

CHAPTER 7

PREPARATION OF FIRE CONTROL EQUIPMENT

This chapter discusses the different types of data entry for the mortar ballistic computer and how they are entered into the computer. The different levels of initialization are also explained. Figure 7-1 is an overview of the groupings of switches and indicators used in setting up the MBC for the tactical scene.

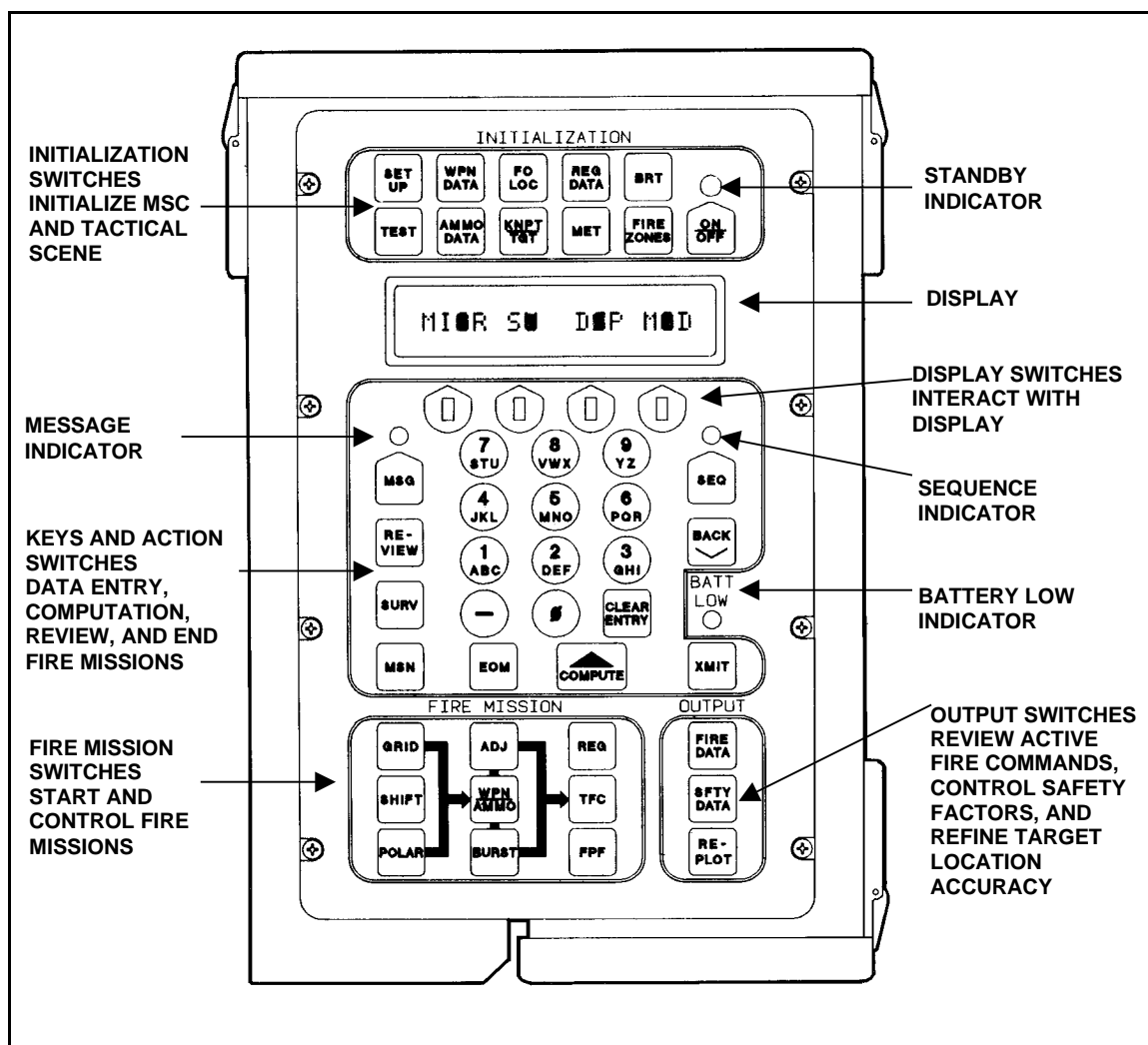


Figure 7-1. Mortar ballistic computer switch panel.

