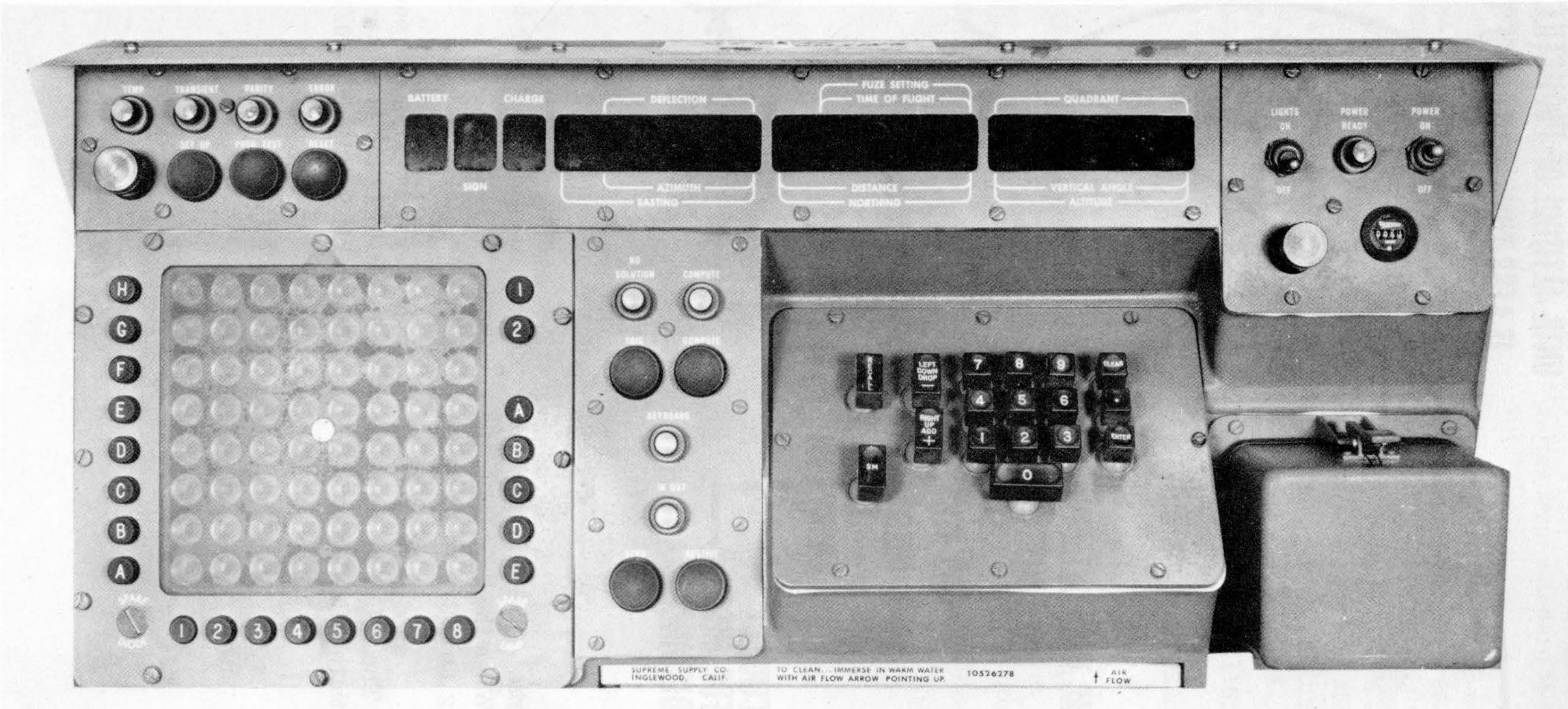


Figure 2. Operator control panel.

CHAPTER 3

OPERATOR PROCEDURES

Section I. GENERAL

10. General

This chapter describes the use of the input selection matrix and other operator procedures and computer displays associated with the cannon trajectory program.

11. Program Tests

Test of permanent and working storage should be conducted by the operator after the program is entered in memory, after turning the computer on, and after a loss of power.

Caution: **The channel select switch inside the computer must be set in the 12 position by maintenance personnel prior to operation of the computer with any of the cannon programs.**

a. The procedure to test permanent storage is as follows:

(1) Depress the PROG TEST button. The keyboard light will light.

(2) Depress the 1 key on the keyboard. If the test is successful a series of zeroes will be displayed in the DEFLECTION windows and the left 3 digits of the FUZE SETTING windows (fig. 3). If unsuccessful the NO SOLUTION light will flicker and a different series of numbers will be displayed. The remaining numbers in the FUZE SETTING, QUADRANT, and CHARGE windows indicate the program which is entered in the computer.

(3) Repeat the test if the first attempt is unsuccessful. If it is successful on the second or third attempt, the operator is reasonably certain the program is properly loaded. The cause of the condition above is due to aging parts in the computer. Organizational maintenance should be scheduled immediately.

b. The procedure to test working storage is as follows:

(1) Depress the PROG TEST button. The keyboard light will light.

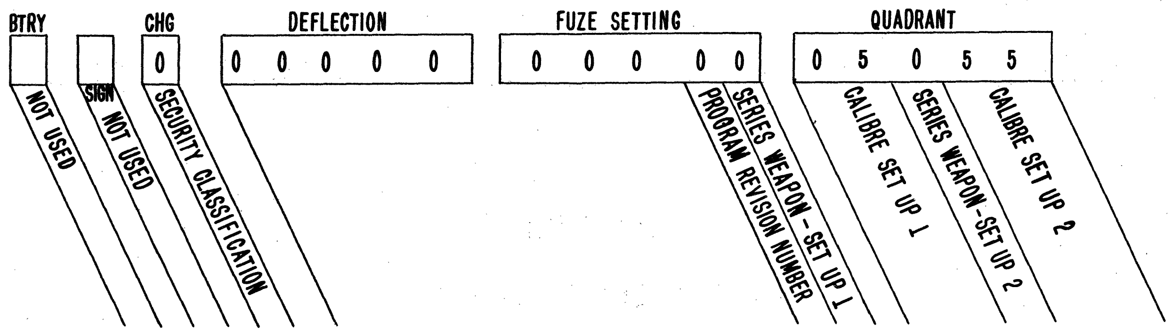
(2) Depress the 2 key on the keyboard. If the test is successful, the number 136 will appear in the 3 digits to the right in the QUADRANT window. If the test is not successful the NO SOLUTION (PARITY) light will flicker and a number 136 or less (less than 136) will be displayed in the QUADRANT window.

(3) If the test is unsuccessful, the computer will display the number of the line in the computer memory in which the error occurred. The incorrect line must be cleared and the data reentered using normal entry procedures. To clear a memory line use procedures described in matrix position E–5 (CLEAR MEMORY) (fig. 4). After the line is corrected, repeat the test and corrective action until the proper display is obtained.

c. A third test, which insures proper computer operation, is to cause the computer to solve a sample problem for which the answer is known. This test should be made only during lulls in firing and maintenance periods.

12. Computer Inputs

The most accurate information is entered in the computer for best results. If all the elements for a predicted fire solution are not



SECURITY CLASSIFICATION CODES

0 - For Official Use Only
1 - Unclassified
2 - Confidential
3 - Secret
4 - Top Secret
5- 9 - To be announced as needed.

PROGRAM REVISION NUMBERS

0 - Original Program
1 - 1st Revision
2 - 2nd Revision
3- 9 - 3rd thru 9th Revision

SERIES WEAPONS CODES

105 How
0 - M101A1 (M2A2), M101 (M2A1) M52 (M49)
1 - M108 (XM103)
155 How
0 - M114A1 (M1), M44A1 (M45)
1 - M109 (T255E2)
8 - Inch How
0 - M115 (M2), M55 (M47) M110 (M2A1)
280 Gun
0 - M66 (T131)

CALIBRE CODES

05 - 105 Howitzer
55 - 155mm Howitzer
08 - 8 inch Howitzer
80 - 280mm Gun
75 - 175mm Gun

Figure 3. Program test 1 display.

known, that information which is known should be entered and the remaining information either left at standard or entered on an experience correction basis. Ballistic inputs, their source and accuracy are noted as follows:

a. Battery Eastings, Northing, Altitude. This data is obtained for the computer with the same methods it is obtained for manual FDC procedures.

b. Target Data. Same comment *a* above.

c. Battery Azimuth Laid (Matrix position H–4) and Battery Deflection (Matrix position H–5). These are the azimuth on which the battery is laid and the deflection at which the aiming posts are placed and may be obtained from the Battery Executive Officer's Report.

d. Battery Latitude. Battery Latitude (Matrix Position F–1) and Grid Declination Angle (Matrix Position F–2) may be obtained from the marginal information of the map of area in which the unit is operating. This data applies to all batteries when entered.

e. Powder Temperature. Powder Temperature (Matrix Position G–2) may be obtained from the powder thermometer at the firing battery. Only one powder temperature per battery may be entered at any given time.

f. Projectile Weight. Projectile Weight (Matrix position G–3) may be read directly from the projectile itself. Since the computer uses absolute value of the projectile weight for its computations, the weight of those projectiles whose weight is measured in squares must be converted to the absolute weight. Annex A outlines the method of converting the weight for various type projectiles. A projectile weight for each different type shell, e.g., Shell HE, Shell WP, may be entered at any given time.

g. Ballistic Coefficient Factor (Matrix Position G–4). This matrix position is provided for changes in the ballistic coefficient. The ballistic coefficient of a particular projectile is the measure of that projectile's ability to overcome air resistance. It is based on a particular lot of projectiles and may change with a change in projectile lots. Normally this function remains at 0.00% but it can be changed by as much as ± 15.00%. However, it should not be changed unless directed to do so by proper authority.

h. Meteorological Message. The meteorological message (matrix position G–5) may be ob-

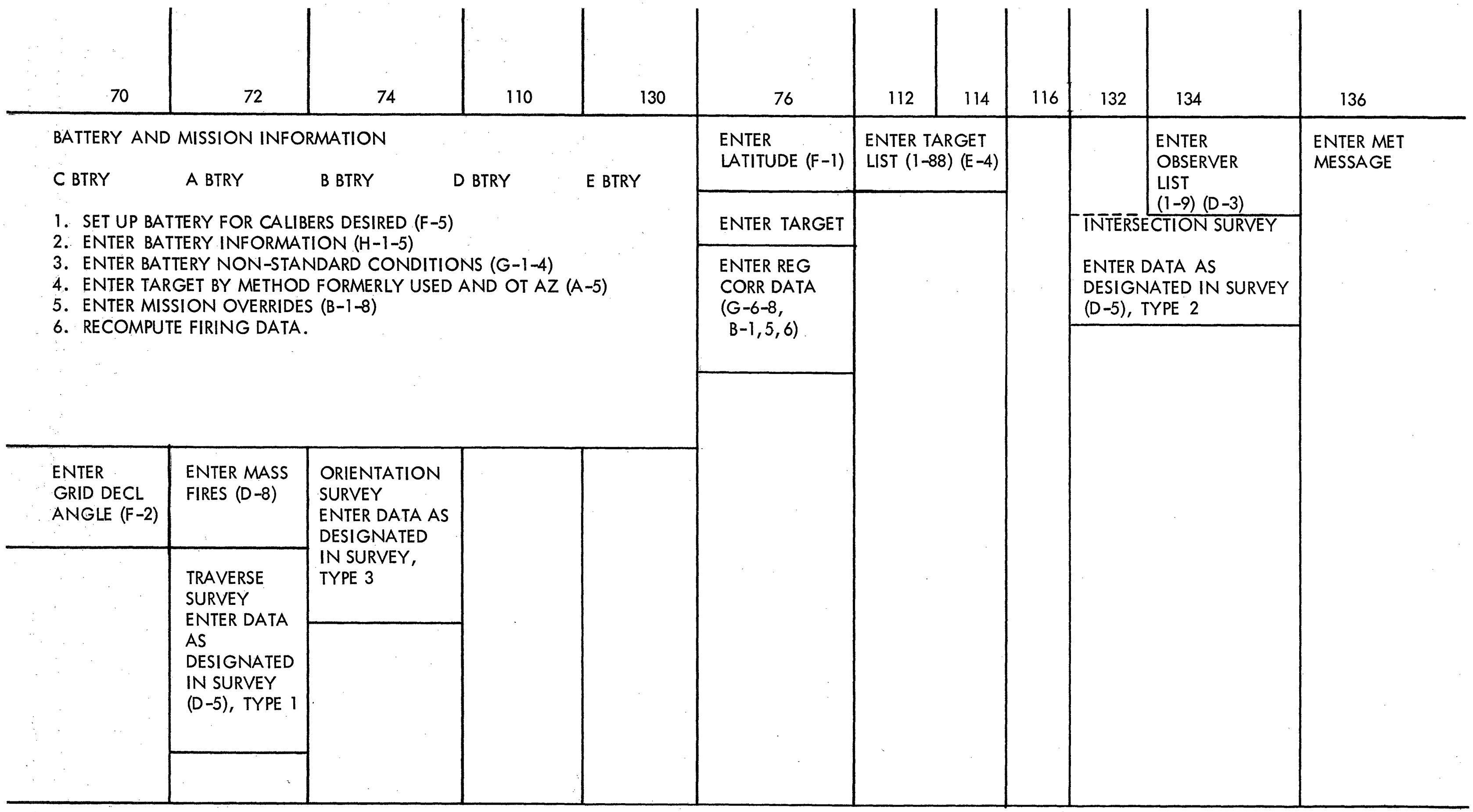


Figure 4. Memory map.

tained from the met station in the normal manner. The computer uses a raw met message (normally referred to as a computer met message) for its computations. The method of preparing this message is described in FM 6–15. This message may be entered manually or by use of the met tape. If it is entered by tape, the tape must be prepared correctly to include proper location of carriage returns and line feeds. The computer will not accept the NATO met message.

i. Muzzle Velocity. Muzzle velocity (matrix position G–1) may be obtained in several ways.

(1) The preferred method of determining the muzzle velocity is by direct measurement using a chronograph.

(*a*) Using the chronograph M–36, the muzzle velocity may be measured during any type fire mission. A direct muzzle velocity reading is obtained.

(*b*) Muzzle velocity may also be obtained by direct measurement using the skyscreen chronograph. Reading obtained will be a muzzle velocity variation (MVV) which may be subtracted from the standard muzzle velocity to obtain the piece muzzle velocity for entry into the computer.

(2) The second method of obtaining muzzle velocity is from fall of shot calibrations. This velocity actually represents a velocity error (VE) converted to muzzle velocity and has absorbed errors at the time of firing such as met, survey, etc., and any changes in the ballistic coefficient because of different projectile lots and muzzle velocity levels. Although this is not the best method of obtaining muzzle velocity inputs for the computer, it is sufficiently accurate for most firings. These VE's may be computed by the following methods:

(*a*) The computer may be used to compute the muzzle velocity directly after the conduct of a registration. Record the adjusted quadrant elevation but do not enter the registration corrections into the computer. Using the registration point as a target, modify the muzzle velocity until the adjusted quadrant elevation is displayed by the computer. A bracketing procedure should be used. The muzzle velocity for the registering piece to cause the computer to display the adjusted quadrant elevation may be considered as the muzzle velocity for that piece. By applying the difference in comparative VE's, the muzzle velocities for the non-registering batteries may then be determined. This method may be used only when the muzzle velocity is the single unknown factor and it is necessary that an accurate projectile weight, powder temperature, valid met message, and good latitude and grid declination data be entered into the computer at the time of registration. The accuracy of the muzzle velocity obtained is in direct ratio to the accuracy of these inputs.

(*b*) VE's computed by hand may be converted to a muzzle velocity by subtracting the VE from the standard muzzle velocity. The preferable VE's to be used are those based on a fall of shot calibration. Those VE's derived from a registration with concurrent met should be considered as the least preferable non-standard muzzle velocities.

13. Five Digit Coordinates Requirement

Each coordinate must be entered to five digits (nearest meter), or the program will halt and the NO SOLUTION light will flicker. The display will retain the erroneous coordinate as entered. To correct the error, the operator—

a. Depresses the SM key display will extinguish and the keyboard light will light.

b. Enters the correct coordinate to five digits through the keyboard.

14. Entry Procedures for Meteorological Message Tape

The meteorological message (met) tapes are usually cut by a radio teletypewriter such as the AN/GRC–46. Running the length of the tape are small offcenter sprocket holes, which allow one side of the tape to contain as many as two punched holes and the other side as many as three. If the tape is cut by a radio teletypewriter, there will be a print out of the information along the wide side of the tape (fig. 5). The procedure for entering the (met) message tape into the mechanical tape reader on the computer and for causing the computer to read the tape are outlined below.

a. Determining the Front of the Tape. The starting end of the tape may be determined by placing the tape in the tape reader with the wide side toward the computer and the printing on the upper side of the tape. If the tape does not contain a printout, the front of the tape will be pointing in the direction of tape flow through the tape reader (fig. 6).

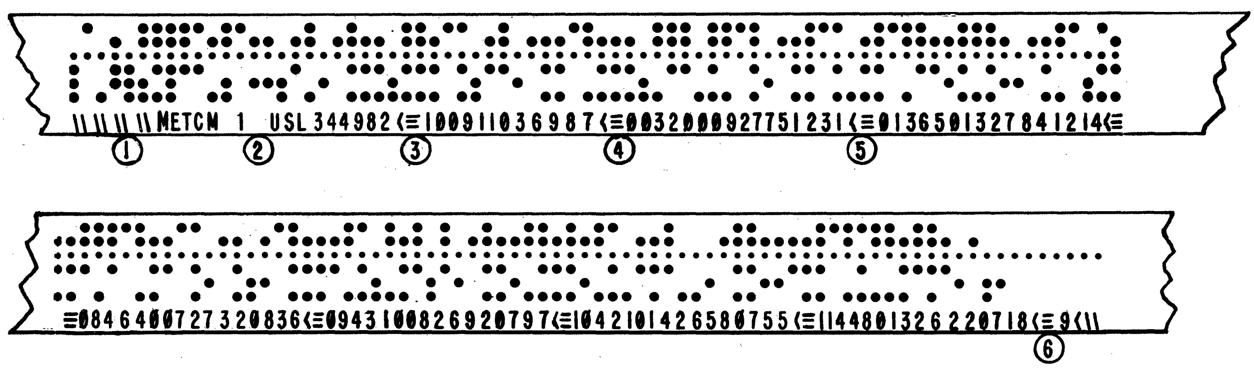
b. Loading the Tape. To place the tape on the reader, open the clamp armature that keeps the tape in place (fig. 7). Place the tape in the track with the wide side (three holes) toward the computer and the narrow portion to the outside. Insure that the entire message section is to the left of the read head (the tape moves in a clockwise direction). Place the tape under the read head clamp, engage the tape sprocket holes with the reader sprockets, and shut the armature clamp (fig. 8). Turn the sprocket knob on the upper right side of the reader a few times to insure correct engagement. If the tape does not move freely, verify that the sprocket holes have made proper contact with the sprocket and that the tape is properly threaded between the read head and the sprocket (fig. 9).

c. Causing the Computer to Read the Tape.

(1) Depress matrix buttons G–5 (MET INPUT lights).

(2) Depress SM key (Keyboard light will light.)

(3) Enter a nonzero digit through the keyboard. (The reader will automatically start reading the tape in a clockwise direction.) Insure that the tape does not tangle while reading. (The mode will be terminated internally.)



1. SYMBOL FOR TAPE ADVANCE.
2. SYMBOL FOR PRINT LETTERS INSTRUCTION.
3. BREAK AFTER LOCATION ITEM IN IDENTIFICATION LINE.
4. SYMBOL FOR LINE FEED INSTRUCTION.
5. SYMBOL FOR CARRIAGE RETURN INSTRUCTION.
6. SERIES OF SYMBOLS AND DIGIT WHICH INDICATE THE END OF THE METEOROLOGICAL MESSAGE.

Figure 5. Meteorological message tape.

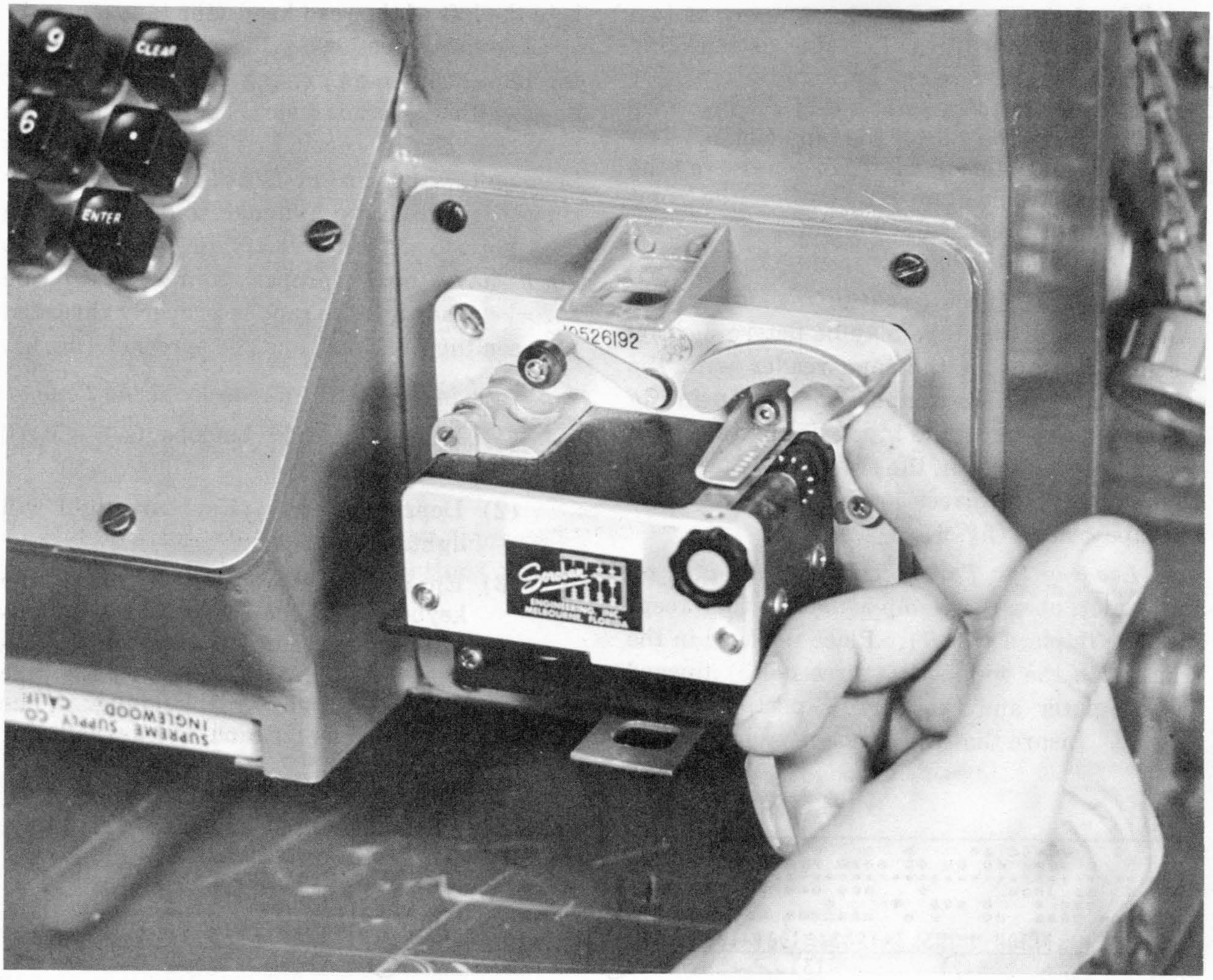


Figure 6. Determining the front, meteorological message tape.

15. Error Indications

In addition to the nonprogram associated error indications described in FM 6–3 and TM 9–1220–221–10/2 the following error indications are associated with the cannon trajectory program. In all cases the NO SOLUTION light flickers in addition to the displays described below:

a. x . . . . 0—Out of range; x = charge.

b. . . . . 1—Battery Button changed during computation.

c. . . . . 2—Fuze type and/or projectile type error; illegal shell/fuze combination; no HOB when required; projectile weight too large.

d. . . . . 3—Observer corrections entered without an OT azimuth entry.

e. . . . . 4—Illegal auxiliary or white bag charge.

f. . . . . 5—No observer azimuth, horizontal or slant distance, or vertical angle entered in the survey routine. Both horizontal and slant distance entered in survey routine.

g. . . . . 6—No target entered before attempting a ballistic computation.

h. x . . .. 8—Out of range, target at or before the peak of the trajectory. x = charge.

i. Gun orders displayed with NO SOLUTION light flashing—maximum on carriage elevation has been exceeded.

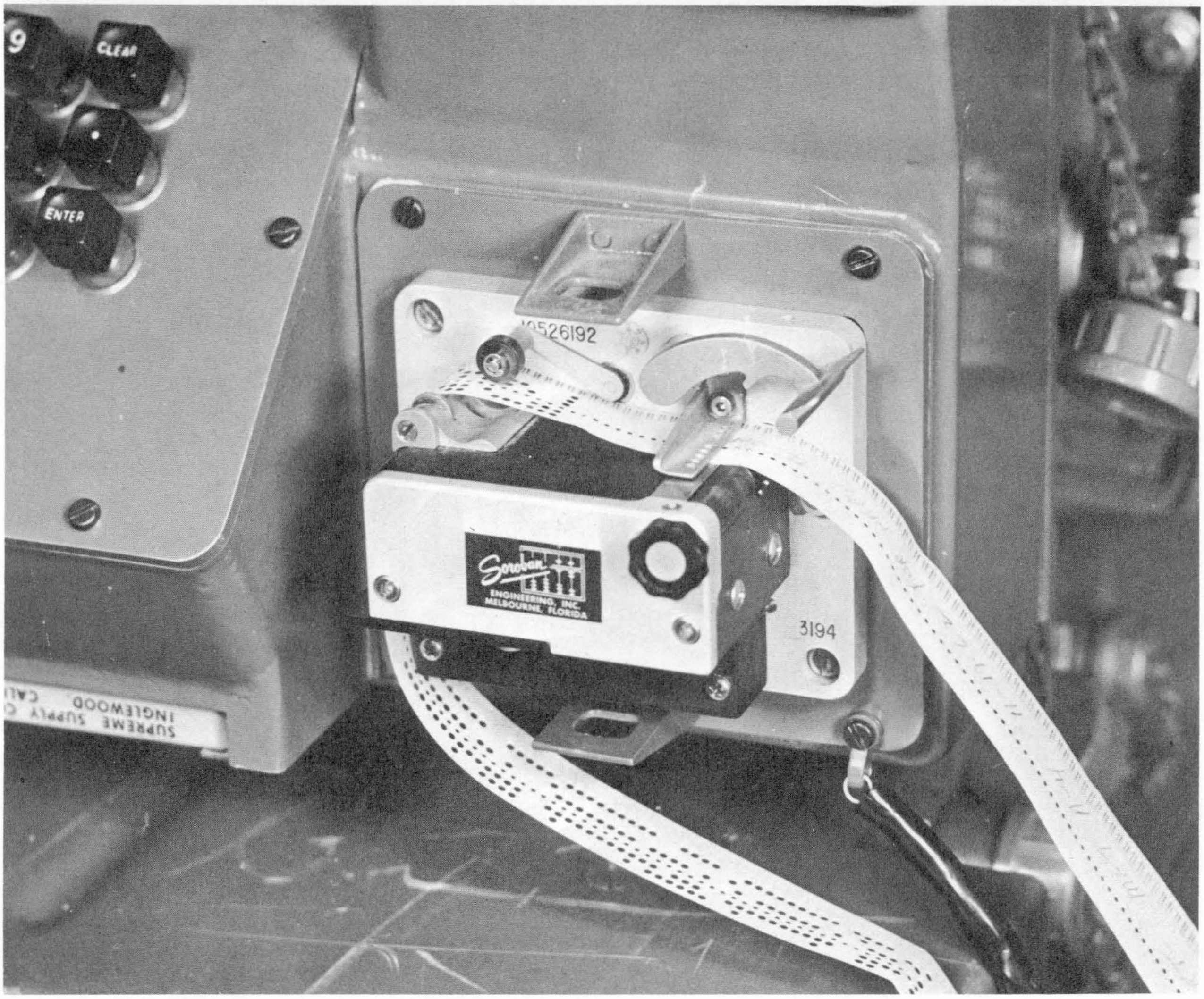


Figure 7. Placed meteorological message tape.

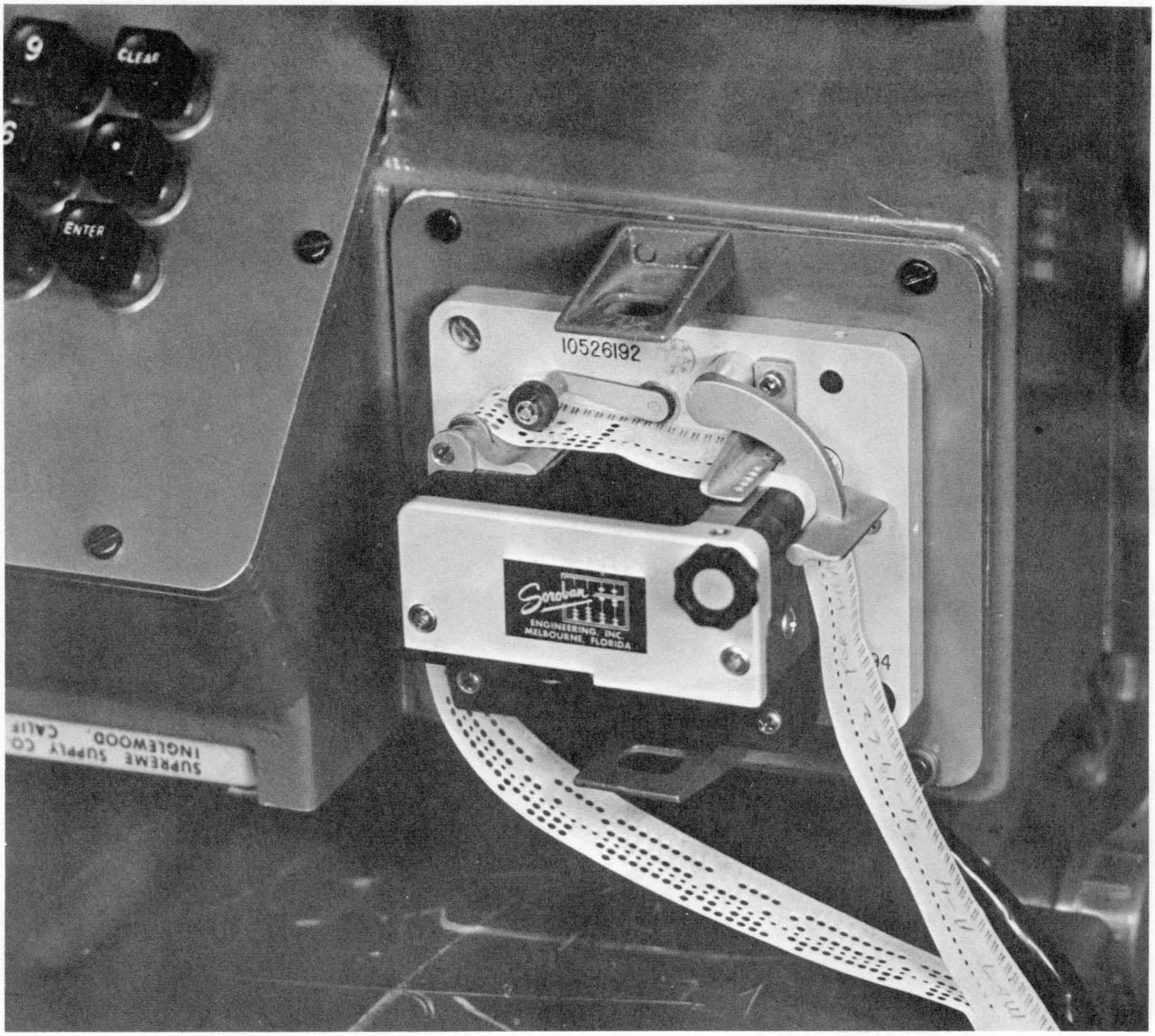


Figure 8. Armature clamp closed on meteorological message tape.

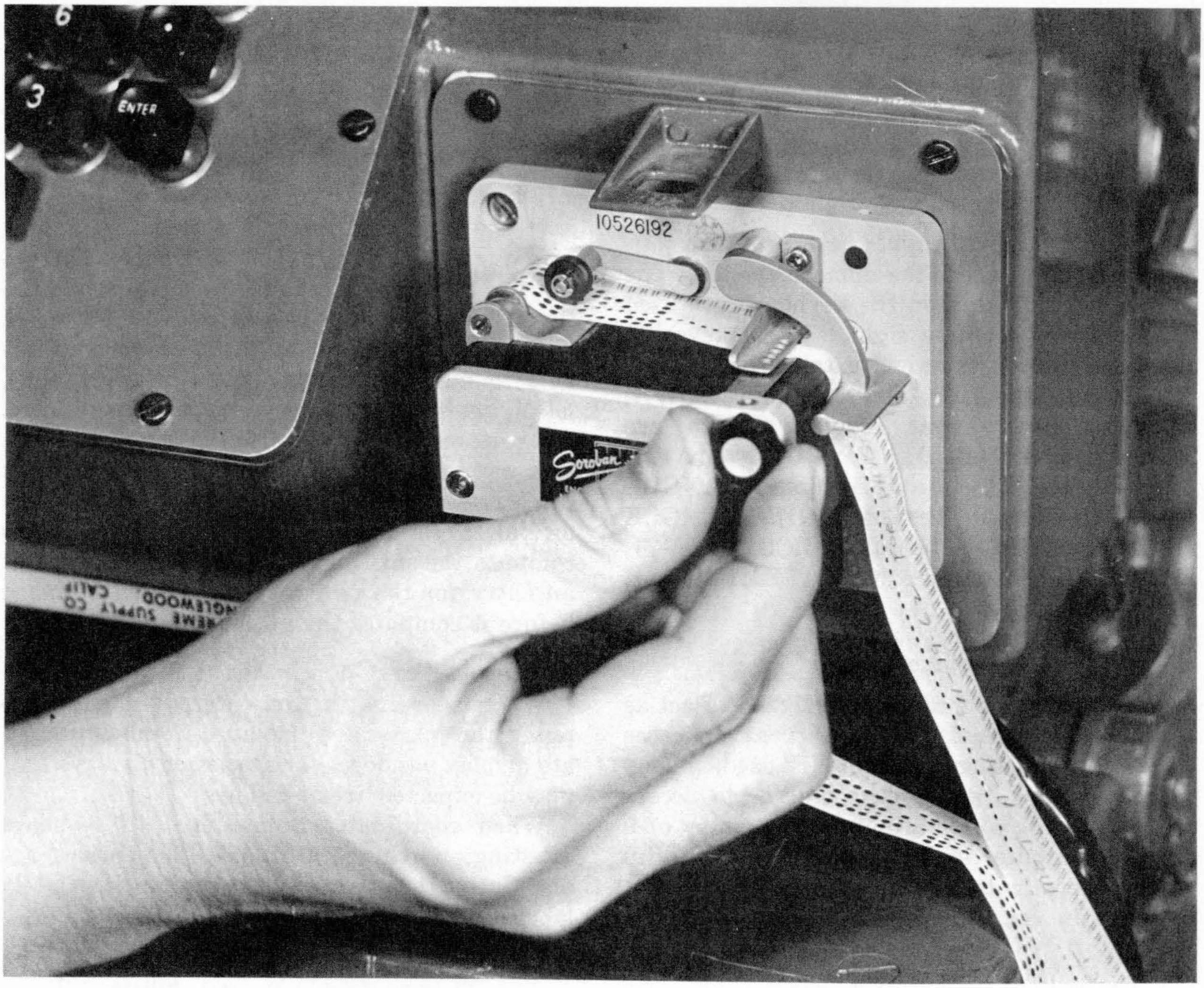


Figure 9. Checking meteorological message tape threading.

Section II. OPERATOR INSTRUCTIONS

16. General

The procedures necessary to prepare the computer for operation are contained in FM 6–3. The specific instructions and procedures required to operate the computer in the cannon application are contained in this section and the following chapters.

17. Sample Matrix and Recall Keys

The sample matrix (SM) key is used to prepare the computer for keyboard input. The RECALL key is used to recall from the memory of the computer the function selected on the matrix. When the SM key is depressed, the KEYBOARD light will light. Do not change the matrix position after the SM or RECALL key has been depressed and before the numerical input has been entered. Changing the matrix position will cause the NO SOLUTION light to flash and the data will not be accepted. If the matrix position has been changed, the SM or RECALL key is depressed again and the information is reentered.

18. Clear and Enter Keys

The CLEAR key is used to erase the display without affecting the memory of the computer. When the CLEAR key is depressed, correct information can be entered without depressing the SM key again. The ENTER key is used to enter information in the memory of the computer. An entry error discovered after the ENTER key has been depressed, is corrected by reselecting the function, depressing the SM key, and reentering the information.

19. Functions Demanding Signed Input

Several numerical inputs require that a plus or minus sign precede the numerical entry. The plus and minus keys on the keyboard are used for the input of these signs. These keys are also used for observer adjustment signs, i.e., + (RIGHT, UP, ADD) and — (LEFT, DOWN, DROP). Inputs that require a sign are RIGHT/LEFT (A–6), UP/DOWN (A–7), ADD/DROP (A–8), OBS VERT ANGLE (C–7), LAT (F–1), GRID DEC ANGLE (F–2), DF CORR (F–6), TIME CORR (F–7), RANGE CORR (F–8), POWD TEMP (G–2), and BCF (G–4).

20. Enabling Procedure

The enabling procedure is designed to act as a safeguard against operator error. In cases where the enabling procedure is used, a keyboard entry of 0 tells the computer to accept the routine for computation, and an entry of 9 tells the computer to disregard the proposed input and terminate the mode. The inputs that require an enabling procedure are HIGH ANGLE (B–2), AUX CHG (B–3), GT LN ADJ (B–4), WHITE CHG 3, 4, 5 (B–8), TEMP MSN RECALL (D–6), TEMP MSN STORE (D–7), EOM (E–1), MET STD (H–6), and ZERO CORR (H–7).

21. Function Reset to Minus Zero

If the computer resets a function to minus zero during computation, it will demand an entry for that function for subsequent computations. This function is a safety feature which will avoid errors made by the operator who forgets to make a certain entry. For example, EOM resets the target data to minus zero. Thus, if, on a new target, the operator enters a new easting and altitude but forgets to enter the target northing, the computer does not use an old target northing for the new target to compute the mission; instead, it requires that an entry for the new target northing be made before it computes the mission.

22. Display of Coordinates

When coordinates are entered in the computer, the entries are displayed in the appropriate display window. The types of displays that may be expected are as follows:

When coordinates are entered in sequence (easting, northing, altitude), the entries are displayed during entry in the appropriately labeled display window.

CHAPTER 4

INPUT SELECTION MATRIX

23. General

This chapter describes the use of each function of the cannon program. Unless otherwise stated, the functions are applicable to all cannon calibers.

24. Description of Matrix

The use of the input selection matrix (fig. 10) to cause the computer to solve a problem is explained in detail in each matrix position in table I.

a. The input selection matrix has six sections. Each section is color coded for ease of identification and the operator may use any section without regard to sequence. The six sections are as follows:

(1) Target information—Row A, color coded yellow.

(2) Overrides—Row B, color coded red. Enters fuze, projectile, and charge overrides.

(3) Observer information and survey—Row C and part of row D, color coded gray.

(4) Miscellaneous information—Row E and sections of rows D and F. color codes vary with the nature of the function to contrast with adjacent sections. Enters functions such as EOM, TARGET DATA STORE, etc.

(5) Battery information—Upper left corner of the matrix, rows F, G, and H, color coded yellow. Enters battery parameters for predicted fire. The computer uses standard values if no entry is made.

(6) Registrations—Upper right corner of the matrix, rows F, G, and H, color coded green. Enter and compute registration corrections.

b. Columns. An explanation of the columns in table I follows:

(1) The input function column includes the name of each function as it appears on the input selection matrix.

(2) The matrix location column gives the location of each function by the row (A–H) and column (1–8) in which it is found. The input functions are listed in table I in alphabetical and numerical order from A-1 to H–8.

(3) The battery column designates whether or not a function is battery associated. If SPECIFIC appears in the column, the input must be associated with a particular battery. If ANY appears in this column, it does not matter which button is depressed. The NO SOLUTION light flickers if a battery button is not depressed. In all cases, a battery button must be depressed to start computations.

(4) The entry procedure column gives the detailed instructions for entering a particular function or causing the computer to solve the problem presented by that function. The term "enter" means that after the operator types the information on the keyboard, and the information is displayed, the ENTER key is depressed to allow the information to be entered in the memory of the computer. Some functions, such as SURVEY, require the entry of more than one function. Unless specifically noted, information may be entered into the computer in any sequence.

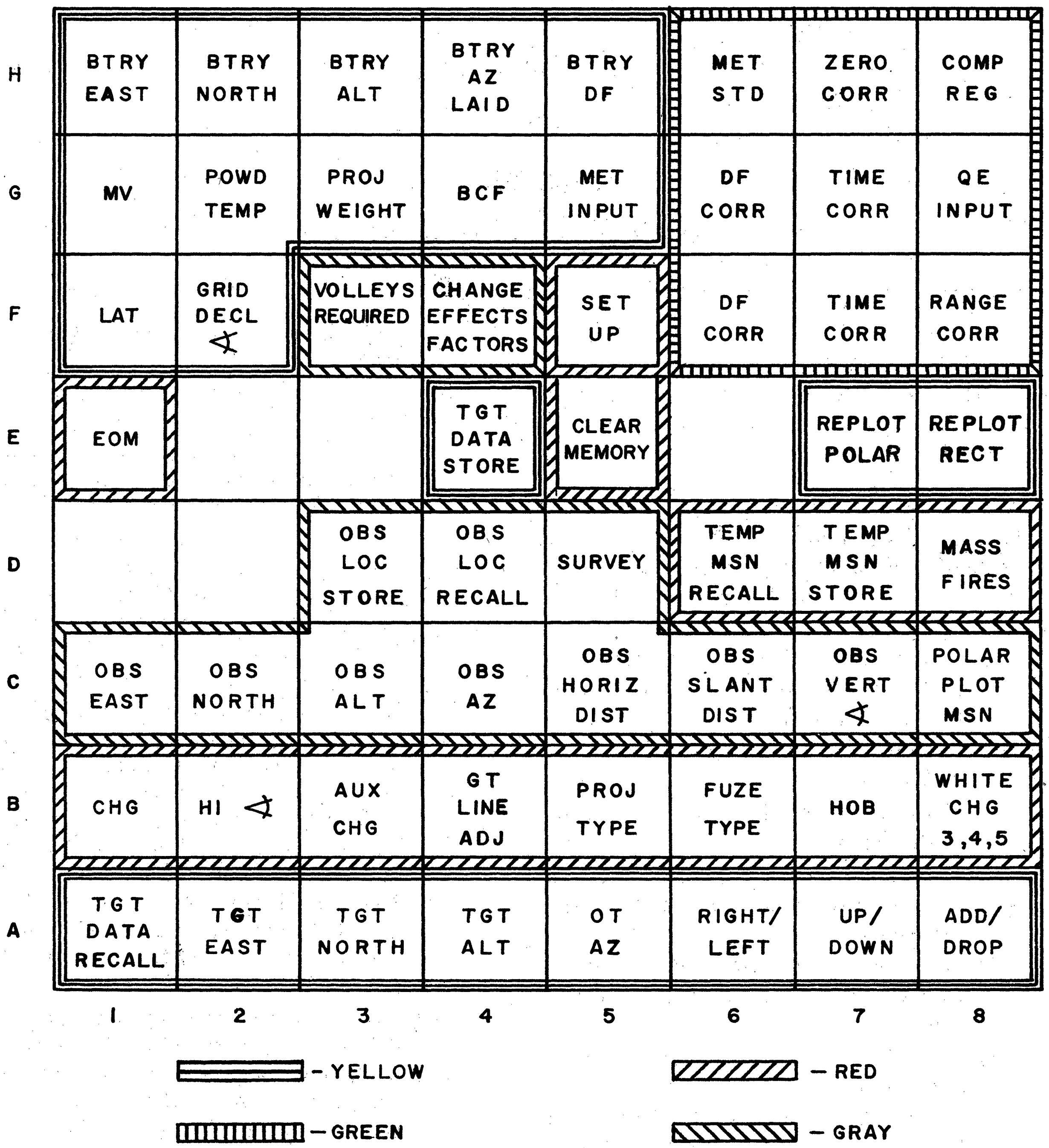


Figure 10. Cannon input selection matrix.