7-1. TYPES OF DATA ENTRY

The types of MBC data entries are default (computer-selected), alphabetical (alpha), numerical (numeric), correction, direction, and multiple choice. The following examples use only the SET UP menu to demonstrate each type of data entry. The data entry examples apply to all menus.

a. The operator presses the ON/OFF switch to activate the MBC. The display shows **POWERUP TEST**, then shows: **READY**.

NOTE: The self-test should be conducted when the MBC is first turned on. However, the operator must first know how to make menu selections to conduct the self-test. (See example on page 7-7, paragraph 7-2.)

(1) *Default entry.* Press the SET UP switch. The MBC displays the menu for setup data: timeout, target prefix, target number block, grid declination, message transmission rate, transmitter warm-up delay time, transmission single or double block mode, and owner identification.

(a) The display window of the MBC shows **TIME OUT: 15**. Timeout means that the computer will automatically shut off the display if another switch is not selected before the given time runs out. The computer is not *off*, just conserving energy. If the computer should shut off during these examples, press any key (except the fire mission keys, which are grid, shift, or polar) to reactivate the display screen.

(b) The flashing cursor on the display screen (on the 15) indicates that a selection can be made to the timeout of the computer. The timeout of the computer can be set at 15, 30, 45, or 60 seconds. The timeout period of 15 seconds is computer-assigned (a default entry) to the lowest setting, thereby maintaining the highest energy conservation. During the time needed to "train up" on the MBC, the timeout period should be changed to 60 seconds.

(2) *Correction entry.* Select the blue display switch beneath the flashing cursor in the display window. The display shows: **15 30 45 60**. There are flashing cursors on each number. The four blue display switches interact with the display directly above them—for example, if the switches were numbered from left to right 1, 2, 3, and 4, and the timeout is to be changed (corrected) to 60 seconds, select the number 4 display switch. The computer now shows **TIME OUT: 60**.

(3) *Alphabetical entry.* The target number block assigned to the mortar platoon is AH0001 - AH0099. Use the keyboard to enter the target prefix, which is entered in the underlined blanks. The target prefix is **AH**.

(a) Press the sequence key: the display shows: **TGT PRFX: _ _**.

(b) Press the 1/ABC key: the display shows: **A B C**. Since a numerical entry is not required at this time, the MBC automatically deleted the number 1 from the display screen.

(c) Press the number 1 blue display switch to select A. The display shows: **TGT PRFX:A _**.

(d) Press the 3/GHI key. The display shows: **G H I**. Since a numerical entry is not required at this time the MBC automatically deleted the number 3 from the display screen.

(e) Press the number 2 blue display switch to select H. The display shows: **TGT PRFX:AH**.

Once the prefix has been entered, the sequence switch activates the memory storage of the computer. The target prefix selected will be used to identify all the targets that are programmed through the MBC. The prefix will be used until changed by the operator or the computer is cleared.

(4) *Numerical entry.* After the sequence switch is selected to store the target prefix, the display screen asks for the numerical half of the target block number: 0001 - 0099. The display shows: **TN:_____**. To make the numeric entry—

(a) Press the 0 key three times. The display shows: **TN:0 0 0 _ - _ _ _**.

(b) Press the 1/ABC key. The number 1 is automatically entered onto the display because the MBC knows that a alphabetical entry is not called for in this situation. The display shows: **TN:0 0 0 1 - _ _ _**.

(c) Press the 0 key twice and the 9/YZ key twice. Once again the MBC is programmed to know when a alphabetical or numerical entry is to be made, therefore when the 9/YZ key is selected and the number 9 is automatically entered on the display. The display should show: **TN:0 0 0 1 - 0 0 9 9**.

Once the sequence key is pressed, the target block numerical entries are stored in the memory of the MBC. If a mistake is made in entering the target block numbers, the operator only has to make a correction entry.

(5) *Correction entry.* If the sequence key is pressed before making the correction entry, simply press the BACK key to bring the last screen information "back" on.

(a) Clearing the rightmost character only:

- The last digit entered for the target block number is a 9, but it is supposed to be a 5. Press the CLEAR ENTRY switch one time and the display shows: **TN:0 0 0 1 - 0 0 9 _**.
- Now select the proper number. Press the 5/MNO key. The display shows: **TN:0 0 0 1 - 0 0 9 5**.