(5) The recall procedure column gives the detailed instructions for recalling information stored in the memory of the computer for certain matrix locations. All input functions that are not recallable are indicated in the table. Some input functions show only if they have been selected and these functions are also designated in the table.

(6) The remarks column contains any remarks pertaining specifically to the function listed and cautions concerning the use of a function.

Table I. Cannon Input Selection Functions

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
TGT DATA RECALL	A–1	Specific	N/A	1. Depress matrix buttons A–1 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Enter number assigned to target (0 to 88) (Coordinates and altitude of target are displayed.)	1. Used to recall target coordinates previously stored by TGT DATA STORE (E–4). 2. Target is associated with battery selected. 3. Entry of 0 will recall the current battery target coordinates and altitude updated for observer shifts.
TGT EAST	A–2	Specific	1. Depress matrix buttons A–2 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Enter target easting to nearest meter (00000 to 99999.)	1. Depress matrix buttons A–2 (Matrix position lights.) 2. Depress RECALL key (TARGET EASTING is displayed.)	1. Used to enter easting coordinates of target. 2. Five figure coordinates must be used. If not, the NO SOLUTION light will flicker and display will remain. See paragraph 13 for corrective procedure. 3. Reset to a minus 0 by *EOM*.
TGT NORTH	A–3	Specific	1. Depress matrix buttons A–3 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Enter target easting to nearest meter (00000 to 99999.)	1. Depress matrix buttons A–2 (Matrix window lights.) 2. Depress RECALL key. (Target northing is displayed.)	1. Used to enter northing coordinates of target. 2. Five figure coordinates must be used. If not, the NO SOLUTION light will flicker and display will remain. See paragraph 13 for corrective procedure. 3. Reset to a minus 0 by *EOM*.
TGT ALT	A–4	Specific	1. Depress matrix buttons A–4 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Enter altitude to nearest meter (0 to 65.535.)	1. Depress matrix buttons A–4 (Matrix window lights.) 2. Depress RECALL key (Altitude is displayed.)	1. Used to enter altitude of target above sea level. 2. Reset to minus 0 by *EOM*. 3. If no TGT ALT is input, computer will use BTRY ALT (H–3) for the target in computations.
OT AZ	A–5	Specific	1. Depress matrix buttons A–5 (Marix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Enter observer-target azimuth to nearest mil (0–6400 mils.)	1. Depress matrix buttons A–5 (Matrix window lights.) 2. Depress RECALL key (Observer-target azimuth is displayed.)	1. Used to enter azimuth from observer to target. 2. Reset to minus 0 by *EOM*. 3. Entry of leading zeros is not necessary. 4. This entry is not used in event GT LN ADJ (B–4) or POLAR PLOT MSN (C–8) is used.

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
RIGHT/ LEFT	A–6	Specific	1. Depress matrix buttons A–6 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Depress LEFT or RIGHT on keyboard (left causes – sign to be displayed; right causes + sign to be displayed.) 4. Enter correction to nearest meter.	1. Depress matrix buttons A–6 (Matrix window lights.) 2. Depress RECALL key (correction is displayed. A left correction has a – sign; a right correction has a + sign).	1. Target coordinate values are modified as a result of the shift. 2. Automatically reset to 0 during computation.
UP/DOWN	A–7	Specific	1. Depress matrix buttons A–7 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Depress UP or DOWN on keyboard. (Up causes + sign to be displayed; Down causes – sign to be displayed.) 4. Enter correction to nearest meter.	1. Depress matrix buttons A–7 (Matrix window lights.) 2. Depress RECALL key. (Correction is displayed. An up correction has a + sign; a down correction has a – sign.)	1. Target altitude is modified as a result of the shift. 2. Automatically reset to 0 during computation.
ADD/ DROP	A–8	Specific	1. Depress matrix buttons A–8 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Depress ADD or DROP on keyboard. (ADD causes + sign to be displayed; DROP causes – sign to be displayed.) 4. Enter correction to nearest meter.	1. Depress matrix buttons A–8 (Matrix window lights.) 2. Depress RECALL key (correction is displayed. An add correction has a + sign; A drop correction has a – sign.)	1. Target coordinate values are modified as a result of the shift. 2. Automatically reset to 0 during computation.
CHG	B–1	Specific	1. See Remark 1 before using. 2. Depress matrix buttons B–1 (Matrix window lights.) 3. Depress SM key (KEYBOARD light lights.)	1. Depress matrix buttons B–1 (Matrix window lights.) 2. Depress RECALL key (Charge is displayed.)	1. This is an override button. The computer will normally select its own charge unless this override is directed. 2. Selection of charge may be changed at any time during mission by following the entry procedure. 3. Computer will again select its own charge after: a. EOM(E–1) is selected. b. Entering a charge of 0.

			4. Enter Charge desired (1 to 7).		4. See Appendix II to determine permissible charges.
HI ANGLE	B–2	Specific	1. Depress matrix buttons B–2 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Enter 0 to cause computer to solve mission for high angle fire (Keyboard light extinguishes.)	1. Depress matrix buttons B–2 (Matrix window lights.) 2. Depress RECALL key. (If HI ANGLE has been selected for this mission, a 0 is displayed. If HI Angle has not been selected for this mission, a 9 is displayed.)	1. Unless this input function is selected, the computer will give the solution for low angle fire. 2. After selection of this function for a mission, firing data will be computed using high angle fire until this function is dismissed. To dismiss this function and get back into low angle fire, the following procedure is used: a. Follow steps 1 and 2, entry procedure. b. Depress 9 on keyboard (KEYBOARD light goes out.) c. Depress enter key on keyboard. 3. This function is dismissed by selection of EOM.
AUX CHG	B–3	Specific	1. Insure that computer is in high angle mode (See HI ANGLE B–2) and the battery selected is a 105 Howitzer battery. 2. Depress matrix buttons B–3 (Matrix window lights.) 3. Depress SM key (KEYBOARD light lights.) 4. Enter 0 to cause computer to solve mission using auxiliary charges (KEYBOARD light extinguishes.)	1. Depress matrix buttons B–3 (Matrix window lights.) 2. Depress RECALL key. (If Aux Chg has been selected for this mission, a 0 is displayed; if Aux Chg had not been selected for this mission, a 9 is displayed. To recall the specific auxiliary charge used, follow Recall Procedure-out-lined for CHG (B–1).)	1. This override is used to have the computer compute the mission using the auxiliary charges (green bag). 2. The need for this override will be designated by an out of range display for charge 1, with the computer in high angle fire. This override should not be used unless this is displayed. 3. This override applies only to 105 Howitzer batteries and can be used only in high angle fire. 4. The auxiliary charges reduce the minimum range in high angle fire. 5. This function is dismissed by EOM. 6. If this function has been selected and sample matrix has been depressed, this function may be dismissed by depressing 9 on the keyboard.
CT LN ADJ	B–4	Specific	1. Depress matrix buttons B–4 (Matrix window lights.)	1. Depress matrix buttons B–4 (Matrix window lights.)	1. This function is used to effect corrections with respect to the Gun-Target line rather than the observer-target line.

Table I. *Cannon Input Selection Functions*—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
CT LN ADJ	B–4	Specific	2. Depress SM key (KEYBOARD light lights.) 3. Enter 0 to cause computer to use the gun-target azimuth in adjustment (KEYBOARD light extinguishes.)	2. Depress RECALL key. (If GT Line Adjust has been selected for the mission, 0 is displayed; if GT Line Adjust has not been selected for this mission, a 9 is displayed.	2. This function is dismissed by EOM. 3. Azimuth of gun-target line can be recalled on the following recall procedures outlined for OT AZ (A–5). 4. If this function has been selected and sample matrix has been depressed, this function may be dismissed by depressing 9 on the keyboard.
FUZE TYPE	B–6	Specific	1. Depress matrix buttons B–6 (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter flag for desired fuze type. (See Annex B for Fuze Flags.)	1. Depress matrix buttons B–6 (Matrix window lights.) 2. Depress RECALL key (Flag is displayed.)	1. For Fuze Time or Fuze VT, program will solve for a 20 meter height of burst. 2. The computer normally selects fuze quick (1) and displays time of flight. If Fuze Time (2) or Fuze VT (3) is used, the fuze setting will be displayed in lieu of time of flight. 3. This is an override function and is dismissed by EOM (E–1) or selection of flag type *1*. 4. The program will subtract 2 seconds from the fuze setting for a zero height of burst (fuze time) to determine the fuze setting for the base ejection smoke round. 5. When using fuze VT, M513 or M514, 0.5 lb must be added to the projectile weight to compensate for the added weight of this fuze over the standard VT fuze. See Appendix II for other fuze weight compensations. 6. This override can be changed at any time during the mission. 7. See Appendix II for allowable shell-fuze combinations.
HOB	B–7	Specific	1. Depress matrix buttons B–7 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.)	1. Depress matrix buttons B–7 (Matrix window lights.) 2. Depress RECALL key (height of burst selected is displayed.)	1. This function is used with Shell type 5 only.

			3. Enter actual height of burst above the target.		
WHITE CHG	B-8	Specific	1. Depress matrix buttons B-8 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights.) 3. Enter 0 to cause computer to solve problem using white bag ammunition for charges 3, 4, 5. (KEYBOARD light extinguishes).	1. Depress matrix buttons B-8 (Matrix window lights.) 2. Depress RECALL key. (If this function has been selected for this mission, a 0 is displayed; if this function had not been selected for this mission, a 9 is displayed.)	1. Computer normally selects green bag for charges 1 to 5 and white bag for 6 and 7 on 155 and 8 Howitzers. This override will select white bag for Chg 3, 4, 5. 2. This override is dismissed by EOM. 3. If this function has been selected and sample matrix has been depressed, it may be dismissed by entering a 9 through the keyboard.
OBS EAST	C-1	Any	1. Depress matrix buttons C-1 (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter observer northing to nearest meter. (00000 to 99999 or 00000.00 to 99999.99.)	1. Depress matrix buttons C-1 (Matrix window lights.) 2. Depress RECALL key. (Observer easting is displayed.)	1. Used to input observer easting for use in the survey routine or polar plot missions. 2. On entering coordinates, 5 figures *must* be used. If not, the "no solution" light will flicker and display will remain. Refer to paragraph 13 for corrective procedure. 3. See SURVEY (D-5), note 4.
OBS NORTH	C-2	Any	1. Depress matrix buttons C-2 (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter observer northing to nearest meter. (00000 to 99999 or 00000.00 to 99999.99.)	1. Depress matrix buttons C-2 (Matrix window lights.) 2. Depress RECALL key. (Observer northing is displayed.)	1. Used to input observer northing for use in the survey routine or polar plot missions. 2. On entering coordinates, 5 figures *must* be used. If not, the "no solution" light will flicker and display will remain. Refer to paragraph 13 for corrective procedure. 3. See SURVEY (D-5), note 4.
OBS ALT	C-3	Any	1. Depress matrix buttons C-3 (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter observer altitude to nearest meter (0 to 65.535 meters or 65.535.-99 meters.)	1. Depress matrix buttons C-3 (Matrix window lights.) 2. Depress RECALL key (altitude is displayed.)	1. Used to input observer altitude for use in the survey routine or for polar plot mission. 2. See SURVEY, note 4.

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
OBS AZ	C–4	Any	1. Depress matrix buttons C–4 (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights. Number of observer for whom data is being entered appears in right QUADRANT window.) 3. Enter observer azimuth to the nearest mil (0 to 6400 mils.)	1. Depress matrix buttons C–4 (Matrix window lights.) 2. Depress RECALL key (observer azimuth is displayed. See Remark 3.)	1. This function is used to enter azimuth in survey routine or observer azimuth in polar plot mission. 2. Automatically set to minus zero during computation. 3. If two observer locations are used and an observer azimuth is entered for each, depression of the RECALL key the first time causes the last observer azimuth entered to appear. Depression of the RECALL key the second time causes the first observer azimuth entered to appear. In both cases, the number of the observer is also displayed. 4. See SURVEY remark 4.
OBS HORIZ DIST	C–5	Any	1. Depress matrix buttons C–5 (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights. Number of observer for whom data is being entered appears in right QUADRANT window.) 3. Enter observer horizontal (distance to nearest meter (1 to 65.535 meters)	1. Depress matrix buttons C–5 (Matrix window lights.) 2. Depress RECALL key. (Distance is displayed. See Remark 3).	1. Entry of this function destroys information entered using OBS SLANT DIST. 2. Automatically set to minus zero during computation. 3. If two observer locations are used and an observer horizontal distance is entered for each depression of the RECALL key the first time causes the last observer horizontal distance entered to appear. Depression of the RECALL key the second time causes the first observer horizontal distance entered to appear. In both cases the number of the observer is also displayed. 4. See SURVEY, remark 4.
OBS SLANT DIST	C–6	Any	1. Depress matrix buttons C–6 (Matrix window lights.) 2. Depress SM key (KEYBOARD light lights. Number of observer for whom data is being entered appears in right QUADRANT window.)	1. Depress matrix buttons C–6 (Matrix window lights.) 2. Depress RECALL key (Distance is displayed. See Remark 3).	1. Entry of this function destroys information entered using OBS HORIZ DIST. 2. Automatically set to minus zero during computation.

					3. If two observer locations are used and observer slant distance is entered for each depression of the RECALL key the first time causes the last observer slant distance entered for the first observer to appear. Depression of the RECALL key the second time causes the first observer slant distance entered to appear. In both cases the number of the observer is also displayed. 4. See SURVEY, remark 4.
OBS VERT ANGLE	C–7	Any	1. Depress matrix buttons C–7. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights. Number of observer for whom data is being entered appears on right QUADRANT window.) 3. Enter observer vertical angle to the nearest mil (0 to + or 1600 mils)	1. Depress matrix buttons C–7. (Matrix window lights.) 2. Depress RECALL key. (Sign and angle are displayed. See Remark 3.)	1. Sign (+ or −) must precede entry. 2. Automatically set to minus 0 during computation. 3. If two observer locations are used and an observer vertical angle is entered for each depression of the RECALL key the first time will cause the observer vertical angle for the first observer to appear. Depression of the RECALL key the second time will cause the observer vertical angle for the second observer to appear. In both cases the number of the observer will also be displayed. 4. See remark 4, Survey (D–5).
POLAR PLOT MSN	C–8	Specific	1. Recall observer location by following procedure outlined for OBS LOC RECALL (D–4) or enter observer location by following procedure outlined for OBS EAST, (C–1), OBS NORTH (C–2) and OBS ALT (C–3). 2. Depress matrix buttons C–8 (Matrix window lights.) 3. Depress SM key. (COMPUTE light lights; target coordinates and altitude are displayed when the battery button is depressed. The target easting, northing and	N/A	1. Azimuth, distance, and vertical angle are automatically reset to minus zero during computation. 2. The vertical angle measured by the observer must be entered in order for the computer to display the correct target coordinates and altitude. If no angle is reported, enter +0.0. 3. If the observer reports the vertical displacement as a shift in meters, enter the vertical angle as +0.0 and enter the vertical shift using the UP/DOWN function. Upon use of this function, the com-

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
POLAR PLOT MSN	C–8	Specific	altitude are stored in matrix positions A–2, A–3 and A–4 respectively. The OBS AZ is stored as OT AZ).		puter displays the target coordinates and the observer altitude; however the computer uses the target coordinates and target altitude in the solution of the ballistic trajectory.
OBS LOC STORE	D–3	Any	1. Enter the easting, northing, and altitude of the observers position by following procedure outlined for OBS EAST (C–1), OBS NORTH (C–2), and OBS ALT (C–3). 2. Depress matrix buttons D–3. (Matrix window lights.) 3. Depress SM key. (KEYBOARD light lights.) 4. Enter assigned number of observer. (.1 to .9.) (Observer coordinates and altitude are displayed in appropriately marked window; assigned observer number is displayed in CHARGE window.)	1. To recall location of observer, use OBS LOC RECALL (D–4) procedure. 2. If this function is recalled by depressing matrix buttons D–3 and recall, only the number assigned to the observer in step 4, entry procedure is displayed.	1. Until changed by the operator, the computer will associate the observers location with the number assigned in step 4, entry procedure. 2. See remark 4, Survey (D–5).
OBS LOC RECALL	D–4	Any		1. Depress matrix buttons D–4. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter the number assigned to the observer. 4. (COMPUTE light lights; coordinates and altitude of observer location are displayed in appropriately marked windows with observer number apappearing in CHARGE window.)	1. Observers location must have previously been stored by using procedure outlined in OBS LOC STORE. 2. Recalling observers location allows it to be used in SURVEY POLAR PLOT MSN. 3. See remark 4, SURVEY (D–5).
SURVEY	D–5	Any	1. The procedure to have the computer solve a traverse is as follows: a. Enter or recall the starting coordinates and altitude of the traverse.	N/A	1. This function is used to cause the computer to solve a traverse survey (Type 1), computation of an intersection from the 01–02 base (Type 2), and to compute the orientation data for 01–02 base to a given point (Type 3).

(1) To enter the starting coordinates and altitude of the traverse, follow procedure outlined for OBS EAST (C–1), OBS NORTH (C–2), and OBS ALT (C–3).

(2) To recall the starting coordinates and altitude of the traverse, follow procedure outlined for OBS LOC RECALL (D–4).

b. Enter the azimuth, horizontal or slant distance, and vertical angle to the forward station of the traverse by following procedure outlined for OBS AZ (C–4), OBS HORIZ DIST (C–5) or OBS SLANT DIST (C–6), and OBS VERT ANGLE (C–7). An azimuth, distance and vertical angle must be entered for each leg.

c. Depress matrix buttons D–5. (Matrix window lights.)

d. Depress SM key. (KEYBOARD light lights.)

e. Enter 1. (KEYBOARD light extinguishes; COMPUTE light lights; coordinates and altitude of forward station are displayed in appropriate windows with 0 displayed in CHARGE window.)

f. To compute next leg of traverse, return to step 1b.

2. The procedure to have the computer solve an intersection is:

a. Recall the coordinates and altitude of the first observer by following procedure outlined for OBS LOC, RECALL (D–4).

b. Enter the azimuth from this observer to the unknown station by following procedure outlined for OBS AZ (C–4). If this observer measured the vertical angle, enter the vertical angle by following procedure outlined for OBS VERT ANGLE (C–7). The vertical angle must be entered for only one observer.

2. Azimuth, distance and vertical angle are automatically reset to minus zero during computation.

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
SURVEY	D–5	Any	c. Recall the location and altitude of the second observer as outlined in step 2a above. d. Enter the azimuth and vertical angle (if applicable) from the second observer to the unknown station as outlined in step 2b above. e. Depress matrix buttons D–5. (Matrix window lights.) f. Depress SM key. (KEY-light lights.) g. Depress 2. (KEYBOARD light extinguishes; COMPUTE light lights; coordinates and altitude of the unknown point are displayed.) h. To compute the coordinates of a new unknown station, repeat procedures outlined in steps 2a–2g above. 3. The procedure to have the computer compute the orienting data for two observers to a target is: a. Enter or recall the target coordinates and altitude. (1) To enter the target coordinates and altitude, follow procedure outlined for TGT EAST (A–2), TGT NORTH (A–3), and TGT ALT (A–4). (2) To recall the target coordinates and altitude, follow procedure outlined for TGT DATA RECALL (A–1). b. Recall coordinates and altitude of first observer by following procedure outlined for OBS LOC RECALL (D–4). c. Recall coordinates and altitude of second observer in same manner as described in step 3b above. d. Depress matrix buttons D–5. (Matrix window lights.)		3. In an intersection survey (Type 2), if the vertical angle is entered from both observers to the target, the computer will use the vertical angle entered for the last observer recalled to compute the altitude of the target.

			e. Depress SM key. (KEYBOARD light lights.) f. Depress the 3 key and the ENTER key. (Keyboard light stays on; the azimuth, distance, and vertical angle from one observer to the target is displayed on appropriate windows and the number of the observer is displayed in the CHARGE window.) g. Depress the ENTER key again. (KEYBOARD light extinguishes; the orienting data for the other observer is displayed in the same manner as discussed in step 3f above.)		
					4. For greater accuracy in the survey routine, the coordinates and altitude of the observer location and the observer azimuth, horizontal or slant distance, and vertical angle may be entered to the nearest .01 mil or meter. Recall of the observer location will not show the decimal portion entered; however, it will be stored as entered and the entire easting or northing may be recalled by recalling the observer location and then recalling the easting, northing and altitude individually.
TEMP MSN RECALL	D–6	Specific	N/A	1. Insure that battery button for whom mission was stored is depressed.	1. Only target coordinates will be displayed. OT AZ and overrides will be stored and may be checked by recall following termination of TEMP MSN RECALL procedures.
				2. Depress matrix buttons D–6. (Matrix window lights.)	2. Used to recall mission previously stored by TEMP MSN RECORD (D–7).
				3. Depress SM key. (KEYBOARD light lights.)	3. If this function has been selected and sample matrix has been depressed, it may be dismissed by entering 9 on the keyboard.
				4. Depress 0. (Target coordinates are displayed.)	4. Once a target stored in TEMP MSN STORE (D–7) has been recalled using TEMP MSN RECALL (D–6), it cannot be recalled again; if this is attempted, the NO SOLUTION LIGHT will flicker.

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
TEMP MSN STORE	D–7	Specific	1. Insure that appropriate battery button is depressed. 2. Depress matrix buttons D–7. (Matrix window lights.) 3. Depress SM key. (KEYBOARD light lights.) 4. Depress 0.	N/A	1. Target data corresponding to battery button depressed are stored temporarily. 2. All overrides and OT AZ for mission are stored temporarily. 3. If this function has been selected and sample matrix has been depressed, it may be dismissed by depressing 9 on the keyboard.
MASS FIRES	D–8	Specific	1. Insure that battery button for whom target is associated is depressed. 2. Depress matrix buttons D–8. (Matrix window lights.) 3. Depress SM key. (KEYBOARD light lights.) 4. Enter batteries to be massed using flags shown below: *Flag* *Btry* 1 A 2 B 3 C 4 D 5 E	1. Depress matrix buttons D–8. (Matrix window lights.) 2. Depress RECALL Key. (Flags of batteries selected to be massed are displayed.)	1. If selected in error, the operator may dismiss by entering a single flag corresponding to the battery button depressed. 2. This function transfers the target associated with the battery whose battery button is depressed to each battery selected in step 4. 3. To cause the computer to compute firing data for each battery selected in step 4, the appropriate battery button must be depressed and the COMPUTE button depressed.
EOM	E–1	Specific	1. Depress matrix buttons E–1. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Depress 0. (KEYBOARD light extinguishes.)	N/A	1. Used to end mission and dismiss data associated with that mission. 2. Computer automatically dismisses: a. CHG override (B–1). b. HI ANGLE (B–2). c. AUX CHG (B–3). d. GT LN ADJUST (B–4). e. WHITE CHG 3, 4, 5 (B–8). 3. Computer automatically sets: a. PROJ type to HE (B–5). b. FUZE Type to Q (B–6). c. HOB (B–7) to minus zero. d. TGT EAST, TGT NORTH, TGT ALT, (A–2, A–3, A–4) to minus zero. 4. If this function has been selected and the SM key has been depressed this function may be dismissed by entering.

TGT DATA STORE	E-4	Specific	1. Enter a target by following procedures outlined for TGT EAST (A-2), TGT NORTH (A-3) and TGT ALT (A-4). 2. Depress matrix buttons E-4. (Matrix window lights.) 3. Depress SM key. (KEYBOARD light lights.) 4. Enter number (1-88) to be assigned to target (coordinates and altitude of target are displayed; KEYBOARD light extinguishes.)	Not Applicable. Target is recalled by following procedure outlined for TGT DATA RECALL (A-1).	1. This function is used to place a target on the target list in the computer storage. 2. NO SOLUTION light will flicker if number greater than 88 is entered. 3. Since target number 0 is reserved for recall of the battery associate target, a target cannot be assigned this number for storage.
CLEAR MEMORY	E-5	Any	1. Upon flickering of the PARITY light, test working storage by following procedures outlined in paragraph 11. (Computer displays line of memory in which PARITY error occurred.) 2. Enter proper section of clear memory tape into mechanical tape reader. This may be determined by comparing number at the beginning of tape section with line number displayed by computer in step 1 above. 3. Depress matrix buttons E-5. (Matrix window lights.) 4. Depress SM key. (KEYBOARD light lights.) 5. Enter line number displayed by computer as result of working storage test in step 1 above. (Computer reads in proper section of tape through mechanical tape reader. This returns the line number en-	N/A	1. This function is used to return selected line of working storage to the state they were in after program entry using the Signal Data Reproducer, AN/GSQ-64. The necessity for using this function is shown by the flickering of the PARITY light indicating an alteration or improper reading from the memory unit. 2. If the program test of working storage is successful (number 136 displayed) and the parity error persists, the trouble is not in working storage and the program should be reloaded using the Signal Data Reproducer, AN/GSQ-64. 3. To prevent undue delay in computing firing data, step 7, entry procedures may be omitted until a lull in firing if that data is not required for the mission. 4. Clear memory tape consists of sections of tape for each line of memory. At the beginning of each section of tape the number of the line memory is written. The computer will accept only the correct section of tape according to the keyboard input. 5. See paragraph 14 for procedure in entering tape into mechanical tape reader.

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
CLEAR MEMORY	E–5	Any	tered to the state it was after program entry with the Signal Data Reproducer, AN/GSQ–64.) 6. Refer to map of working storage (Fig. 4) to determine data stored in cleared line. 7. Reenter data into cleared line by following normal entry procedures. 8. Repeat procedures outlined in steps 1–7 above until test of working storage is successful.		
REPLOT POLAR	E–7	Specific	1. Depress matrix buttons E–7. (Matrix window lights.) 2. Depress SM key. (Azimuth, range, and vertical angle from battery selected to target are displayed).	N/A	1. Must be preceded by REPLOT RECT if registration corrections are being used. 2. NO SOLUTION light flickering if REPLOT POLAR is not preceded by REPLOT RECT is a warning to indicate that result is not precisely correct if registration corrections are being used. 3. Last ballistic trajectory computed is used for replot. 4. 20/R is automatically removed in case of fuze VT and fuze time trajectories.
REPLOT RECT	E–8	Specific	1. Depress matrix buttons E–8. (Matrix window lights.) 2. Depress SM key. (The computer displays the target coordinates used to establish the trajectory which hit the target. The KEYBOARD light remains on.) 3. Compare target altitude appearing on display with those shown at same location on a map of the area. If there is a difference in altitudes, enter map altitude. Clear key may be depressed prior to entry of altitude. 4. Following entry of new altitude, the computer displays new coordinates and altitude. If they do not com-	N/A	Used to successively approximate tgt altitude after adjusting original tgt location.

			pare favorably, follow same procedures in paragraph 3 above. If altitudes agree, the target is properly located and may be stored by TGT REF RECORD procedures. 5. Enter a period on keyboard to terminate mode.		
LAT	F–1	Any	1. Depress matrix buttons F–1. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter the sign and numerical value of the battery latitude to the nearest degree. (0 to ± 90).	1. Depress matrix buttons F–1. (Matrix window lights.) 2. Depress RECALL button. (Latitude is displayed.)	1. Enter + sign if battery is located in northern hemisphere or – sign if battery is located in southern hemisphere. 2. The latitude entered for one battery is applied to all batteries.
GRID DECL ANGLE	F–2	Any	1. Depress matrix buttons F–2. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter the sign and numerical value of the grid declination angle to the nearest mil (0 to ± 63 mils).	1. Depress matrix buttons F–2. (Matrix window lights.) 2. Depress RECALL key. (Grid Declination angle is displayed.)	1. This function is used to convert wind azimuth from true to grid north. If grid north is to the right of true north, sign is +; if grid north is to the left of true north, sign is –. 2. If no entry is made, the computer will assume the GRID DECLINATION ANGLE is 0. 3. This function must be entered prior to MET INPUT.
SET UP	F–5	Specific	1. Depress matrix buttons F–5. (Matrix window lights.) 2. Depress battery button desired. 3. Designate caliber of battery selected in step 2 above by depressing either the 1 or 2 button. See paragraph for explanation of calibre designations by 1 and 2 buttons. 4. Depress the SET UP button. (COMPUTE light flashes.) 5. After COMPUTE light has flashed and extinguishes, return to step 2 above to set up other batteries. Repeat process for all batteries desired.	N/A	1. This procedure is used to designate to the computer. 2. *All constants pertaining to the battery selected in Step 2 are set to standard.* These constants are muzzle velocity, projectile weight, BCF, and powder temperature. 3. All registration corrections for the battery selected are set to zero.

Table I. *Cannon Input Selection Functions*—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
DEFL CORR	F–6	Specific	1. Depress matrix buttons F–6. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter the charge using charge flag as outlined in CHG (B–1). (KEYBOARD light remains on.) 4. Enter deflection correction as sign (Left or Right) and correction to the nearest mil. (0 to ± 225).	1. Depress matrix buttons F–6. (Matrix window lights.) 2. Depress RECALL key. (KEYBOARD light lights.) 3. Enter the charge using charge flags as outlined in CHG (B–1). (Deflection correction is displayed).	1. This function is used to enter the deflection correction for a specific charge for the battery designated. 2. Depressing the ENTER key after the computation of registration corrections in the COMP REG procedure will automatically enter the deflection correction for the battery selected. See COMP REG (H–8).
TIME CORR	F–7	Specific	1. Depress matrix buttons F–7. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter the charge using charge flags as outlined in CHG (B–1). (KEYBOARD light remains on.) 4. Enter time correction as sign (+ or −) and correction to the nearest .1 second. (0 to ± 255.0).	1. Depress matrix buttons F–7. (Matrix window lights.) 2. Depress RECALL key. (KEYBOARD light lights.) 3. Enter the charge using charge flags as outlined in CHG (B–1). (Fuze correction is displayed).	1. This function is used to enter the fuze correction for a specific charge for the battery designated. 2. Depressing the ENTER key after the computation of registration corrections in the COMP REG procedure will automatically enter the fuze correction for the battery selected. See COMP REG (H–8).
RANGE CORR	F–8	Specific	1. Depress matrix buttons F–8. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter the charge using charge flags as outlined in CHG (B–1). (KEYBOARD light remains on.) 4. Enter range correction as sign (+ or −) and correction to the nearest meter/1000. (0 to ± 255).	1. Depress matrix buttons F–8. (Matrix window lights.) 2. Depress RECALL key. (KEYBOARD light lights.) 3. Enter the charge using charge flags as outlined in CHG (B–1). (Range correction is displayed.)	1. This function is used to enter the range correction for a specific charge for the battery designated. 2. Depressing the Enter key after the computation of registration corrections in the COMP REG procedure will automatically enter the range corrections for the battery selected. See COMP REG (H–8).
MV	G–1	Specific	1. Depress matrix buttons G–1. (Matrix window lights.)	1. Depress matrix buttons G–1. (Matrix window lights.)	1. Examples of flag entries: *Description* — *Flag* Shell HE, Chg 2 — 12 Shell HE, Chg 10 — 110 Shell HE, Aux Chg 2 — 112

			2. Depress SM key. (KEYBOARD light lights.) 3. Enter a flag of two digits, the first of which is the projectile type flag (see Annex B for appropriate flag) and the second is the charge flag. (KEYBOARD light remains on.) 4. Enter muzzle velocity to nearest 0.1 m/sec:	2. Depress RECALL key. (KEYBOARD light comes on.) 3. Enter flag as outlined in entry procedures, step 3. (MV is displayed.)	2. Refer to appendix II for standard muzzle velociites. 3. If a nonstandard muzzle velocity is entered for shell HE, WP Smoke, or Gas for the 105 or 155mm Howitzer, the computer automatically applies the muzzle velocity entered to the other projectiles of this group.
POWD TEMP	G–2	Specific	1. Depress matrix buttons G–2. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter the sign and numerical value of the Powder temperature to the nearest degree fahrenheit. (−255 to +255).	1. Depress matrix buttons G–2. (Matrix window lights.) 2. Depress RECALL key. (Powder temperature is displayed.)	Standard temperature is +70°F.
PROJ WT	G–3	Specific	1. Depress matrix buttons G–3. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter 1 digit (flag) for the projectile type desired (see Appendix II for flags. KEYBOARD light remains on.) 4. Enter projectile weight to the nearest .1 pound.	1. Depress matrix buttons G–3. (Matrix window lights.) 2. Depress RECALL key. (KEYBOARD light lights.) 3. Enter 1 digit (flag) for projectile to be recalled. (The stored weight for projectile desired will be displayed.)	1. Minor differences will occur between inputs and recall of inputs. This is caused by the computer using projectile weight to the nearest 1/16 pound. 2. See Appendix II for standard projectile weights.
BCF	G–4	Specific	1. Depress matrix buttons G–4. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter 1 digit (flag) for desired projectile. (See Appendix II for flag. KEYBOARD light remains on.) 4. Enter the sign and numerical value of ballistic coefficient factor.	1. Depress matrix buttons G–3. (Matrix window lights.) 2. Depress RECALL key. (KEYBOARD light lights.) 3. Enter 1 digit (flag) for desired projectile. (The ballistic coefficient factor and sign will be displayed to the nearest .01%.)	1. The range of factors is from −15.00% to +15.00%. 2. Refer to paragraph 12 before using this function.
MET INPUT	G–5	Any	1. The procedure for keyboard entry is as follows: a. Depress matrix buttons G–5. (Matrix window lights.)	1. Depress matrix buttons G–5. (Matrix window lights.)	1. If, on keyboard entry, a line is entered without the proper number of digits (16), the computer will call for the same line again.

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
MET INPUT	G–5	Any	b. Depress SM key. KEYBOARD light lights.) c. Enter a 0 on the keyboard. (88 will be displayed.) d. Enter entire ID line. 2 digits (date). 4 digits (valid time). 3 digits (MDP altitude to nearest 10 meters). 3 digits (Surface pressure in percent of standard to nearest .1%. Do not enter decimal point. If surface pressure exceeds 100%, do not enter first digit). After ENTER key is depressed, computer demands line 00 ("00" will be displayed.) e. Enter entire 00 line. 2 digits (00). 3 digits (wind direction to nearest 10 mils). 3 digits (wind speed to nearest knot). 4 digits (temperature Kelvin to nearest .1 degree. The decimal point is not entered). 4 digits (density to nearest gram/ cubic meter). After ENTER key is depressed, the computer will demand line 01. f. The remaining lines are entered in same manner as line 00. When all intended lines are entered (maximum is 20), the input is mode terminated by entering 9 after the last complete line has been entered. If the maximum number of lines is entered, the input mode is automatically terminated.		

			Note: If mistake is made in any line entry and the ENTER key for that line has been depressed, the entire metro message must be reentered. However, if the ENTER key for that line had not yet been depressed, the line may be erased by depressing the clear key and that line may then be reentered.		
			2. The procedure for tape met entry is as follows: a. Load tape onto the tape reader. (See paragraph 4 for description of procedures used to enter tape). b. Depress matrix buttons G–5. (Matrix window lights.) c. Depress SM key. (KEYBOARD light lights.) d. Enter single non-0 digit. (The reader will automatically feed the tape and end the mode. The computer does not accept a line of the met message through the tape reader, it will stop the tape reader, display the line number of the metro message on which it has stopped, and light the keyboard light. The remainder of of the met message may then be entered manually by following the procedure outlined in step 1e and 1f above. (Starting with line displayed.) If it is not desired to enter any more of the met message, enter 9).	2. Depress RECALL KEY. (ID line only is displayed.)	2. A display of zeros for ID line on recall signifies a standard met is in use. See MET STD (H–6).
					3. A check should be made to insure that the correct grid delination angle is enter prior to the use of this function.
DF INPUT	G–6	Specific	1. Depress matrix buttons G–6. (Matrix window lights). 2. Depress SM key. (KEYBOARD light lights.) 3. Enter deflection to nearest mil. (0–6400 mils.)	1. Depress matrix buttons G–6. (Matrix window lights.) 2. Depress RECALL key. (Deflection input is displayed.)	This function is used to enter the adjusted deflection after a registration. It is used by the computer to determine the deflection correction.

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
TIME INPUT	G–7	Specific	1. Depress matrix buttons G–7. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter fuze setting to nearest .1 second. (0–255.9 sec.)	1. Depress matrix buttons G–7. (Matrix window lights.) 2. Depress RECALL key. (Time input is displayed.)	This function is used to enter the adjusted time after a registration. It will be used by the computer to determine the correction fuze.
QE INPUT	G–8	Specific	1. Depress matrix buttons G–7. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter QE to nearest mil. (0–8191 mils.)	1. Depress matrix buttons G–7. (Matrix window lights.) 2. Depress RECALL key. (QE input is displayed.)	This function is used to enter the adjusted QE after a registration. It will be used by the computer to determine the range correction (Range "K").
BTRY EAST	H–1	Specific	1. Depress matrix buttons H–1. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter battery northing to the nearest meter. (00000 to 99999).	1. Depress matrix buttons H–2. (Matrix window lights.) 2. Depress RECALL key. (Battery easting is displayed.)	On entering coordinates, 5 figures must be used. If not, the NO SOLUTION light will flicker and display will remain. Refer to paragraph 13 for corrective procedure.
BTRY NORTH	H–2	Specific	1. Depress matrix buttons H–2. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter battery northing to the nearest meter. (00000 to 99999).	1. Depress matrix buttons H–2. (Matrix window lights.) 2. Depress RECALL key. (Battery northing is displayed.)	On entering coordinates, 5 figures must be used. If not, the NO SOLUTION light will flicker and display will remain. Refer to paragraph 13 for corrective procedure.
BTRY ALT	H–3	Specific	1. Depress matrix buttons H–3. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter altitude to the nearest meter (0 to 65.535 meters.)	1. Depress matrix buttons H–3. (Matrix window lights.) 2. Depress RECALL key. (Battery altitude is displayed.)	1. Used to enter the altitude of battery above sea level. 2. Negative inputs are not accepted.
BTRY AZ LAID	H–4	Specific	1. Depress matrix buttons H–4. (Matrix window lights.) 2. Depress SM key. (KEYBOARD light lights.) 3. Enter azimuth on which battery is laid (0–6400 mils.)	1. Depress matrix buttons H–4. (Matrix window lights.) 2. Depress RECALL key. (Battery azimuth is displayed.)	
BTRY DF	H–5	Specific	1. Depress matrix buttons H–5. (Matrix window lights.)	1. Depress matrix buttons H–5. (Matrix window lights.)	

			2. Depress SM key. (KEYBOARD light lights.)	2. Depress RECALL key. (Battery referred deflection is displayed.)	
			3. Enter referred deflection of battery to nearest mil (0–6400 mils).		
MET STD	H–6	Any	1. Depress matrix buttons H–6. (Matrix window lights.)	N/A	1. This function deletes the most recent met input and replaces it with standard values.
			2. Depress SM key. (KEYBOARD light lights.)		2. After the use of this function, the recall of MET INPUT (G–5) displays all zeros except for altitude of MDP which appears in altitude portion of the display. The MDP altitude is set to that of A Btry.
			3. Depress 0. (KEYBOARD light goes out; COMPUTE light flashes.)		3. Entering 9 instead of 0 is described in step 3, input procedure, dismisses this function without setting met to standard.
ZERO CORR	H–7	Specific	1. Depress matrix buttons H–7. (Matrix window lights.)	N/A	1. This function deletes all registration corrections for the batteries whose battery button is depressed.
			2. Depress SM key. (KEYBOARD light lights.)		2. Entering 9 instead of 0 as described in step 3, input procedure, dismisses this function without setting registration corrections to zero.
			3. Depress 0 on keyboard. (KEYBOARD light goes out; COMPUTE light flashes.)		3. The set-up procedure as outlined under SET UP (F–5) also sets all registration corrections to zero.
					4. Selection of COMP REG (H–8) automatically sets all previous registration corrections to zero.
COMP REG	H–8	Specific	1. The procedure to be followed to have the computer compute the registration corrections for a precision and time registration is as follows: a. Conduct of registration. The computer is used to compute firing data for the adjustment phase only. The following are the steps to be followed during this phase: (1) Select battery for which corrections are to apply by depressing battery button on right side of matrix.	N/A	1. This function is used to determine registration corrections following a precision, time, high burst, or center of impact registration. 2. Selection of this function automatically zeros all previous registrations corrections for the battery selected. 3. The registration corrections displayed by the computer are the residual corrections between the data required to hit the registration point (Adjusted Data) and the data the computer would have used to hit that point using all parameters for weather and materiel which were entered

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
COMP REG	H–8	Specific	(2) Recall or enter the coordinates and altitudes of the registration point by following procedure outlined in TGT DATA RECALL (A–1) or TGT EAST (A–2), TGT NORTH (A–3), and TGT ALT (A–4). (3) If a specific charge is desired for the registration, override for the charge using the procedures outlined for CHG (B–1). (4) Insure that fuze quick or shell HE have not been overridden and cause computer to compute firing data in normal manner for adjustment phase. (5) Upon entry into fire for effect, the firing data is completed using the procedures outlined in Chap 18, Sections II and III, FM 6–40 and DA Form 6–12 (Record of Precision Fire). See Remark 6. (6) Following the firing of the impact registration, the adjusted time may be determined using the procedures outlined in Chap 18, Sections II and III, FM 6–40 and DA Form 6–12. Use a graphical or tabular firing table to determine the initial fuze setting to start the registration (the fuze setting corresponding to the adjusted elevation modified by any known fuze corrections). See Remark 6. b. Computation of registration corrections. The computer is used to compute registration corrections. 2. The procedure to have the computer compute the registration corrections and apply them to subsequent computations are:	N/A	into the computer at the time the SM key for this function is depressed. It should be noted that these corrections are not the same as those used for manual corrections since there is no way graphically to separate the corrections and they exclude factors such as drift that are automatically included by the computer. The corrections displayed by the computer are: a. Deflection Correction will be displayed to the nearest mil in the DEFLECTION windows. The direction (sign) of the correction appears in the sign window. A "+" indicates a right correction; a "−" indicates a left correction. b. Fuze correction is displayed to the nearest .1 second in the time window. The sign of the correction is displayed by a digit in the left digit of the display. A blank indicates a plus correction: a "9" indicates a minus. c. Range correction is displayed as a Range "K" in meters/1000 in the Quadrant window. The sign of the correction is displayed in the same manner as the sign of the fuze correction. 4. Storage of registration corrections by depressing the ENTER key after the computer displays the registration corrections (steps 1b(8) – 1b(10), entry procedure) will cause the corrections to be stored without alteration for all charges for all batteries for whom the procedure is applied. 5. All known materiel and meteorological parameters such as muzzle velocity, etc., should be entered into the computer prior to the computation of registration corrections. The corrections the computer displays will the an be function of any parameters left at staudard and the inaccuracies of measurement and the age of the

(1) Reenter coordinates and altitude of registration point. This is necessary in order that the computer use this location rather than the adjusted location for its computations.

(2) Enter adjusted deflection, adjusted time (time registration only) and adjusted QE as outlined in DF INPUT (G–6), TIME INPUT (G–7) and QE INPUT (G–8).

(3) Override for fuze time using procedures outlined for FUZE TYPE (B–6) if a time registration was also fired.

(4) Insure that the charge has not been changed since the firing of the registration by following the Recall Procedures outlined for CHG (B–1).

(5) Depress matrix buttons H–8. (Matrix window lights.)

(6) Depress SM key. (COMPUTE light flashes; KEYBOARD light lights; computer displays the registration corrections. See Remark 3.

(7) If it is desired to store the registration corrections and have them applied for the charge used for the registration only, the following procedure is used.

(*a*) Note the corrections displayed.

(*b*) Depress the PERIOD key to end the mode.

(*c*) Enter the corrections using the procedures outlined for DF CORR (F–6), TIME CORR (F–7) (time registration only), and RANGE CORR (F–8).

(8) If it is desired to store the registration corrections and have them applied for all charges for the registering battery, depress the enter key. (KEYBOARD light remains on).

met and materiel parameters entered. Since the computer adds the corrections displayed to the effect of the met and materiel parameters in its computations, the success of the transfer of registration corrections to other charges and/or batteries is dependent on the accuracy and completeness of this input prior to computation of registration corrections.

6. The computer may be used to assist in the determination of the following for use in a precision registration:

a. Angle T. Upon entry of the Registration Point coordinates and altitude, use the REPLOT POLAR (E–7) function to determine the azimuth and range from the battery to the registration point. Manually compare the battery-registration point azimuth with observer-registration point azimuth to determine the Angle T.

b. Factor S. Use the range displayed by the computer and the Angle T determined above to enter the S/2 Table on DA Form 6–12 and determine S/2.

c. Site. Enter the Registration Point coordinates and altitude into the computer.

(1) Cause computer to compute firing data in normal manner.