(b) Clearing the entire field. During firing your section leader tells you that the target block numbers have been changed from AH-0095 to AH-8000. The flashing cursors above the display switches 1 and 3 indicate that both fields may be changed. To clear the entire field, in this case the 0095, follow these instructions:

- Press the number 3 (blue) display key. The field is cleared and the display shows: **TN:0 0 0 1 - _ _ _ _**.
- Enter the new number by pressing the 8/VWX key once and the 0 key three times. The display should show: **TN:0 0 0 1 - 8 0 0 0**.

For the computer to use the target numbers, the sequence switch must be pressed. Once the sequence switch is pressed, the numbers are stored in the memory.

NOTE: The next display is for the ALARM OFF/ON function, which is discussed in Chapter 9. For now, sequence past this display. The computer defaults the selection to ALARM:OFF.

(6) *Minimum easting and minimum northing entries.* The next two displays, **MIN E: _ _ 0 0 0** and **MIN N: _ _ 0 0 0**, are entered with numerical selections. The minimum easting (MIN E) and the minimum northing (MIN N) are the coordinates at the lower left corner of a map sheet. Each of these coordinates are entered into the MBC preceded by a 0—for example, the grid intersection of a map sheet (lower left corner) is 50/89. The MIN E is entered into the computer as 050, and the MIN N is entered as 089. The three trailing zeros are computer-entered for each display.

(7) *Direction entry (display-selectable)*. Select the sequence switch and the display shows: **E W GD: _ _**. This display is one example of a direction entry with an amount. East (E) or west (W) must be selected from the display before filling in the underlined blanks for grid declination.

(a) Locate the grid declination (GD) in the map sheet legend of the area of operations. Before entering the GD, round it off to the nearest 10 and express it in tenths—for example, the GD of 132 is 130; expressed in tenths is 13 (Figure 7-2).

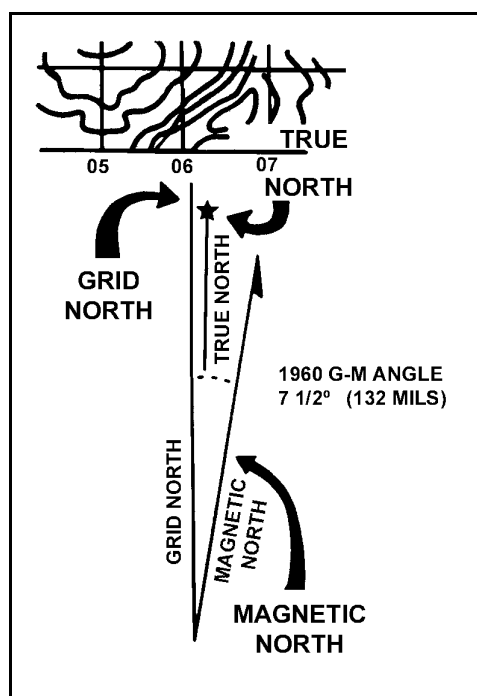


Figure 7-2. Declination diagram.

(b) Since the grid declination is easterly, make the selection of the blue display switch beneath the E on the display. The display should show: **E W GD:E _**. The declination diagram shows the declination in both degrees and mils. Use the mils value given. The difference between the grid north and magnetic north is 100 mils. The entry made in the MBC is in tens of mils. Press the 1/ABC key once, and the zero (0) key once. The display shows: **E W GD:E 10**.

(c) Additional direction indicators found in other menus are:

H = Horizontal	S = Slant
L = Left	R = Right
U = Up	D = Down
+ = Add	- = Drop
+ = North	- = South

When these symbols appear in later chapters, their meaning will be discussed in depth. Select the sequence switch once and store the grid declination in the computer.

NOTE: Latitude (LAT -/+) comes from a map sheet of an area of operation. Enter plus (+) for the northern hemisphere or minus (-) for southern hemisphere. The latitude is an optional entry.

(8) *Multiple choice entry.* The keytone is the length of time required for a communications device (FM radio) to enable the transmitter before sending data. When a radio is hot from frequent use, it takes a lower keytone to send a message. Similarly, if the radio is cold from the outside temperature, it takes longer to send a message. The normal or default value is 1.4 seconds. For this example, change the keytone to 3.5 seconds as follows:

NOTE: The next three screens are not required at this time. They are explained in later chapters. Press the sequence switch four times, advancing the display to the keytone menu.