(2) Change target altitude to that of the battery.

(3) Cause computer to compute firing data.

(4) Subtract QE determined in remark 6c(3) above from the QE determined in remark 6c(1) above. The difference is Site.

(5) Reenter correct target altitude for subsequent corrections.

d. Fork. Upon entry into fire for effect, use the REPLOT POLAR (E–7) function again. Using the range displayed, enter a tabular or graphical firing table to determine the fork as outlined in FM 6–40, paragraph 294.

7. If the base piece is displayed from the

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
COMP REG	H–8	Specific	(9) If it is desired to store the corrections and have them applied for all charges for the non-registering batteries, depress the appropriate battery button or the right of the input selection matrix and depress the ENTER key again. (KEYBOARD light remains on.) Repeat for all batteries desired. (10) After the corrections have been stored for all batteries desired, terminate mode by depressing the PERIOD key. (KEYBOARD light extinguishes.) 3. The procedure to be followed to have the computer compute registration corrections for a center of impact registration is as follows: a. Conduct of registration. The computer is used to compute firing data, orient the target base, and compute the location of the center of impact. The following steps are to be followed during this phase: (1) Select battery for which corrections are to apply by depressing battery button on right of matrix. (2) Recall or enter the coordinates and altitude of the registration point by following procedure outlined in TGT DATA RECALL (A–1) or TGT EAST (A–2), TGT NORTH (A–3), and TGT ALT (A–4). (3) Compute orienting data by following procedures outlined in step 3, Entry Procedures, SURVEY (D–5). Observers are oriented as outlined in FM 6–40, paragraph 312b. (4) Insure that fuze quick or shell HE have not been overridden	N/A	battery center, the coordinates and altitude of the base piece must be entered in place of the coordinates and altitude of the battery center prior to making the COMP REG computations. After the registration corrections are displayed and entered, the coordinates and altitude of the battery center should be reentered for future firing. In this way, the computer will automatically be correcting for base piece displacement. These corrections may then be transferred to other batteries without regard for that battery's base piece displacement.

and cause computer to compute firing data in normal manner.

(5) Conduct registration by following procedures outlined in paragraph 314, FM 6–40.

b. Computation of registration corrections. The computer is used to compute registration corrections. See Remark 3. The procedure to have the computer compute the registration corrections and apply them to subsequent computations are:

(1) Determine average azimuths and vertical angle from observer base manually.

(2) Use computer to compute location of center of impact by using procedure outlined in step 2, Entry Procedures, SURVEY (D–5). The computation of the center of impact in this manner will cause the center of impact to be stored as the current target for the battery whose battery button is depressed. If the center of impact was determined by other methods, enter its location by following procedure outlined for TGT EAST (A–2), TGT NORTH (A–3), and TGT ALT (A–4).

(3) The remainder of the procedure is the same as outlined for a precision registration. Follow the procedures outlined in steps 1b(2) thru 1b(10). Since fuze time was not fired, no entry is made for TIME INPUT (step 1b(2)). TIME CORR (Step 1b(7)(c)), and step 1b(3) is omitted.

4. The procedures to be followed to have the computer compute registration corrections for a high burst registration is as follows:

a. Conduct of registration. The computer is used to compute the firing data, orient the target base, and compute the location of the high

Table I. Cannon Input Selection Functions—Continued

Input function	Matrix location	Btry	Entry procedures	Recall procedures	Remarks
COMP REG	H–8	Specific	burst. The following steps are to be followed during this phase: (1) Select battery for which corrections are to apply by depressing battery button on right of matrix. (2) Recall or enter the coordinates and altitude of the registration point (adding the height of burst over the registration point to the registration point altitude) by following procedure outlined in TGT DATA RECALL (A–1) or TGT EAST (A–2), TGT NORTH (A–3), and TGT ALT (A–4). (3) Compute orienting data by following procedures outlined in step 3, Entry Procedures, SURVEY (D–5). Observers are oriented as outlined in FM 6–40, paragraph 312b. (4) Select fuze time as outlined in FUZE TYPE (B–6). (5) Insure that shell HE has not been overridden. (6) Enter a correction of DOWN 20 using the procedures outlined for UP/DOWN (A–7). This correction compensates for the automatic addition of 20/R by the computer when it is computing for fuze time. (7) Cause computer to compute firing data in normal manner. (8) Conduct registration as outlined in paragraph 314, FM 6–40. b. Computation of registration corrections. The registration corrections and the procedure for the computation of the registration corrections is identical to that presented for the center of impact registration (step 2b) except that	N/A	

			the high burst point rather than the center of impact is used and, since fuze time was fired, the remarks pertaining to the fuze correction in steps 1b(2), 1b(7)(c) and 1b(3) apply.		

CHAPTER 5

SAMPLE PROBLEMS

25. General

This chapter contains a series of sample problems which may be used for operator training and also to check out the operation of the computer. The problems are continuous in nature, and should be accomplished through all situations for proper operator training.

26. Computer Check Out

a. Situation. "A" Battery has occupied position and is ready to deliver fires on order from battalion FDC. To insure the proper operation of the computer prior to computing data, the operator must run certain tests before processing any missions.

b. Operator Actions. The operator performs the following test routine:

(1) Run Bit-Sum Test.

(*a*) Depress PROG TEST button. (Top panel of computer.)

(*b*) Depress "1" key to check permanent storage. (Proper display should appear.)

(*c*) Depress PROG TEST button.

(*d*) Depress "2" key to check working storage. (Number 136 should appear.)

(2) To set-up battery "A" as desired caliber.

(*a*) Depress matrix buttons F–5 (SET-UP).

(*b*) Depress "A" button and the appropriate button, 1 or 2, depending upon program.

(*c*) Depress SET UP button.

(3) To zero corrections "A" battery.

(*a*) Insure "A" button is depressed.

(*b*) Depress matrix buttons H–7 (ZERO CORR).

(*c*) Depress SM key.

(*d*) Type in 0 on keyboard.

(4) EOM "A" Battery.

(*a*) Insure A battery is depressed.

(*b*) Depress matrix buttons E–1 (EOM).

(*c*) Depress SM key.

(*d*) Type in 0 on keyboard.

27. Entry of Battery Data

a. Situation Continued. The following information is reported by "A" Battery.

(1) Coordinates: 43490 34370

(2) Altitude: 409 meters

(3) Laid Azimuth: 60 mils

(4) Referred deflection: 105 How – 2800 mils, 155 How –2400 mils, 8″ How –2600 mils, 175 Gun –2600 mils, 280 Gun –2200 mils.

(5) Powder temperature: +27°

(6) Projectile weight: 105 (33.0 lbs); 155 (95.0 lbs); 8″ (200.0 lbs); 175 (147.0 lbs); 280 (600.0 lbs).

(7) Latitude: +34°

(8) Grid Declination Angle: +5 mils

b. Operator Actions Continued. The operator in the battalion FDC does the following to input battery "A" data:

(1) Depress "A" button.

(2) Depress matrix buttons H–1 (BTRY EAST).

(3) Depress SM key.

(4) On keyboard type in 43490; depress ENTER key.

(5) Depress matrix button H–2 (BTRY NORTH).

(6) Depress SM key.

(7) On keyboard type in 34370; depress ENTER key.

(8) Depress matrix buttons H–3 (BTRY ALT).

(9) Depress SM key.

(10) On keyboard type in 409 meters; depress ENTER key.

(11) Depress matrix buttons H–4 (BTRY AZ LAID).

(12) Depress SM key.

(13) On keyboard type in 60; depress ENTER key.

(14) Depress matrix buttons H–5 (BTRY DF).

(15) Depress SM key.

(16) On keyboard type in deflection 2800, 2400, 2600, or 2200. (For 105, 155, 8″ how, 280 gun, respectively.)

(17) Depress matrix buttons G–2 (POWD TEMP).

(18) Depress SM key.

(19) On keyboard type +27; depress ENTER key.

(20) Depress matrix buttons G–3 (PROJ WT).

(21) Depress RECALL key.

(22) On keyboard, type in 1; depress ENTER key. (Since the projectile weight is standard, it is not necessary to enter it. This function is set to standard by the SET UP procedure. However, it should be recalled to insure correctness.)

(23) Depress matrix buttons F–1 (LAT).

(24) Depress SM key.

(25) On keyboard type in +34; depress ENTER key.

(26) Depress matrix buttons F–2 (GRID DECL).

(27) Depress SM key.

(28) On keyboard type in +5; depress ENTER key.

c. Situation Continued. Since no met message has been received, the S–3 orders the computer operator to set the met to standard.

d. Operator Actions Continued. The computer sets the met to standard.

(1) *To set met to standard*

(*a*) Depress matrix buttons H–6 (MET STD).

(*b*) Depress SM key.

(*c*) On keyboard type in 0; depress ENTER key.

(2) *To recall metro input*

(*a*) Depress matrix buttons G–5 (MET INPUT).

(*b*) Depress RECALL key. (A line of zeros plus the altitude of "A" Battery must be displayed after this operation. If this is not displayed, the computer is malfunctioning and unit maintenance personnel should be notified.)

e. Situation Continued. A fire mission comes into the FDC and the S–3 issues his fire order.

Fire mission	*Fire order*
Coord 44520 43310	Alpha, Fuze Time
Azimuth 6200 platoon of	2 volleys, Conc #AB 101
infantry, Will Adjust	

Other data

Target Altitude, 435 meters

f. Operator Actions Continued.

(1) Procedure steps to process initial firing data:

(*a*) Depress "A" button.

(*b*) Depress matrix button A–2 (TGT EAST).

(*c*) Depress SM key.

(*d*) On keyboard type in 44520; depress ENTER key.

(*e*) Depress matrix button A–3 (TGT NORTH).

(*f*) Depress SM key.

(*g*) On keyboard type in 43310; depress ENTER key.

(*h*) Depress matrix buttons A–4 (TGT ALT).

(*i*) Depress SM key.

(*j*) On keyboard type in 435; depress ENTER key.

(*k*) Depress matrix buttons B–6 (FUZE TYPE).

(*l*) Depress SM key.

(*m*) On keyboard type in 2; depress ENTER key.

(*n*) Depress COMPUTE button. The firing data is displayed.

105 how	CHG 7	DF 2753	TI 33.9	QE 463
155 how	CHG 7	DF 2350	TI 25.9	QE 282
8″ how	CHG 6	DF 2552	TI 27.2	QE 328
280 gun	CHG 1	DF 2157	TI 28.5	QE 390

(2) Procedure for processing subsequent corrections.

(*a*) Forward observer corrections.
R 180 U40 RR

1. Depress matrix buttons A–6 (RIGHT/LEFT).
2. Depress SM key.
3. On keyboard type in RIGHT 180; depress ENTER key.
4. Depress matrix buttons A–7 (UP/DOWN).
5. Depress SM key.
6. On keyboard type in UP 40; depress ENTER key.
7. Depress TRIG button.

Note. The NO SOLUTION light will flash and . . . . 3 will be displayed. This indicates to the operator that no azimuth has been placed into computer.

8. Depress matrix buttons A–5 (OT AZ).
9. Depress SM key.
10. On keyboard type in 6200; depress ENTER key.
11. Depress TRIG button.

Note. COMPUTE button may be used for more accurate solution.

(*b*) Firing data

105 how	CHG 7	DF 2733	TI 34.1	QE 470
155 how	CHG 7	DF 2331	TI 26.1	QE 289
8″ how	CHG 6	DF 2533	TI 27.5	QE 336
280 gun	CHG 1	DF 2138	TI 28.8	QE 399

(*c*) Forward observer corrections.
D 10 +200

1. Depress matrix buttons A–7 (UP/DOWN).
2. Depress SM key.
3. On keyboard type in DOWN 10; depress ENTER key.
4. Depress matrix button A–8 (ADD/DROP).
5. Depress SM key.
6. On keyboard type in ADD 200; depress ENTER key.
7. Depress TRIG button.

Note. COMPUTE button may be used for more accurate solution.

(*d*) Firing data.

105 how	CHG 7	DF 2741	TI 35.3	QE 488
155 how	CHG 7	DF 2339	TI 26.9	QE 297
8″ how	CHG 6	DF 2541	TI 28.2	QE 345
280 gun	CHG 1	DF 2145	TI 29.6	QE 409

(*e*) Forward observer corrections.
—100

1. Depress matrix buttons A–8 (ADD/DROP).
2. Depress SM key.
3. On keyboard type in DROP 100; depress ENTER key.
4. Depress TRIG button.

Note. COMPUTE button may be used for more accurate solution.

(*f*) Firing data.

105 how	CHG 7	DF 2737	TI 34.7	QE 479
155 how	CHG 7	DF 2335	TI 26.5	QE 293
8″ how	CHG 6	DF 2537	TI 27.8	QE 340
280 gun	CHG 1	DF 2141	TI 29.1	QE 403

(*g*) Forward observer corrections.
U 10 +50 FFE

1. Depress matrix buttons A–7 (UP/DOWN).
2. Depress SM key.
3. On keyboard type in UP 10; depress ENTER key.
4. Depress matrix buttons A–8 (ADD/DROP).
5. Depress SM key.
6. On keyboard type in ADD 50; depress ENTER key.
7. Depress TRIG button.

Note. COMPUTE button may be used for more accurate solution.

(*h*) Firing data.

105 how	CHG 7	DF 2739	TI 35.0	QE 484
155 how	CHG 7	DF 2337	TI 26.7	QE 296
8″ how	CHG 6	DF 2539	TI 28.0	QE 343
280 gun	CHG 1	DF 2143	TI 29.4	QE 408

(3) Store target as concentration #1.

(*a*) Depress matrix buttons E–4 (TGT DATA STORE).

(*b*) Depress SM key.

(*c*) On keyboard type in 1; depress ENTER key. (Computer displays target coordinates 44667 43492, altitude 475).

(4) End of mission.

(*a*) Depress matrix buttons E–1 (EOM).

(*b*) Depress SM key.

(*c*) On keyboard type in 0; depress ENTER key.

28. Solution of Traverse Survey

a. Situation.

(1) The battalion survey party has completed the field work for Battery "A" position. The survey officer has brought the field notes into the fire direction center to have the survey checked on the computer.

(2) The field work is tabulated as follows:

SCP 44963.61 31694.50	= Altitude 418.8
Azimut SCP—TS 1	= 5598.1 mils
Distance SCP— TS 1	= 918.06 meters
Vertical angle SCP—TS 1	= —2.6 mils
Azimuth TS 1— TS 2	= 692.5 mils
Distance TS 1— TS 2	= 1121.87 meters
Vertical angle TS 1—TS2	= —4.4 mils
Azimuth TS 2— TS 3	= 5858.7 mils
Distance TS 2— TS 3	= 995.08 meters
Vertical Angle TS 2—TS 3	= —3.3 mils
Azimuth TS 3—BC	= 5008.3 mils
Distance TS 3—BC	= 1120.62 meters
Vertical angle TS 3—BC	= —2.5 mils

b. Operator Actions. The operator is directed by the S3 to compute the coordinates of the battery center and to record the coordinates of the various stations of the traverse survey.

(1) Indicated below are the procedure steps and the solution of the survey:

(*a*) Place coordinates and altitude of SCP in computer.

1. Depress matrix buttons C–B (OBS EAST).

2. Depress SM key.

3. On keyboard type in 44963.61; depress ENTER key.

4. Depress matrix button C–2 (OBS NORTH).

5. Depress SM key.

6. On keyboard type in 31694.50; depress ENTER key.

7. Depress matrix buttons C–3 (OBS ALT).

8. Depress SM key.

9. On keyboard type in 418.80; depress ENTER key.

10. Depress matrix buttons D–3 (OBS LOC STORE).

11. Depress SM key.

12. On keyboard type in *1* (any number 1–9 could be used); depress ENTER key.

(*b*) Computation of traverse type survey.

1. Depress matrix buttons D–4 (OBS LOC RECALL).

2. Depress SM key.

3. On keyboard type in *1*; depress ENTER key.

4. Depress matrix buttons C–4 (OBS AZ).

5. Depress SM key.

6. On keyboard type in 5598.10; depress ENTER key.

7. Depress matrix buttons C–5 (OBS HORIZ DIST).

8. Depress SM key.

9. On keyboard type in 918.06; depress ENTER key.

10. Depress matrix buttons C–7 (OBS VERT ANGLE).

11. Depress SM key.

12. On keyboard type in —2.60; depress ENTER key.

13. Depress matrix buttons D–5 (SURVEY).
14. Depress SM key.
15. On keyboard type in 1; depress ENTER key. (Coordinates and altitude of traverse station 1 are displayed. Coordinates 44313 32342, altitude 417.)
16. Depress matrix buttons C–4 (OBS AZ).
17. Depress SM key.
18. On keyboard type in AZIMUTH 692.50; depress ENTER key.
19. Depress matrix buttons C–5 (OBS HORIZ DIST).
20. Depress SM key.
21. On keyboard type in DISTANCE 1121.87; depress ENTER key.
22. Depress matrix buttons C–7 (OBS VERT ANGLE).
23. Depress SM key.
24. On keyboard type in VERTICAL ANGLE —4.40; depress ENTER Key.
25. Depress matrix buttons D–5 (SURVEY).
26. Depress SM key.
27. On keyboard, type in 1; depress ENTER key. (Coordinates and altitude of TS 2 are displayed. Coordinates 45019 33215, altitude 412.)
28. Depress matrix buttons C–4 (OBS AZ).
29. Depress SM key.
30. On keyboard type in AZIMUTH 5858.70; depress ENTER key.
31. Depress matrix buttons C–5 (OBS HORIZ DIST).
32. Depress SM key.
33. On keyboard, type in DISTANCE 995.08; depress ENTER key.
34. Depress matrix buttons C–7 (OBS VERT ANGLE).
35. Depress SM key.
36. On keyboard, type in VERTICAL ANGLE —3.30; depress ENTER key.
37. Depress matrix buttons D–5 (SURVEY).
38. Depress SM key.
39. On keyboard, type in 1; depress ENTER key. Coordinates and altitude of TS 3 are displayed. Coordinates 44514 34073, Altitude 409).
40. Depress matrix buttons C–4 (OBS AZ).
41. Depress SM key.
42. On keyboard, type in AZIMUTH 5008.30; depress ENTER key.
43. Depress matrix buttons C–5 (OBS HORIZ DIST).
44. Depress SM key.
45. On keyboard, type in DISTANCE 1120.62; depress ENTER key.
46. Depress matrix buttons C–7 (OBS VERT ANGLE).
47. Depress SM key.
48. On keyboard, type in VERTICAL ANGLE —2.50; depress ENTER key.
49. Depress matrix buttons D–5 (SURVEY).
50. Depress SM key.
51. On keyboard, type in 1; depress ENTER key. (Coordinates and altitude of BC are displayed. Coordinates 43417 34300 Altitude 406).

Note. The coordinates and altitude displayed during the process of computing the survey are rounded values and displayed to the nearest meter. If, for some reason, the accuracy was desired to the hundredths of a meter they can be recalled from OBSERVER EASTING, NORTHING, and ALTITUDE prior to terminating survey.

29. Entry of Data for Battalion

a. Situation Continued. The remainder of the battalion has occupied positions. Battalion survey has been completed and the following information has been received from the survey officer:

	A	*B*	*C*
Coordinates	43417 34300	43906 34682	43462 34603
Altitude	406	395	398
Az of Fire	60	60	60
Latitude	34°N	34°N	34°N

Grid Declination	+5 mils	+5 mils	+5 mils
Deflection:			
105 how	2800	2800	2800
155 how	2400	2400	2400
8″ how	2600	2600	2600
280 gun	2200	2200	2200

b. Operator Actions. The operator sets up the batteries for desired calibres and enters the survey information.

(1) Correct "A" Battery's data.

(*a*) Depress "A" battery button.

(*b*) Depress matrix buttons H–1 (BTRY EAST).

(*c*) Depress SM key.

(*d*) On keyboard, type 43417; depress ENTER key.

(*e*) Depress matrix buttons H–2 (BTRY NORTH).

(*f*) Depress SM key.

(*g*) On keyboard, type 34300; depress ENTER key.

(*h*) Depress matrix buttons H–3 (BTRY ALT).

(*i*) Depress SM key.

(*j*) On keyboard, type 406; depress ENTER key.

(*k*) Since azimuth of fire, deflection, latitude, and grid declination angle have not changed no further entry need be made. However, they should be checked using the RECALL procedures.

(2) Set Up of "B" Battery.

(*a*) Set up "B" Battery for desired calibre.

1. Depress matrix buttons F–5 (SET UP).

2. Depress "B" button and appropriate numbered button (1 or 2 depending upon program).

3. Depress SET UP button.

(*b*) Zero Corrections "B" Battery.

1. Depress "B" Button.

2. Depress matrix buttons H–7 (ZERO CORR).

3. Depress SM key.

4. On keyboard, type in 0; depress ENTER key.

(*c*) EOM "B" Battery.

1. Depress "B" button.

2. Depress matrix buttons E–1 (EOM).

3. Depress SM key.

4. On keyboard, type in 0; depress ENTER key.

(3) Enter "B" Battery data.

(*a*) Depress matrix buttons H–1 (BTRY EAST).

(*b*) Depress SM key.

(*c*) On keyboard, type 43906; depress ENTER key.

(*d*) Depress matrix buttons H–2 (BTRY NORTH).

(*e*) Depress SM key.

(*f*) On keyboard, type 34682; depress ENTER key.

(*g*) Depress matrix buttons H–3 (BTRY ALT).

(*h*) Depress SM key.

(*i*) On keyboard, type 395; depress ENTER key.

(*j*) Depress matrix buttons H–4 (BTRY AZ LAID).

(*k*) Depress SM key.

(*l*) On keyboard, type 60; depress ENTER key.

(*m*) Depress matrix buttons H–5 (BTRY DF).

(*n*) Depress SM key.

(*o*) On keyboard, type deflection for calibre desired; depress ENTER key.

Note. Latitude and grid declination angle need not be entered for battery. These are non-battery associated functions and the entry of this data for any battery suffices for all batteries. This information has already been entered for "A" Battery.

(4) Set up of "C" Battery. Repeat (2) above depressing the "C" Battery button instead of the "B" Battery button.

(5) Entry of "C" data. Repeat (3) above depressing the "C" Battery button and entering the data listed for "C" Battery in *a* above.

c. Situation Continued. The following information is reported by the batteries:

		A	B	C
Muzzle Velocity—Shell HE, Lot T(105), TZ(155, 8, 280)				
105 how	Chg 6	359.6	357.4	356.2
	Chg 7	457.8	456.1	454.9
155 how	Chg 5	370.0	368.2	367.1
	Chg 6	460.2	459.1	457.6
	Chg 7	562.0	560.4	559.1
8″ how	Chg 5	417.6	414.6	412.0
	Chg 6	495.0	490.9	488.0
280 gun	Chg 1	416.2	417.3	416.8
	Chg 2	538.1	536.1	537.1
Projectile Weight				
105 how—Shell HE		33.6	33.6	34.2
Shell WP		35.4	35.4	35.4
155 how—Shell HE		95.0	96.1	97.2
Shell WP		98.3	98.3	98.3
8″ how —Shell HE		200.0	202.5	205.0
280 gun—Shell HE		600.0	603.5	603.6
Powder Temperature		+28°	+29°	+26°

d. Operator Actions Continued. The operator enters the battery information.

(1) "A" Battery—depress "A" Battery button and enter.

(*a*) Muzzle Velocity.

1. Depress matrix buttons G–1 (MV).

2. Depress SM key.

3. On keyboard, type in 16; depress ENTER key.

4. On keyboard, type in 359.6; depress ENTER key.

5. On keyboard, type in 17; depress ENTER key.

6. On keyboard, type in 457.8; depress ENTER key.

Note. Subparagraph (*a*) *3* through *6* above refers to the 105 howitzer. Type in appropriate quantities listed for other calibres.

(*b*) Powder Temperature.

1. Depress matrix buttons G–2 (POWD TEMP).

2. Depress SM key.

3. On keyboard, type in +28; depress ENTER key.

(*c*) Projectile Weight.

1. Depress matrix buttons G–3 (PROJ WT).

2. Depress SM key.

3. On keyboard, type in 1; depress ENTER key.

4. On keyboard, type in 33.6; depress ENTER key.

5. On keyboard, type in 2; depress ENTER key.

6. On keyboard, type in 35.4; depress ENTER key.

Note. Subparagraph (*c*) *3* through *6* above refers to the 105 howitzer. Type in appropriate quantities listed for other calibres. Subparagraph (*c*) *5* and *6* above are omitted for 8″ howitzer and 280 gun units.

(2) "B" and "C" Batteries—repeat (1) above for "B" and "C" Batteries by depressing the appropriate battery button and entering information listed for that battery.

e. Situation Continued. The following computer met message has been received at the battalion FDC.

Identification	Octant	Country	Service	Location	Date	Time	Station height (10's M)	MDP Pressure % of STD
METCM	1	US	L	361 320	26	1620	036	974

Line N. ZZ	True values: Wind direction (10's M) ddd	Wind speed (knots) FFF	Temperature (1/10° K) TTTT	Density (GMS/M^3) ΔΔΔΔ
00	010	011	2693	1277
01	048	019	2679	1266
02	032	014	2673	1243
03	056	037	2617	1195
04	014	015	2672	1093
05	540	014	2718	1016
06	512	022	2707	0953
07	516	033	2672	0903
08	504	060	2672	0846
09	492	070	2657	0802
10	491	065	2616	0763
11	490	060	2580	0725
12	485	050	2542	0665
13	475	055	2483	0596
14	480	052	2410	0533
15	490	055	2327	0478
16	500	060	2248	0427
17	550	058	2192	0375
18	601	036	2141	0328
19	614	035	2106	0284
20	587	032	2119	0237

f. Operator Actions. Having been directed to enter the met, the operator manually enters the met message.

(1) Depress matrix buttons G–5 (MET INPUT).

(2) Depress SM key.

(3) On keyboard, type 0; depress ENTER key. (The numbers 88 will be displayed, indicating manual met input mode.)

(4) On keyboard, type ID line: 261620 036 974; depress ENTER key.

(5) On keyboard, type 00 line: 00 010 011 2693 1277; depress ENTER key (after entering line, *01* will be displayed to indicate the computer is ready for 01 line of met message.

(6) On keyboard, type in 01 line: 01 048 019 2679 1266; depress ENTER key.

(7) Continue this procedure for each line of the met.

(8) Terminate the mode by depressing 9 on the keyboard; depress ENTER key.

Note. At this time the S–3 has:

(*a*) Requirements for a predicted fire solution for shell HE in the charges for which a muzzle velocity has been entered.

(*b*) The ability to place the fire of three batteries on a target.

30. Target of Opportunity Mission

a. Situation. A fire mission is received from the Air OP and the S–3 issues his fire order.

Fire mission	*Fire order*
Coordinates 44350 4197	ALPHA, 2 volleys
Platoon of infantry in foxholes	SHELL WP in effect
Will Adjust	CONC AB 102

Other data

Powder temperature	=	+30°
Projectile weight	=	No change
Altitude	=	418

Note 1. Since this is a target of opportunity, the S–3 decides to use an odd lot of ammunition. He decides to let the computer select the optimum charge for this mission.

Note 2. Use Shell HE in fire for effect for 8″ howitzer and 280 gun.

b. Operator Actions.

(1) Perform procedure steps for processing the initial firing data.

(*a*) Depress "A" button.

(*b*) Depress matrix buttons A–2 (TGT EAST).

(*c*) Depress SM key.

(*d*) On keyboard, type in 44350; depress ENTER key.

(*e*) Depress matrix buttons A–3 (TGT NORTH).

(*f*) Depress SM key.

(*g*) On keyboard, type in 41970; depress ENTER key.

(*h*) Depress matrix buttons A–4 (TGT ALT.)

(*i*) Depress SM key.

(*j*) On keyboard, type in 418; depress ENTER key.

(*k*) Depress matrix buttons G–2 (POWD TEMP).

(*l*) Depress SM key.

(*m*) On keyboard, type in +30, depress ENTER key.

(*n*) Depress COMPUTE button.

Initial Firing Data

105 how	CHG 7	DF 2739	QE 407
155 how	CHG 6	DF 2341	QE 349
8″ how	CHG 5	DF 2543	QE 377
280 gun	CHG 1	DF 2145	QE 337

(2) Procedure for processing subsequent correction.

(*a*) Observer correction.
R 30 —200

1. Depress matrix buttons B–4 (GT LN ADJ).

2. Depress SM key.

3. On keyboard, type 0; depress ENTER key.

4. Depress matrix buttons A–6 (RIGHT/LEFT).

5. Depress SM key.

6. On keyboard type in RIGHT 30; depress ENTER key.

7. Depress matrix buttons A–8 (ADD/DROP).

8. Depress SM key.

9. On keyboard type in DROP 200; depress ENTER key.

10. Depress TRIG button. (COMPUTE button may be used for more accurate solution.)

(*b*) *Subsequent firing data.*

105 how	CHG 7	DF 2735	QE 393
155 how	CHG 6	DF 2337	QE 336
8″ how	CHG 5	DF 2539	QE 363
280 gun	CHG 1	DF 2141	QE 324

(*c*) *Observer correction.*

+100

1. Depress matrix buttons A–8 (ADD/DROP).

2. Depress SM key.

3. On keyboard, type in ADD 100; depress ENTER key.

4. Depress TRIG button. (COMPUTE button may be used for more accurate solution.)

(*d*) *Subsequent firing data.*

105 how	CHG 7	DF 2735	QE 401
155 how	CHG 6	DF 2337	QE 342
8″ how	CHG 5	DF 2539	QE 370
280 gun	CHG 1	DF 2141	QE 331

(*e*) *Observer correction.*

–50 FFE

1. Depress matrix buttons A–8 (ADD/DROP).

2. Depress SM key.

3. On keyboard, type in DROP 50; depress ENTER key.

4. Depress matrix buttons B–5 (PROJ TYPE).

5. Depress SM key.

6. On keyboard, type in 2; depress ENTER key.

7. Depress COMPUTE button.

Note. Do not use *4–7* above for 8″ how and 280 gun.

(*f*) *Subsequent firing data.*

105 how	CHG 7	DF 2734	QE 395
155 how	CHG 6	DF 2336	QE 340
8″ how	CHG 5	DF 2539	QE 367
280 gun	CHG 1	DF 2141	QE 328

c. Situation Continued. The S–3 directs the operator to perform data for replot on this target and store the target as concentration #2.

d. Operator Actions. The operator performs data for replot and records target as concentration number 2.

(1) Procedure steps for data for replot.

(*a*) Depress matrix buttons E–8 (REPLOT RECT).

(*b*) Depress SM key.

(*c*) The fire-for-effect coordinates and altitude are displayed.

105 how
Coordinates 44362 41817 Altitude 418

155 how
Coordinates 44362 41817 Altitude 418

8″ how
Coordinates 44362 41817 Altitude 418

280 gun
Coordinates 44362 41817 Altitude 418

(*d*) The coordinates are plotted on a map. The new altitude is determined. If the altitude derived from the map does not agree within one meter of the altitude displayed, the new altitude is placed in the computer to determine new coordinates. This procedure continues until two successive altitudes agree within one meter.

Altitude 430

(*e*) On keyboard, type in 430; depress ENTER key.

(*f*) The new coordinates and altitude are displayed.

105 how
Coordinates 44359 41797 Altitude 430

155 how
Coordinates 44359 41793 Altitude 430

8″ how
Coordinates 44359 41792 Altitude 430

280 gun
Coordinates 44359 41791 Altitude 430

(*g*) Plot the new coordinates on a map and determine a new altitude.

Altitude 428

(*h*) On keyboard, type in 428; depress ENTER key.

(*i*) The new coordinates and altitude are displayed.

105 how
Coordinates 44360 41800 Altitude 428

155 how
Coordinates 44359 41797 Altitude 428

8″ how
Coordinates 44359 41797 Altitude 428

280 gun
Coordinates 44359 41796 Altitude 428

(*j*) Plot the new coordinates and determine a new altitude.

Altitude 428

(*k*) This altitude agrees within one meter of the previous altitude displayed, therefore the replot procedure is complete.

(*l*) Terminate replot by typing in PERIOD on keyboard, and depress ENTER key.

(2) Procedure for recording target.

(*a*) Depress matrix buttons E–4 (TGT DATA STORE).

(*b*) Depress SM key.

(*c*) On keyboard type in 2; depress ENTER key.

(3) Cease fire end of mission.

(*a*) Depress matrix buttons E–1 (EOM).

(*b*) Depress SM key.

(*c*) On keyboard type in 0; depress ENTER key.

31. High Angle and Battalion Mass Missions

a. Situation. The following fire mission is received in the FDC. The S–3 gives the fire order as shown.

Fire mission	*Fire order*
From Conc #1, Az 240 R150—400 Mortars behind hill, High Angle Fuze VT, Will Adjust	Bn, "A", FZ Q, 2 volleys Conc AB 103

Note 1. Since this is a high angle and will adjust mission, the S–3 decides to use an odd lot of ammunition. He decides to let the computer select the optimum charge for this mission.

Note 2. In the event that "A" battery is a 280 gun Battery, disregard target location given above and use the following target location—Coordinates 51100 44380, Altitude 420. Answers given for mission in this case are based on this target. In the event that "B" and "C" batteries are 280 gun batteries, answers are based on this target also.

b. Operator Actions. The operator enters the target data and adjusts with Battery "A".

(1) Procedure for entering target location.

(*a*) Depress "A" Button.

(*b*) Depress matrix buttons A–1 (TGT DATA RECALL).

(*c*) Depress SM key.

(*d*) On keyboard type 1; depress ENTER key. (Computer displays 44667 43492, alt 475).

(*e*) Depress matrix buttons A–5 (OT AZ).

(*f*) Depress SM key.

(*g*) On keyboard type 240; depress ENTER key.

(*h*) Depress matrix buttons A–6 (RIGHT/LEFT).

(*i*) Depress SM key.

(*j*) On keyboard type RIGHT 150; depress ENTER key.

(*k*) Depress matrix buttons A–8 (ADD/DROP).

(*l*) Depress SM key.

(*m*) On keyboard type DROP 400; depress ENTER key.

(2) Procedure for determining initial firing data.

(*a*) Depress matrix buttons B–2 (HI ANGLE).

(*b*) Depress SM key.

(*c*) On keyboard type 0; depress ENTER key.

(*d*) Depress COMPUTE button. Initial firing data is displayed.

105 how	CHG 7	DF 2781	QE 1084
155 how	CHG 5	DF 2349	QE 922
8″ how	CHG 4	DF 2545	QE 910
280 gun	CHG 2	DF 1664	QE 1204

& No solution

(3) Subsequent Observer Correction. +200

(4) Procedure for determining subsequent firing data.

(*a*) Depress matrix buttons A–8 (ADD/DROP).

(*b*) Depress SM key.

(*c*) On keyboard type ADD 200; depress ENTER key.

(*d*) Depress TRIG button. (COMPUTE button may be used for more accurate solution.) Subsequent firing data is displayed.

105 how	CHG 7	DF 2777	QE 1066
155 how	CHG 5	DF 2343	QE 844
8″ how	CHG 4	DF 2539	QE 822
280 gun	CHG 2	DF 1668	QE 1196

& No solution

c. Situation Continued. A more lucrative and urgent target is reported to the FDC. The S–3 decides to temporarily interrupt "A" battery's mission to mass the battalion on this target. He plans to use the computer's predicted fire capability to place immediate fire for effect on the target. However, he desires to continue "A" battery's mission after the completion of firing the mass mission. The data for the new target is:

Fire request	*Fire order*
Coordinates 46038 42230	Bn, Lot TZ, CHG 7
Altitude 428 meters	3 volleys
Two convoys at road intersection, FFE.	Conc AB 104

Note 1. Charge given in fire order is for 105 howitzer. Use the following charges for other calibres:

155 how	Charge 6
8″ how	Charge 5
280 gun	Charge 1

d. Operator Actions. The operator temporarily stores "A" battery's mission and clears overrides from computer.

(1) Procedure to store mission.

(*a*) Depress matrix buttons D–7 (TEMP MSN STORE).

(*b*) Depress SM key.

(*c*) On keyboard, type 0; depress ENTER key.

(2) Procedure to clear overrides.

(*a*) Depress matrix buttons E–1 (EOM).

(*b*) On keyboard, type 0; depress ENTER key.

e. Operator Actions. The operator enters the new target, masses the battalion on it, and computes firing data.

(1) Procedure to enter target.

(*a*) Depress matrix buttons A–2 (TGT EAST).

(*b*) Depress SM key.

(*c*) On keyboard, type 46038; depress ENTER key.

(*d*) Depress matrix buttons A–3 (TGT NORTH).

(*e*) Depress SM key.

(*f*) On keyboard, type 42230; depress ENTER key.

(*g*) Depress matrix buttons A–4 (TGT ALT).

(*h*) Depress SM key.

(*i*) On keyboard, type 428; depress ENTER key.

(2) Procedure to mass battalion.

(*a*) Depress matrix buttons D–8 (MASS FIRES).

(*b*) Depress SM key.

(*c*) On keyboard, type 123; depress ENTER key.

(3) Procedure to enter fire order data and compute.

(*a*) Depress matrix buttons B–1 (CHG).

(*b*) Depress SM key.

(*c*) On keyboard, type 7; depress ENTER key (for 105 howitzer unit; use charge listed in *c* above note 1, for other calibres).

(*d*) Depress COMPUTE button. Firing data is displayed for "A" battery.

105 how	CHG 7	DF 2543	QE 461
155 how	CHG 6	DF 2143	QE 392
8″ how	CHG 5	DF 2345	QE 422
280 gun	CHG 1	DF 1946	QE 376

(*e*) Depress "B" Battery button.

(*f*) Depress matrix buttons B–1 (CHG).

(*g*) Depress SM key.

(*h*) On keyboard, type 7; depress ENTER key (for 105 howitzer unit; use charge listed in *c* above, note 1, for other calibres).

(*i*) Depress COMPUTE button. Firing data is displayed for "B" Battery.

105 how	CHG 7	DF 2585	QE 424
155 how	CHG 6	DF 2186	QE 363
8″ how	CHG 5	DF 2388	QE 396
280 gun	CHG 1	DF 1990	QE 346

(*j*) Depress "C" Battery Button.

(*k*) Depress matrix buttons B–1 (CHG).

(*l*) Depress SM key.

(*m*) On keyboard, type 7; depress ENTER key (for 105 howitzer unit; use charge listed in *c* above, note 1, for other calibre).

(*n*) Depress COMPUTE button. Firing data is displayed for "C" Battery.

105 how	CHG 7	DF 2536	QE 442
155 how	CHG 6	DF 2136	QE 380
8″ how	CHG 5	DF 2338	QE 417
280 gun	CHG 1	DF 1939	QE 360

f. Situation Continued. The observer desires no further fire for effect. The S–3 decides to store the target as Conc #7 and continue with the high angle mission interrupted by this mission.

(1) Procedure for storing target.

(*a*) Depress matrix buttons E–4 (TGT DATA STORE).

(*b*) Depress SM key.

(*c*) On keyboard, type 7; depress ENTER key. (Computer displays coordinates 46038 42230, altitude 428.)

(2) Procedure for ending mission.

(*a*) Depress matrix buttons E–1 (EOM).

(*b*) Depress SM key.

(*c*) On keyboard, type 0; depress ENTER key.

(*d*) Depress "B" battery button and repeat (*a*) through (*c*) above for "B" battery.

(*e*) Depress "A" battery button and repeat (2) (*a*) through (*c*) for "A" battery.

(3) Procedure for recalling high angle mission.

(*a*) Insure that "A" battery button is depressed.

(*b*) Depress matrix button D–6 (TEMP MSN RECALL).

(*c*) Depress SM key.

(*d*) On keyboard, type 0; depress ENTER key. (Computer displays coordinates 44766 43263, altitude 475 in case of 105mm, 155mm, and 8-inch howitzer, coordinates 51147, altitude 420 for 280mm gun).

(4) Subsequent observer correction.
R 20, —100

(5) Procedure for determining subsequent firing data.

(*a*) Depress matrix buttons A–6 (RIGHT/LEFT).

(*b*) Depress SM key.

(*c*) On keyboard, type RIGHT 20; depress ENTER key.

(*d*) Depress matrix buttons A–8 (ADD/DROP).

(*e*) Depress SM key.

(*f*) On keyboard, type DROP 100; depress ENTER key.

(*g*) Depress TRIG button. (COMPUTE button may be used for more accurate solution.) Subsequent firing data is displayed.

105 how	CHG 7	DF 1776	QE 1075
155 how	CHG 5	DF 2342	QE 893
8″ how	CHG 5	DF 2574	QE 1130
280 gun	CHG 2	DF 1665	QE 1199

& No solution

(6) Subsequent observer correction.
+50 FFE

(7) Procedure for determining the fire-for-effect data.

(*a*) Depress matrix buttons A–8 (ADD/DROP).

(*b*) Depress SM key.

(*c*) On keyboard, type ADD 50; depress ENTER key.

(*d*) Depress TRIG button. (COMPUTE button may be used for more accurate solution.) Fire-for-effect data for Battery "A" is displayed.

105 how	CHG 7	DF 2775	QE 1071
155 how	CHG 5	DF 2341	QE 873
8″ how	CHG 5	DF 2574	QE 1127
280 gun	CHG 2	DF 1666	QE 1198

& No solution

g. Operator Actions. The operator masses the fire of Batteries "B" and "C" on the target location above.

(1) Procedure for massing fires.

(*a*) Depress matrix buttons D–8 (MASS FIRES).

(*b*) Depress SM key.

(*c*) On keyboard, type 123; depress ENTER key.

(2) Procedure for computing fire for effect data for Battery "B".

(*a*) Depress "B" button.

(b) Depress matrix buttons B–2 (HI ANGLE).

(c) Depress SM key.

(d) On keyboard, type 0; depress ENTER key.

(e) Depress COMPUTE button. Computer displays fire-for-effect data for Battery "B".

105 how	CHG 7	DF 2832	QE 1104
155 how	CHG 5	DF 2400	QE 969
8″ how	CHG 4	DF 2597	QE 964
280 gun	CHG 2	DF 1683	QE 1218

& No solution

(3) Procedure for computing fire-for-effect data for Battery "C".

(a) Depress "C" button.

(b) Depress matrix buttons B–2 (HI ANGLE).

(c) Depress SM key.

(d) On keyboard, type 0; depress ENTER key.

(e) Depress COMPUTE button. Computer displays fire-for-effect data for Battery "C".

105 how	CHG 7	DF 2779	QE 1093
155 how	CHG 5	DF 2345	QE 930
8″ how	CHG 4	DF 2543	QE 932
280 gun	CHG 2	DF 1658	QE 1215

& No solution

h. Situation Continued. The observer send back "End of Mission, many casualties, request replot". The S–3 decides to replot the target and record it as Conc #3.

i. Operator Actions. Operator performs data for replot and records the target as Conc #3.

(1) Procedure for performing replot.

(a) Depress matrix buttons E–8 (REPLOT RECT).

(b) Depress SM key.

(c) The fire-for-effect coordinates and altitude are displayed.

	Coordinates	*Altitude*
105 how	44774 43209	475
155 how	44774 43209	475
8″ how	44774 43209	475
280 gun	51154 44521	420

(d) Plot the coordinates on a map and determine the new altitude.

Altitude 486 (105, 155, 8″)
Altitude 436 (280)

(e) On keyboard, type in 486; (436); depress ENTER key.

(f) The new coordinates and altitude are displayed.

	Coordinates	*Altitude*
105 how	44773 43205	486
155 how	44773 43202	486
8″ how	44773 43202	486
280 gun	51151 44517	436

(g) Plot the new coordinates and determine a new altitude.

	Coordinates	*Map Altitude*
105 how	44773 43205	487
155 how	44773 43202	487
8″ how	44773 43201	487
280 gun	51151 44517	437

(h) This new altitude agrees within *1* meter of the previous altitude displayed, therefore, the replot procedure is complete.

(i) Type in PERIOD; depress ENTER key.

(2) Procedure for recording target.

(a) Depress matrix buttons E–4 (TGT DATA STORE).

(b) Depress SM key.

(c) On keyboard, type in 3; depress ENTER key.

(3) Procedures for ending mission.

(a) Depress matrix buttons E-1 (EOM).

(b) Depress SM key.

(c) On keyboard, type 0; depress ENter key.

(d) Depress "B" and "C" battery buttons and repeat (a)–(c) above for these batteries.

32. Precision Registration

a. Situation. Weather conditions have changed considerably and the S–3 decides to fire a precision registration to improve the accuracy of his fires. Because of the degree of change in the met conditions, he decides to set met to standard prior to firing the registration.