(a) Press the number 3 display switch under the flashing cursor. This rejects the default value and gives the first four available selections: **0.2 0.7 1.4 2.1**. The selection 3.5 is not yet available. The sequence indicator bulb should also be flashing at this time, indicating that there are more selections to be viewed.

(b) Press the sequence switch again, and the remaining selections appear in the display: **2.8 3.5 4.2 4.8**. Press the blue display switch under the flashing cursor and 3.5. The display should now show: **KEYTONE:3.5**.

(c) Return to ready display. Press the sequence switch twice and advance to the last fill-in-the-blank selection in the **SET UP** menu. The display shows: **OWN ID: __**. The owner identification code must be entered here. This code is found in the SOI. Enter the **OWN ID**, A through Z or 0 through 9. For this example enter 1. Press the 1/ABC key once. Press the blue display key (4) under the 1 once. The display now shows: **OWN ID: 1**.

NOTE: Coordination must be made between the FO and FDC to ensure that both know the owner's identification when using DMD.

7-2. INITIALIZATION

This paragraph discusses the initialization switches and how they are affected by the different modes of operation.

a. **SELF-TEST.** The MBC can perform its own internal tests. When the operator turns on the MBC or suspects a malfunction, he should initiate the self-test.

(1) Press the ON/OFF switch; the MBC shows: **POWERUP TEST** while performing internal circuit checks, and then it shows: **READY**. If any other display appears, turn the MBC in to the GS maintenance team. If the BATT (battery) LOW indicator flashes or the display does not appear, replace the battery or check the power connections.

(2) Perform the four self-test in any sequence. The SELF-TEST switch provides testing of the microprocessor (MICR), all switches and keys (SW), the display and indicators (DSP), and the modem (MOD).

(3) Press the TEST switch. If after pressing the TEST switch, the correct software revision number (Revision III/A) is not displayed, turn the MBC in to the GS maintenance team.

NOTE: Test should be performed when time is available.

(a) Microprocessor. Press the SEQ switch. Use the multiple choice entry to select MICR. If after the microprocessor test (about 38 seconds) a display other than **MICR: PASS** appears, turn in the MBC to the GS maintenance team.

(b) Switches and Keys. Use the multiple choice entry to select SW. Press the switch or key indicated in the display. When a switch fails or is pressed out of sequence, the display shows **ERROR**. The display returns to the name of the switch to be pressed. If the specified switch is pressed and ERROR reappears in the display, the switch is inoperative. Failure of the MBC to respond to a normal key pressed indicates a malfunctioning keyboard assembly and should be turned in to the GS maintenance team. After all the switches and keys have been tested, **END OF TEST** is displayed, and then **READY** is displayed.

(c) Display. Use the multiple choice entry to select DSP. Press the SEQ switch three times to check for unlighted dot segments in each character space. During the first part of the display test, make sure all dot segments are lit in the 16-character display. In the second part of the test, check for character generation and indicators. Even though one or more dot segments may be out, use the MBC if characters are readable. When characters are not readable or an indicator is not flashing, turn the MBC in to the GS maintenance team.

CAUTION

Do not test modem while connected to a radio. This could cause internal damage to the MBC.

(d) Modem. Use the multiple-choice entry to select MOD. After modem test (about 20 seconds), **MODEM PASS** or **MODEM FAIL** is displayed. If **MODEM FAIL** shows, message transmission and reception are inoperative. The MBC still accepts manual input data and computes fire missions.

b. **Basic Data Input.** Before computing a fire mission, the operator must use certain initialization switches to input basic data. Overall MBC initialization is directly related to the tactical scene. Operators must always initialize **SET UP**, **WPN DATA**, and **AMMO DATA** switches, initializing other switches as needed.

(1) *Manual mode.* When the MBC is not connected to an external communication device, all data are manually entered.

(2) *Digital mode.* When the MBC is connected to an external device (DMD-supported), data are digitally entered into the appropriate switch memory. Data entered digitally may be reviewed or supplemented manually.

c. **Minimum Initialization.** Minimum initialization is the least required data to compute for a standard mission. For minimum initialization, operators use the following sequence:

(1) *TEST and BRT*. These keys are used first to check the overall MBC operation and to set the display brightness. The LOW setting in the BRT menu also lights up the keyboard for night or limited visibility usage.