Registration Point 1 Coordinates 43196 43137 Altitude 457 *b. Situation Continued.* The following materiel conditions are available to the S–3 at the time of firing the registration:

	A	*B*	*C*
Muzzle Velocity	No change from paragraph 29*c*		
Powder Temperature	+60°	+62°	+61°
Projectile Weight	No change from paragraph 29*c*		

Since the unit has remained in the same position, there is no change in surveyed data.

c. Operator Actions. The operator corrects the battery data and sets the met to standard in preparation for the registration.

Note. Prior to computing a registration on the computer all known weather and materiel conditions should be entered into the computer. If a met message were received, it should be enterd at this time.

(1) Correction of Powder Temperature.

(*a*) Depress "A" battery button.

(*b*) Depress matrix buttons G–2 (POWD TEMP).

(*c*) Depress SM key.

(*d*) On keyboard, type +60; depress ENTER key.

(*e*) Depress "B" battery button.

(*f*) Depress SM key.

(*g*) On keyboard, type +62; depress ENTER key.

(*h*) Depress "C" battery button.

(*i*) Depress SM key.

(*j*) On keyboard, type +61; depress ENTER key.

(2) Set met to standard.

(*a*) Depress matrix buttons H–6 (MET STD).

(*b*) Depress SM key.

(*c*) On keyboard, type 0; depress ENTER key.

d. Situation Continued. The S–3 notifies the observer to request a precision on registration point 1. The observer sends the following request which the S–3 decides to fire with "A" Battery.

Fire request	*S–3 order*
RP1, Az 5600	A, Lot TZ, CHG 7
Registration, Will Adjust	RP 1

Note. Charge 7 is used for a 105 howitzer unit. Use the following charges for other calibres.

155 how	CHG 6
8″ how	CHG 5
280 gun	CHG 1

e. Operator Actions Continued. The operator enters the registration point, fire request, and charge data and causes the computer to compute firing data for the adjustment phase of the registration.

(1) Procedure for computing initial firing data.

(*a*) Depress "A" battery button.

(*b*) Depress matrix buttons A–2 (TGT EAST).

(*c*) Depress SM key.

(*d*) On keyboard, type in 43196; depress ENTER key.

(*e*) Depress matrix buttons A–3 (TGT NORTHING).

(*f*) Depress SM key.

(*g*) On keyboard, type in 43137; depress ENTER key.

(*h*) Depress matrix buttons A–4 (TGT ALT).

(*i*) Depress SM key.

(*j*) On keyboard, type in 457; depress ENTER key.

(*k*) Insure that projectile is type 1.

1. Depress matrix buttons B–5 (PROJ TYPE).

2. Depress RECALL button.

3. Note display, should be 1.

(*l*) Insure that fuze is type 1.

1. Depress matrix buttons B–6 (FUZE TYPE).

2. Depress RECALL button.

3. Note display, should be 1.

(*m*) Override for appropriate charge (105—Chg 7, 155—Chg 6, 8″—Chg 5, 280—Chg 1).

1. Depress matrix buttons B–1 (CHG).

2. Depress SM key.

3. On keyboard, type in 7; depress ENTER key.

Note. Type in 7 if "A" Battery is a 105 unit; if "A" Battery is another caliber, type in appropriate charge as shown above.

(*n*) Depress COMPUTE button. The

computer displays the following data:

105 how	CHG 7	DF 2895	QE 453
155 how	CHG 6	DF 2496	QE 393
8″ how	CHG 5	DF 2697	QE 424
280 gun	CHG 1	DF 2299	QE 382

(2) Observer corrections and operator actions:

R 20 +200

(*a*) Depress matrix buttons A–5 (OT AZ).

(*b*) Depress SM key.

(*c*) On keyboard, type in 5600; depress ENTER key.

(*d*) Depress matrix buttons A–6 (RIGHT/LEFT).

(*e*) Depress SM key.

(*f*) On keyboard, type in Right 20; depress ENTER key.

(*g*) Depress matrix buttons A–8 (ADD/DROP).

(*h*) Depress SM key.

(*i*) On keyboard, type in ADD 200; depress ENTER key.

(*j*) Depress TRIG button. Computer displays:

105 how	CHG 7	DF 2909	QE 467
155 how	CHG 6	DF 2510	QE 404
8″ how	CHG 5	DF 2711	QE 435
280 gun	CHG 1	DF 2313	QE 392

(3) Observer corrections and operator actions: —100

(*a*) Depress matrix buttons A–8 (ADD/DROP).

(*b*) Depress SM key.

(*c*) On keyboard, type in DROP 100; depress ENTER key.

(*d*) Depress TRIG button. Computer displays:

105 how	CHG 7	DF 2901	QE 461
155 how	CHG 6	DF 2502	QE 399
8″ how	CHG 5	DF 2703	QE 430
280 gun	CHG 1	DF 2305	QE 388

(4) Observer corrections and operator actions: L 10, +50 FFE

(*a*) Depress matrix buttons A–6 (RIGHT/LEFT).

(*b*) Depress SM key.

(*c*) On keyboard, type in LEFT 10; depress ENTER key.

(*d*) Depress matrix buttons A–8 (ADD/DROP).

(*e*) Depress SM key.

(*f*) On keyboard, type in ADD 50; depress ENTER key.

(*g*) Depress TRIG button. Computer displays:

105 how	CHG 7	DF 2906	QE 463
155 how	CHG 6	DF 2507	QE 401
8″ how	CHG 5	DF 2708	QE 432
280 gun	CHG 1	DF 2310	QE 389

f. Situation Continued. The FDC manually computes the adjusted data based on the above fire-for-effect deflection and quadrant and on the subsequent observer sensings. This portion of the registration procedure is the same as that found in FM 6–40. It should be noted that line shots in the adjustment phase may be used for the computation of adjusted deflections the same as in the manual method. The time to initiate the time registration is the time corresponding to the adjusted elevation.

Note 1. Initial Ti is modified by any known fuze corrections.

Note 2. The computer may be used to assist in the determination of the Angle T, Factor S, Fork, and Site for use in the fire-for-effect phase of the registration. See Table I, COMP REG function, Remark 6 for method of using the computer to do this.

g. Situation Continued. The fire-for-effect phase of the registration is completed manually using DA Form 6–12 (Record of Precision Fire) and the procedures outlined in FM 6–40. The following adjusted data has been determined.

	CHG	*ADJ DEFL*	*ADJ time*	*ADJ QE*
105 how	7	2906	33.4	460
155 how	6	2505	30.0	404
8″ how	5	2704	30.4	433
280 gun	1	2308	27.9	386

h. Operator Actions To Cause FADAC Computer To Compute The Registration Corrections.

(1) Enter surveyed coordinates and altitude of registration point again.

Registration pt.	*Coord*	*Alt*
1	43196 43137	457

(2) Depress matrix buttons G–6 (DF INPUT).

(3) Depress SM key.

(4) Enter of keyboard:
If 105 Btry 2906; depress ENTER key.
If 155 Btry 2505; depress ENTER key.
If 8″ Btry 2704; depress ENTER key.
If 280 Btry 2308; depress ENTER key.

(5) Depress matrix buttons G–7 (TIME INPUT).

(6) Depress SM key.

(7) Enter on keyboard:
If 105 Btry 33.4; depress ENTER key.
If 155 Btry 30.0; depress ENTER key.
If 8″ Btry 30.4; depress ENTER key.
If 280 Btry 27.9; depress ENTER key.

(8) Depress matrix buttons G–8 (QE INPUT).

(9) Depress SM key.

(10) Enter on keyboard:
If 105 Btry 460; depress ENTER key.
If 155 Btry 404; depress ENTER key.
If 8″ Btry 433; depress ENTER key.
If 280 Btry 386; depress ENTER key.

(11) Recall charge to insure that it has not been changed.

(*a*) Depress matrix buttons B–1 (CHG).

(*b*) Recall (Charge should be the same. If not, reenter charge used for registration).

(12) Enter fuze time.

(*a*) Depress matrix buttons B–6 (FUZE TYPE).

(*b*) Depress SM key.

(*c*) On keyboard, type 2; depress ENTER key.

(13) Depress matrix buttons H–8 (COMP REG).

(14) Depress SM key. Computer displays the following registration corrections:

	DEFL corr	*Time corr*	*RG K*
105 how	L 11.5	+.4	+10
155 how	L 9.4	+.3	+18
8″ how	L 7.0	+.2	+15
280 gun	L 9.4	+.1	+ 8

Note 1. These corrections represent the difference between the data required to hit the registration point (adjusted data) and the data the computer would have computed to the registration point using the parameters input into its equations of motion solution.

Note 2. "A" Battery's base piece is over the battery center.

i. Operator Actions To Cause Computer To Store And Apply Registration Corrections. The registration corrections may be stored for all charges for any of the batteries desired or they may be stored for the particular charges designated.

(1) If it is desired to enter corrections for *all* charges for "A" Battery, depress ENTER key. Depress "B" battery button and depress ENTER key to enter corrections for all charges for "B" battery if desired. Repeat for "C" battery if desired. Type PERIOD after last battery to end mode.

(2) If it is desired to enter different registration corrections for other charges, do not depress ENTER key as outlined in (1) above. Note the corrections displayed and enter them in the following manner:

(*a*) Depress matrix buttons F–6 (DF CORR).

(*b*) Depress SM key.

(*c*) On keyboard, type in CHG 7; depress ENTER key.

	CHG
105 how	7
155 how	6
8″ how	5
280 gun	1

(*d*) On keyboard, type in L 11.5; depress ENTER key.

105 how	L 11.5
155 how	L 9.4
8″ how	L 7.0
280 gun	L 9.4

(*e*) Depress matrix buttons F–7 (TIME CORR).

(*f*) Depress SM key.

(*g*) On keyboard, type in CHG 7; depress ENTER key.

	CHG
105 how	7
155 how	6
8″ how	5
280 gun	1

(*h*) On keyboard, type in +.4; depress ENTER key.

105 how	+.4
155 how	+.3
8″ how	
280 gun	

(*i*) Depress matrix buttons F–8 (RANGE CORR).

(*j*) Depress SM key.

(*k*) On keyboard, type in CHG 7; depress ENTER key.

	CHG
105 how	7
155 how	6
8″ how	5
280 gun	1

(*l*) On keyboard, type in +10; depress ENTER key.

105 how	+10
155 how	+18
8″ how	+15
280 gun	+ 8

(*m*) Enter registration corrections for other charges in the same manner.

j. Situation Continued. The S–3 decides to store and apply the corrections for all charges for all batteries.

k. Operator Actions Continued. The operator follows actions outlined in *i*(1) above for all batteries.

l. Situation Continued. The S–3 decides to construct GFT settings for use with a manual backup. He will cause the computer to compute adjusted data through the registration point for each battery to determine the adjusted deflection, time, and quadrant elevation. He will subtract the site (computed as outlined in Remark 6, COMP REG function, table I or on the Graphical Site Table) from the adjusted quadrant elevation to determine the adjusted elevation.

(1) Determination of "A" Battery GFT setting.

(*a*) Plotting the registration point on the firing chart, the chart range is determined to be 8840 meters. The site is determined to be:

105 how	+7 mils
155 how	+7 mils
8″ how	+7 mils

(*b*) The adjusted data as determined by the registration is used for the GFT setting.
105 How: GFT A, Chg 7, Lot T, Rg 8840, El 453, Ti 33.4, Adj DF 2906.
155 How: GFT A, Chg 6, Lot TZ, Rg 8840, El 397, Ti 30.0, Adj DF 2505.
8″ How: GFT A, Chg 5, Lot TZ, Rg 8840, El 426, Ti 30.4, Adj DF 2704.
280 gun: No graphical equipment exists. Adjusted DF 2308, Fuze Corr +.1/1000 m, Rg K +8/1000 m.

(2) Determination of "B" Battery GFT Setting. The operator causes the computer to compute firing data to the registration point using the registration corrections. The data displayed will be adjusted deflection, time, and quadrant elevation.

(*a*) Depress "B" battery button.

(*b*) Depress matrix buttons A–2 (TGT EAST).

(*c*) Depress SM key.

(*d*) On keyboard, type 43196; depress ENTER key.

(*e*) Depress matrix buttons A–3 (TGT NORTH).

(*f*) Depress SM key.

(*g*) On keyboard, type 43137; depress ENTER key.

(*h*) Depress matrix buttons A–4 (TGT ALT).

(*i*) Depress SM key.

(*j*) On keyboard, type 457; depress ENTER key.

(*k*) Depress matrix buttons B–1 (CHG).

(*l*) Depress SM key.

(*m*) On keyboard, type in 7; depress ENTER key. For 105 Howitzer unit; if other than 105 unit, type in charge in which registration was conducted.)

(*n*) Depress matrix buttons B–6 (FUZE TYPE).

(*o*) Depress SM key.

(p) On keyboard, type in 2; depress ENTER key.

(q) Depress matrix buttons A–7 (UP/DOWN).

(r) Depress SM key.

(s) On keyboard, type in DOWN 20; depress ENTER key.

Note. This is to compensate for the 20/R which the computer automatically applies and allows computation of a zero height of burst.

(t) Depress COMPUTE button. Computer displays the following data:

105 how	CHG 7	DF 2965	Ti 31.6	QE 434
155 how	CHG 6	DF 2565	Ti 28.4	QE 383
8″ how	CHG 5	DF 2764	Ti 29.0	QE 416
280 gun	CHG 1	DF 2367	Ti 26.5	QE 366

(u) The chart range is measured on the firing chart as 8360 meters. The site is—

105 How	+9 mils
155 How	+8 mils
8″ How	+9 mils

(v) The GFT setting for "B" Battery are:

105 How: GFT B, Chg 7, Lot TZ, Rg 8480, El 425, Ti 31.6, Adj Df 2965.

155 How: GFT B, Chg 6, Lot TZ, Rg 8480, El 375, Ti 28.4, Adj Df 2565.

8″ How: GFT B, Chg 5, Lot TZ, Rg 8480, El 407, Ti 29.0, Adj Df 2764.

280 Gun: Adjusted Df 2367, Fuze Corr +.1/1000, Rg K +8/1000 m.

(3) Determination of "C" Battery GFT settings:

(a) The operator repeats the operations outlined in (2) (*a*) through (*t*) above depressing the "C" battery button. The computer displays the following data:

105 how	CHG 7	DF 2912	Ti 31.9	QE 439
155 how	CHG 6	DF 2511	Ti 28.8	QE 389
8″ how	CHG 5	DF 2710	Ti 29.5	QE 427
280 gun	CHG 1	DF 2314	Ti 26.7	QE 369

(b) The chart range is measured on the firing chart as 8540 meters. The site is—

105 How	+9 mils
155 How	+8 mils
8″ How	+8 mils

(c) The GFT settings for "C" Battery is:

105 How: GFT C, Chg 7, Lot TZ, Rg 8540, El 430, Ti 31.9, Adj Df 2912.

155 How: GFT C, Chg 6, Lot TZ, Rg 8540, El 381, Ti 28.8, Adj Df 2511.

8″ How: GFT C, Chg 5, Lot TZ, Rg 8540, El 419, Ti 29.5, Adj Df 2710.

280 Gun: Adjusted DF 2314, Fuze Corr +.1/1000, Rg K +8/1000 m.

33. High Burst Registration

a. Situation. The battalion has displaced into new firing positions. The following is the surveyed data for the new positions:

	A	*B*	*C*
Coordinates	49912 35619	50155 35915	50560 35599
Altitude	400	400	391
Azimuth of Fire	6400	6300	6300
Latitude	34°N	34°N	34°N
Grid Declination Angle.	+5	+5	+5
Deflection		No change	

	01	*02*
Coordinates	50205.10 41850.02	48431.01 42621.03
Altitude	510.1	483.1

b. Situation Continued. The S3 directs the computer operator to get his computer ready for operation and to enter the new surveyed data.

c. Operator Actions. The operator takes the following actions:

(1) Bit sum test. Since the computer has been turned off for the move to the new position, the operator runs the bit sum test to insure proper operation of the program.

(a) Depress PROG TEST button. (Top panel of computer.)

(b) Depress "1" key to check permanent storage. (Proper display should appear.)

(c) Depress PROG TEST button.

(*d*) Depress "2" key to check working storage. (Number 136 should appear.)

(2) EOM all batteries.

(*a*) Depress matrix buttons E–1 (EOM).

(*b*) Depress "A" battery button.

(*c*) Depress SM key.

(*d*) On keyboard, type in 0; depress ENTER key.

(*e*) Depress "B" battery button.

(*f*) Depress SM key.

(*g*) On keyboard, type in 0; depress ENTER key.

(*h*) Depress "C" battery button.

(*i*) Depress SM key.

(*j*) On keyboard, type in 0; depress ENTER key.

(3) Entry of surveyed data.

(*a*) Battery "A" entry procedure.

1. Depress "A" battery button.

2. Depress matrix buttons H–1 (BTRY EAST).

3. Depress SM key.

4. On keyboard, type 49912; depress ENTER key.

5. Depress matrix buttons H–2 (BTRY NORTH).

6. Depress SM key.

7. On keyboard, type 35619; depress ENTER key.

8. Depress matrix buttons H–3 (BTRY HT).

9. Depress SM key.

10. On keyboard, type 400; depress ENTER key.

11. Depress matrix buttons H–4 (BTRY AZ LAID).

12. Depress SM key.

13. On keyboard, type 6400; depress ENTER key.

Note. Since the battery deflection, latitude and grid declination angle did not change, it is not necessary to reenter this data. Since the battery calibres did not change, it is not necessary to SET UP again. The computer has a non-volatile memory so that information is not destroyed in the computer's memory when the power is turned off.

(*b*) Battery "B" entry procedure.

1. Depress "B" battery button.

2. Follow the procedures used for Battery "A" in (*a*)*2* through *13* above using Battery "B" data.

(*c*) Battery "C" entry procedure.

1. Depress "C" button.

2. Follow the procedures used for Battery "A" above in (*a*)*2* through *13* above using Battery "C" data.

(*d*) The procedure to enter 01 and 02 survey data is—

1. Depress matrix buttons C–1 (OBSR EAST).

2. Depress SM key.

3. On keyboard, type 50205.10; depress ENTER key.

4. Depress matrix buttons C–2 (OBSR NORTH).

5. Depress SM key.

6. On keyboard, type 41850.02; depress ENTER key.

7. Depress matrix buttons C–3 (OBSR ALT).

8. Depress SM key.

9. On keyboard, type 510; depress ENTER key.

10. Depress matrix buttons D–3 (OBS LOC STORE).

11. Depress SM key.

12. On keyboard, type in 1; depress ENTER key.

Note. 01 is now stored in Observer Location 1.

13. Depress matrix buttons C–1 (OBSR EAST).

14. Depress SM key.

15. On keyboard, type 48431.01; depress ENTER key.

16. Depress matrix buttons C–2 (OBSR NORTH).

17. Depress SM key.

18. On keyboard, type 42621.03; depress ENTER key.

19. Depress matrix buttons C–3 (OBSR ALT).

20. Depress SM key.

21. On keyboard, type 483; depress ENTER key.

Note. 02 is now stored in Observer Location 2.

d. Situation Continued. The following materiel conditions are reported by the batteries.

	A	B	C
Powder Temperature	+42°	+43°	+41°

Muzzle Velocity Shell HE, Lot TZ. There is no change in muzzle velocities for the charges previously reported.

Projectile Weight Shell HE and WP. No change from that previously reported.

e. Operator Actions. The S–3 directs the operator to correct the powder temperatures to that reported. The operator—

(1) Depresses the "A" battery button.

(2) Depress matrix buttons G–2 (POWD TEMP).

(3) Depress SM key.

(4) On keyboard, type +42; depress ENTER key.

(5) Depress the "B" battery button.

(6) Depress SM key.

(7) On keyboard, type +43; depress ENTER key.

(8) Depress the "C" battery button.

(9) Depress SM key.

(10) On keyboard, type +41; depress ENTER key.

Note. Since the muzzle velocity or projectile weight did not change, there is no need to reenter these items.

f. Situation Continued. The S–3 decides to shoot a high burst registration to determine accurate corrections. No met message is available so he directs the operator to set the met to standard. He further decides to use the corrections from the precision registration for the computed data for the high burst registration. Examining a map, he decides to fire the high burst registration at coordinates 5044 and at an altitude of 500 meters. He directs the operator to orient the observers and compute firing data for Battery "B". Using lot TZ and Charge 7 (for 105 Howitzer; Use Charge 6 for 155 Howitzer, Charge 5 for 8″ Howitzer, Charge 1 for 280 gun).

g. Operator Actions. The operator takes the following actions:

(1) Set met to standard.

(*a*) Depress matrix buttons H–6 (MET STD).

(*b*) Depress SM key.

(*c*) On keyboard, type 0; depress ENTER key.

Note 1. This sets met to standard with the altitude of the MDP set as that of "A" battery.

Note 2. The registration corrections from the precision registration from paragraph 32 remain in the computer so no operator action is necessary in this case.

(2) Orient the 01–02 Base.

(*a*) Procedure for entering high burst location.

1. Depress "B" battery button.

2. Depress matrix buttons A–2 (TGT EAST).

3. Depress SM key.

4. On keyboard, type 50000; depress ENTER key.

5. Depress matrix buttons A–3 (TGT NORTH).

6. Depress SM key.

7. On keyboard, type 44000; depress ENTER key.

8. Depress matrix buttons A–4 (TGT ALT).

9. Depress SM key.

10. On keyboard, type 500; depress ENTER key.

(*b*) Computation of orienting data for 01 and 02.

1. Depress matrix buttons D–4 (OBS LOC RECALL).

2. Depress SM key.

3. On keyboard, type 1; depress ENTER key.

4. Depress SM key.

5. On keyboard, type 2; depress ENTER key.

6. Depress matrix buttons D–5 (SURVEY).

7. Depress SM key.

8. On keyboard, type 3; depress ENTER key. Type 3 indicates the mode of operation for determining orienting data. The 02 orienting data is displayed.

Azimuth 856 Distance 2089
Vertical Angle +8

The operator announces this data.

9. Depress ENTER key on the keyboard. The 01 orienting data is displayed.

Azimuth 6303 Distance 2160
Vertical Angle —5

The operator announces this data.

Note. The computer automatically terminates mode after display of 01 data.

(3) Computation of firing data.

(*a*) Insure that "B" button is depressed.

(*b*) Depress matrix buttons B–1 (CHG).

(*c*) Depress SM key.

(*d*) On keyboard, type in 7; depress ENTER key. (For 105 Howitzer unit; type in charge specified in par. 33 *f* for other calibres.)

(*e*) Depress matrix buttons B–6 (FUZE TYPE).

(*f*) Depress SM key.

(*g*) On keyboard, type FUZE TYPE 2; depress ENTER key.

(*h*) Depress matrix buttons A–6 (UP/DOWN).

(*i*) Depress SM key.

(*j*) On keyboard, type DOWN 20; depress ENTER key.

Note. This is necessary in order to compensate for the 20/R automatically applied by the computer when fuze time is selected.

(*k*) Depress COMPUTE button. The following firing data is displayed.

105 how	CHG 7	DF 2739	TI 29.7	QE 410
155 how	CHG 6	DF 2338	TI 26.8	QE 367
8″ how	CHG 5	DF 2537	TI 27.3	QE 396
280 gun	CHG 1	DF 2141	TI 25.6	QE 351

h. Situation Continued. The firing of the high burst has been completed and the readings from 01 and 02 have been averaged in the FDC and are tabulated below—

01 Azimuth	6290
01 Vertical Angle	+5
02 Azimuth	855

i. Operator Actions. Using the average readings from 01 and 02, the operator computes the coordinates and altitude of the high burst registration.

(1) Depress matrix buttons D–4 (OBS LOC RECALL).

(2) Depress SM key.

(3) On keyboard, type in 1; depress ENTER key.

(4) Depress matrix buttons C–4 (OBS AZ).

(5) Depress SM key.

(6) On keyboard, type in 6290; depress ENTER key.

(7) Depress matrix buttons C–7 (OBS VERT ANGLE).

(8) Depress SM key.

(9) On keyboard, type in +5; depress ENTER key.

(10) Depress matrix buttons D–4 (OBS LOC RECALL).

(11) Depress SM key.

(12) On keyboard, type in 2; depress ENTER key.

(13) Depress matrix buttons C–4 (OBS AZ).

(14) Depress SM key.

(15) On keyboard, type in 855; depress ENTER key.

(16) Depress matrix buttons D–5 (SURVEY).

(17) Depress SM key.

(18) On keyboard, type in 2; depress ENTER key. (The coordinates and altitude of high burst location are displayed. The computer will terminate the survey mode automatically

COORDINATES 49972 44004
ALTITUDE 521.)

j. Situation Continued. Registration with Battery "A" and Battery "C" is prohibited at this time so the S–3 decides to compute the registration corrections for Battery "B" and apply these corrections to all batteries in the battalion. Based on the "B" Battery Executive Officer's Report, the coordinates and altitude of the base piece are determined to be coordinates 50175 35935, Altitude 404.

k. Operator Actions. The operator determines the registration corrections for Battery "B" and applies these corrections to all batteries.

(1) Enter the adjusted data (data fired), base piece coordinates, and compute registration corrections.

(*a*) Depress matrix buttons G–6 (DF INPUT).

(*b*) Depress SM key.

(*c*) On keyboard, type 2739; depress ENTER key. (For 105 How, only; enter adjusted deflection shown on other calibres.)

(*d*) Depress matrix buttons G–7 (TIME INPUT).

(*e*) Depress SM key.

(*f*) On keyboard, type 29.7; depress ENTER key. (For 105 How, only; enter adjusted time shown for other calibres.)

(*g*) Depress matrix buttons G–8 (QE INPUT).

(*h*) Depress SM key.

(*i*) On keyboard, type 410; depress ENTER key. (For 105 How, only; enter adjusted quadrant elevation shown for other calibres.)

(*j*) Depress matrix buttons H–1 (BTRY EAST).

(*k*) Depress SM key.

(*l*) On keyboard, type 50175; depress ENTER key.

(*m*) Depress matrix buttons H–2 (BTRY NORTH).

(*n*) Depress SM key.

(*o*) On keyboard, type 35935; depress ENTER key.

(*p*) Depress matrix buttons H–3 (BTRY ALT).

(*q*) Depress SM key.

(*r*) On keyboard, type 404; depress ENTER key.

(*s*) Depress matrix buttons B–6 (FUZE TYPE).

(*t*) Depress SM key.

(*u*) On keyboard, type 2; depress ENTER key.

(*v*) Depress matrix buttons B–1 (CHG).

(*w*) Depress RECALL key—insure that charge has not been changed.

(*x*) Depress matrix buttons H-8 (COMP REG).

(*y*) Depress SM key. The deflection correction, time correction, and range K are displayed as follows:

105 how
DF CORR L5.5 TI CORR +.4 RG K +8

155 how
DF CORR L3.2 TI CORR +.3 RG K +21

8″ how
DF CORR L .9 TI CORR +.2 RG K +15

280 gun
DF CORR L3.4 TI CORR +.1 RG K +5

(2) Store corrections for Battery "A", "B", and "C".

(*a*) Depress ENTER key. (Corrections are recorded for all charges for "B" battery.)

(*b*) Depress "A" battery button.

(*c*) Depress ENTER key. (Corrections are recorded for all charges for "A" battery.)

(*d*) Depress "C" battery button.

(*e*) Depress ENTER key. (Corrections are recorded for all charges for "C" battery.)

(*f*) Depress PERIOD key to each mode.

Note 1. In the event manual GFT settings are desired, the computations are done as outlined in paragraph 32. Use the computed coordinates and altitude of the high burst point as the registration point to be entered.

Note 2. The entry of the base piece coordinates was necessary to compensate for base piece displacement. The coordinates of the battery center must be reentered for future firing.

(3) Reentry of "B" battery center.

(*a*) Depress "B" battery button.

(*b*) Depress matrix buttons H–1 (BTRY EAST).

(*c*) Depress SM key.

(*d*) On keyboard, type 50155; depress ENTER key.

(e) Depress matrix buttons H–2 (BTRY NORTH).

(f) Depress SM key.

(g) On keyboard, type 35915; depress ENTER key.

(h) Depress matrix buttons H–3 (BTRY ALT).

(i) Depress SM key.

(j) On keyboard, type 400; depress ENTER key.

l. Situation Continued. 01 calls into FDC with a target of opportunity.

FIRE MISSION

Az 500, Vert Angle —20, Distance 2000, Assembly Area, Fire for Effect.

FIRE ORDER

Battalion, Use High Burst Registration, Lot TZ, Charge 7. Fuze VT, 1 C Apart, Conc AB105.

Note 1. Use Charge 7 for 105 How only; use Chg 6 for 155 How, Chg 5 for 8″ How.

Note 2. Based on his analysis of the target, the S–3 decides to fire with "A" battery firing at the target, "B" battery firing 100 meters over the target, and "C" battery firing 100 meters short of the target.

m. Operator Actions. The operator processes the mission as follows:

(1) Operator Actions to Compute Polar Plot Mission.

(a) Depress "A" battery button.

(b) Depress matrix buttons D–4 (OBS LOC RECALL).

(c) Depress SM key.

(d) On keyboard, type in 1; depress ENTER key. (Coordinates and altitude are displayed.)

(e) Depress matrix buttons C–4 (OBS AZ).

(f) Depress SM key.

(g) On keyboard, type in 500; depress ENTER key.

(h) Depress matrix buttons C–5 (OBS HORIZ DIST).

(i) Depress SM key.

(j) On keyboard, type in 2000, depress ENTER key.

(k) Depress matrix buttons C–7 (OBS VERT ANGLE).

(l) Depress SM key.

(m) On keyboard, type in —20; depress ENTER key.

(n) Depress matrix buttons C–8 (POLAR PLOT MSN).

(o) Depress SM key. (Coordinates 51148 43614 and Altitude 471 of target are displayed and associated with target input positions A–2, A–3, A–4 respectively.)

(2) Operator Procedures to compute data for "A" battery:

(a) Depress matrix buttons B–1 (CHG).

(b) Depress SM key.

(c) On keyboard, type in 7; depress ENTER key. (For 105 How; enter Chg 6 for 155 How, Chg 5 for 8″ How, Chg 1 for 280 gun.)

(d) Depress matrix buttons B–6 (FUZE TYPE).

(e) Depress SM key.

(f) On keyboard, type in 3; depress ENTER key.

(g) Depress COMPUTE button. Computer displays the following firing data:

105 how	CHG 7	DF 2657	TI 28.0	QE 406
155 how	CHG 6	DF 2256	TI 15.0	QE 363
8″ how	CHG 5	DF 2455	TI 26.0	QE 387
280 gun	CHG 1	DF 2059	TI 25.0	QE 350

(3) Operator Actions for Mass Fire.

(a) Depress matrix buttons D–8 (MASS FIRES).

(b) Depress SM key.

(c) On keyboard, type in 123; depress ENTER key.

(d) Depress "B" battery button.

(e) Depress matrix buttons B–1 (CHG).

(f) Depress SM key.

(g) On keyboard, type in 7; depress ENTER key. (For 105 How only; enter Chg 6 for 155 How, Chg 5 for 8″ How, or Chg 1 for 280mm gun.)

(h) Depress matrix buttons B–4 (GT LN ADJ).

(i) Depress SM key.

(j) On keyboard, type 0.

(*k*) Depress matrix buttons B–6 (FUZE TYPE).

(*l*) Depress SM key.

(*m*) On keyboard, type in 3; depress ENTER key.

(*n*) Depress matrix buttons A–8 (ADD/DROP).

(*o*) Depress SM key.

(*p*) On keyboard, type ADD 100; depress ENTER key.

(*q*) Depress COMPUTE button. Fire for effect data for "B" battery is:

105 how	CHG 7	DEFL 2582	TI 27.0	QE 391
155 how	CHG 6	DEFL 2182	TI 25.0	QE 350
8″ how	CHG 5	DEFL 2380	TI 25.0	QE 371
280 gun	CHG 1	DEFL 1984	TI 24.0	QE 336

(*r*) Depress "C" battery button.

(*s*) Depress matrix buttons B–1 (CHG).

(*t*) Depress SM key.

(*u*) On keyboard, type in 7; depress ENTER key. (For 105 How unit only; enter Chg 6 for 155 How unit, Chg 5 for 8″ How unit, Chg 1 for 280mm gun unit).

(*v*) Depress matrix buttons B–4 (GT LN ADJ).

(*w*) Depress SM key.

(*x*) On keyboard, type 0.

(*y*) Depress matrix buttons B–6 (FUZE TYPE).

(*z*) Depress SM key.

(*aa*) On keyboard, type in 3; depress ENTER key.

(*ab*) Depress matrix buttons A–8 (ADD/DROP).

(*ac*) Depress SM key.

(*ad*) On keyboard, type DROP 100; depress ENTER key.

(*ae*) Depress COMPUTE button. Fire for effect data for "C" battery is:

105 how	CHG 7	DF 2639	TI 27.0	QE 400
155 how	CHG 6	DF 2238	TI 25.0	QE 360
8″ how	CHG 5	DF 2437	TI 26.0	QE 391
280 gun	CHG 1	DF 2040	TI 24.0	QE 343

n. Situation Continued. The observer sends the message, "End of Mission, Many Casualties." The S–3 directs the computer operator to store the target as target 5 and end the mission.

o. Operator Actions. The operator stores the target as reported and ends the mission for all batteries.

(1) Storage of Target.

(*a*) Depress "A" battery button.

(*b*) Depress matrix buttons E–4 (TGT DATA STORE).

(*c*) Depress SM key.

(*d*) On keyboard, type 5; depress ENTER key.

(2) End of Mission, all batteries.

(*a*) Depress matrix buttons E–1 (EOM).

(*b*) Depress SM key.

(*c*) On keyboard, type 0; depress ENTER key.

(*d*) Depress "B" battery button.

(*e*) Depress SM key.

(*f*) On keyboard, type 0; depress ENTER key.

(*g*) Depress "C" battery button.

(*h*) Depress SM key.

(*i*) On keyboard, type 0; depress ENTER key.

APPENDIX I

REFERENCES

1. Field Manuals

FM 6–3	Gun Direction Computer M18
FM 6–40	Field Artillery Cannon Gunnery.
FM 6–125	Qualification Tests for Specialists, Field Artillery.

2. Technical Manuals

TM 9–1220–221–10/1	Operators Manual: Gun Direction Computer M18
TM 9–1220–221–10/2	Operators Manual: Gun Direction Computer M18 (Cannon Artillery Application)
TM 9–1220–221–20/1	Organizational Maintenance Manual; Computer, Gun Direction M18.
TM 3–220	Decontamination.

3. Miscellaneous

ATP 6–100	Army Training Programs for Field Artillery Unit.

APPENDIX II

AMMUNITION REFERENCE DATA

1. Standard Projectiles and Projectile Weights

Flag	Type	105-mm howitzer		155-mm howitzer		8-inch howitzer		175-mm gun		280-mm gun	
		Model	Std wt	Model	Std wt	Model	Std wt	Model	Std wt	Model	Std wt
1	HE	M1	33.0 (a)	M107, M107B2	95.0 (e)	M106	200.0 (g)	M437	147.0	M124	600.0 (d)
2	WP	M60	34.8 (a)	M105, M110	97.2 (e)						
3	Smoke	M84, M84B1	32.9 (b)	M116, M116B1	86.4 (f)						
4	Illuminating	M314	36.6	M118A2B1	103.0						
	Illuminating			M485	95.0 (c)	M424 (h)	242.0 (d)				
5	AE					M422	242.0 (d)			M366	600.0 (d)
9	Gas	M360	35.4 (a)	M121A1	99.4 (e) (c)						
	Gas	M60	33.0 (a) (c)	M110	95.0 (e) (c)						

a. The weight of 105-mm howitzer projectiles is indicated by squares. Each square is 0.6 pound. Standard weights, in squares, are—

Shell HE, M1, and shell gas, M60	2
Shell WP, M60	5
Shell gas, M360	6

b. Shell smoke (HC, BE), M84, or M84B1 has a standard weight as shown. This projectile is unzoned for weight, however; because of the low density and variations of weight of the colored smoke filler, the accuracy of the projectiles may be improved by using weights for the colored fillers as shown below—

Filler	*Projectile weight*
Yellow	30.3
Red	30.7
Violet	30.5
Green	30.5

c. Standard projectile weight for these must be entered manually.

d. The actual weight of this projectile if it varies from standard is stamped on the projectile.

e. The weight of 155-mm howitzer projectiles is indicated by squares. Each square is 1.1 pounds. Standard weights, in squares are—

Shell HE, M107, M107B2	4
Shell WP, M105, M110	6
Shell gas, M110	4
Shell gas, M121A1	8

f. Shell smoke, M116, is fired with a mean weight of 86.4 pounds. This is equivalent to a decrease of 8 squares below the standard weight of 95.0 pounds.

g. The weight of 8-inch howitzer shell HE, M106, is designated by squares. Each is 2.5 pounds. Four squares (200 pounds) is the standard projectile weight.

h. HES round for 8-inch howitzer.

2. Permissible Charges and Standard Muzzle Velocities

a. Permissible Charges and Standard Muzzle Velocities, 105-mm Howitzer (M101A1) and (M52).

Flag	Proj	Type	Normal charges										Green bag charges			
			1	2	3	4	5	6	7	8	9	10	1	2	3	4
1	HE	M1														
2	WP	M60														
3	Smoke	M84, M84B1	195.1	211.8	233.2	262.1	301.8	365.8	464.8	--	--	--	132.6	146.3	160.0	176.8
9	Gas	M360														
4	Illum	M314	187.5	203.9	221.9	246.9	284.4	343.8	433.7	--	--	--	--	--	--	--

b. Permissible Charges and Standard Muzzle Velocities 105-mm Howitzer M101.

Flag	Proj	Type	Normal charges										Green bag charges			
			1	2	3	4	5	6	7	8	9	10	1	2	3	4
1	HE	M1														
2	WP	M60														
3	Smoke	M84, M84B1														
9	Gas	M360	196.6	213.4	236.2	266.7	309.4	374.9	474.0	--	--	--	--	--	--	--
4	Illum	M314				Data not available. (Use M101A1 data for this projectile.)										

Note. When muzzle velocity is set to standard by the *SET UP (F 5)* function, it will be set to the values as outlined in table above (M101A1, M52 howitzer). However, since the absolute value of muzzle velocity is used in computations, nonstandard muzzle velocities may be entered without regard as to whether the M101A1/M52 or M101 105-mm howitzer is used. If standard muzzle velocity is desired for a M101 howitzer, the values listed in table IV must be entered manually.

c. Permissible Charges and Standard Muzzle Velocities 155-mm Howitzer M114A1 and M44A1.

Flag	Proj	Type	Green bag charges					White bag charges							
			1	2	3	4	5	3	4	5	6	7	8	9	10
1	HE	M107, M107B2													
2	WP	M110													
3	Smoke	M116	207.3	234.7	268.2	310.9	371.9	268.2	310.9	371.9	463.3	563.9	--	--	--
9	Gas	M121A1													
4	Illum	M118	198.1	224.0	256.0	295.7	353.6	256.0	295.7	353.6	440.4	541.0	--	--	--
2	WP	M105(a)	211.5	238.0	270.7	312.4	372.5	--	--	--	--	--	--	--	--

Note. Standard muzzle velocities, shell WP, M105 must be entered manually.

d. Permissible Charges and Standard Muzzle Velocities 8-inch Howitzer M115, M110, and M55.

Flag	Proj	Type	Green bag charges					White bag charges				
			1	2	3	4	5	3	4	5	6	7
1	HE	M106	249.9	274.3	304.8	350.5	420.6	304.8	350.5	420.6	499.9	594.4
4	HES	M424	254.5	359.7	547.1							
5	AE	M422	251.5	356.9	543.9							

e Permissible Changes and Standard Muzzle Velocities 280-mm Gun M66.

Flag	Proj	Type	Green bag charges			
			1	2	3	4
1	HE	M124	420.6	542.6	640.1	762.0
5	AE	M366				

3. Allowable Projectile-Fuze Combinations

a. Projectile-fuze combinations, 105–mm howitzer.

Projectile			Fuze type	Quick	Time	VT	Delay
Flag	Type	Model	Flag	1	2	3	4
1	HE	M1	M51A4,	M51A5	M520	M513A1, B1	M51A4, A5
2	WP	M60	M51A4,	M51A5	M501*		M51A4, A5
3	SMK	M84, M84B1	M51A4,	M51A5*	M501A1		M51A4, A5*
4	ILLUM	M314			M501A1		
9	GAS	M360	M50808				

* Combat emergency only.

(1) For shell gas, M60, use fuses as shown for shell WP M60.

(2) Other authorized fuzes and weight corrections necessary to compensate for the difference in fuze weight are as follows:

(*a*) Shell HE (M1).

Fuze	*Model*	*Correction to projectile weight*
Quick	M535	No correction
Time	M67	Add 0.1 lb
Time	M55A3	Add 0.1 lb
Time	M500A1	Add 0.5 lb
VT	M513	Add 0.5 lb

(*b*) Shell WP (M60).

Quick	M508	No correction
Quick	M535	No correction
Quick	M57	No correction

(*c*) Shell smoke (M84, M84B1).

Time	M54	Deduct 0.7 lb

(*d*) Shell illuminating (M314).

Time	M54	Deduct 0.7 lb

(3) Fuze, concrete piercing (M78, M78A1) is used for all calibers. Add 0.7 lb to projectile weight and designate fuze type 1 (quick) to the computer.

b. Projectile-fuze combinations, 155-mm howitzer.

Projectile			Fuze type	Quick	Time	VT	Delay
Flag	Type	Model	Flag	1	2	3	4
1	HE	M107, M107B2	M51A4,	A5	M520	M514A1, B1	M51A4, A5
2	WP	M105, M110	M51A4,	A5	M501*		M51A4, A5
3	SMK	M116, M116B1	M51A4,	A5*	M501A1		M51A4, A5*
4	Illum	M118			M501A1		
9	Gas						

* Combat emergency only.

(1) Other authorized fuzes and weight corrections necessary to compensate for the difference in fuze weight are are as follows:

(*a*) Shell HE (M107, M107B2). Same as shown for 105 howitzer above except: VT (M514)—add .5 lb. to projectile weight.

(*b*) Shell WP (M105, M110).

Fuze	*Model*	*Correction*
QUICK	M508	No correction necessary.
QUICK	M535	No correction necessary.
QUICK	M57	No correction necessary.
TIME	M67	No correction necessary. (Must be entered into computer and used as fuze quick.)

(*c*) Shell Smoke (M116, M116B1)—same as paragraph 3*a*(2) (*c*).

(*d*) Shell Illuminating (M118)—same as paragraph 3*a*(2) (*d*).

(*e*) Shell Gas (M110)—same as paragraph (1) (*b*) above.

(2) For fuse concrete piercing (M78, M78A1)—see paragraph 3*a*(3).

(3) For shell illuminating, M85, see paragraph (1) (*d*) above.

(4) For shell gas, M110 use the fuses shown for shell WP, M110 above.

c. Projectile-fuze combinations, 8-inch howitzer.

Projectile			Fuze type Flag	Quick 1	Time 2	VT 3	Delay 4	Spec (MT) 5
Flag	Type	Model						
1	HE	M106	M51A4,	A5	M520	M514A1, B1	M51A4, A5	
4	HES	M424						M543
5	AE	M422						M542

(1) Other authorized fuzes for shell HE and the weight corrections necessary to compensate for the difference in fuze weight are the same as outlined for 155 howitzer, shell HE.

(2) Use of fuse concrete piercing (M78, M78A1)—same as outlined for 105 howitzer above.

d. 280-mm gun projectile fuze combinations.

Projectile			Fuze type Flag	Quick 1	Time 2	VT 3	Delay 4	Spec (MT) 5
Flag	Type	Model						
1	HE	M124		M535	M520	M514E2	M535	
5	AE	M366						M522

(1) Use of other fuzes. Other fuzes authorized for shell HE and the corrections to compensate for their weight difference from standard are as follows:

Fuze	*Model*	*Correction*
Time	M67	Add 0.1 lb to projectile weight
Time	M55A3	Add 0.1 lb to projectile weight
Time	M500A1	Add 0.1 lb to projectile weight

(2) Use of fuze concrete piercing (M78, M78A1)—follow instructions outlined for 105 howitzer (par. 2*d*).

e. Use of emergency fuzes. In the event emergency fuzes as shown in TM 9-1300-203 are used, their weight should be compared with that programmed to determine any corrections to projectile weight which may be necessary.

By Order of the Secretary of the Army:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:

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

Distribution:

Active Army:

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ACSI (2)
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Units org under fol TOE:
6–156 (5)
6–157 (5)
6–166 (5)
6–167 (5)
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6–216 (5)
6–346 (5)
6–347 (5)
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For explanation of abbreviations used, see AR 320–50.