(2) *SET UP and WPN DATA*. These two switches must be initialized. They are always manually entered in the MBC. Data will never change due to other switch action; however, the operator may review and update data as needed. When the AMMO DATA switch default values are suitable, this switch is not needed for initialization. The default values are:

- 60-mm mortar: HE, M720; WP, M302A1; and ILLUM, M83A3.
- 81-mm mortar: HE, M374; WP, M375; ILLUM, M301A3; TNG, M1; and RP, M819.
- 4.2-inch mortar: HE, M329A1; WP, M328A1; ILLUM, M335A2; and CS, XM630.
- 120-mm mortar: HE, M933, M934; WP, M929; ILLUM, M930.
- 120-mm (insert) mortar: HE, M374; WP, M375A2; ILLUM, M301A3.

d. **Minimal Initialization.** Once the MBC is turned on and the self-test is conducted the following minimal initialization information must be entered to compute for a standard grid mission.

EXAMPLE

SET UP (menu)

Timeout: 60 seconds

Target prefix: AH

Target numbering block: 0001 - 0200

Easting (area of operation): 096000

Northing (area of operation): 029000

NOTE: Precede each easting and northing coordinate with a (zero).

(Digital communications data)

Computer owner's identification: A

WPN DATA (menu)

Unit: A (section)

Caliber: 107 mm

Elevation: 0800 mils (107 mm only)

Carrier mounted: YES

Base piece: A2

Base piece location: E: 0400

N: 4700

Altitude: 0750 meters

Azimuth of fire: 0800 mils

Referred deflection: 2800 mils

NOTE: If firing a parallel sheaf with all mortars on line, the only weapon needed is the base piece. When the situation allows, enter the rest of the section.

WARNING

Using the default firing data for all guns in the firing section may cause rounds to be fired outside of the safety fan or firing zone. Therefore, always use the TFC menu when a safety fan or firing zone is used. This gives the mbc operator a "WARNING" message indicating if any of the rounds for any particular weapon will land outside the safety fan or firing zone. For revision III/A, the operator must override the message in order to continue.

Weapon No. 1: Direction - 1600 mils

Distance - 040 meters

Weapon No. 3: Direction - 4800 mils

Distance - 040 meters

AMMO DATA (menu): (ammunition data for 107 mm only)

Powder temperature: +70 degrees F

HE: M329A1 - 4 squares

WP: M328A1 - 0 squares

ILL: M335A2 - (noncorrectable)

CS: XM630 - default

FO: W12 04500 46500 ALT: 0550 meters DIR 0500

(1) Press the ON/OFF switch. The display shows: **POWERUP TEST** momentarily, and then shows: **READY**. Use the test switch to manually start the MBC self-test. Perform the self-test as the situation permits or as advised by the supervisor.

(2) Use the BRT switch to select the level of display character brightness (LOW, MED, HI, and MAX). Use the LOW level to turn on the keyboard background lighting. Character brightness is always set at HI when the MBC is turned on or when the BRT switch is pressed.

(3) Press the SEQ switch. The display shows: **READY**. Press the SET UP switch. Use the multiple choice entry to change the time-out to the desired length. Use time-out to set the number of seconds (15, 30, 45, or 60); the display stays on between switch actions. The default value of 15 seconds provides for minimal battery drain. A time-out of 60 is recommended for the novice FDC computer.

(4) Press the SEQ switch. Using alpha entry, enter the target prefix AH.

(5) Press the SEQ switch. Using numeric entry, enter the target numbering block 0001 through 9999.

(6) Press the SEQ switch. Use the default shown: **ALARM:OFF**. Use message alarm for DMD-supported missions, if needed.

(7) Press the SEQ switch. Using numeric entry, enter the minimum easting coordinate 096.

(8) Press the SEQ switch. Using numeric entry, enter the minimum northing coordinate 029.

(9) Press the SEQ switch until OWN ID: _ is displayed. The **E W GD:, + - LAT:, LISTEN ONLY: OFF, BIT RATE: 1200, KEYTONE: 1.4, and BLK:SNG** information may be entered into the computer for expanded initialization.

(10) The final entry in the SET UP menu is the **OWN ID**. Enter the unit identification code located in the SOI.

e. **Weapon Data.** Use the WPN DATA switch to enter the weapon data for section A, B, and or C. Assign weapons to one, two, or all three sections. A total of 18 weapons may be assigned (six for each section): A1 through A6, B1 through B6, and C1 through C6. The first weapon entered in a section becomes the basepiece. The basepiece is the reference point for the MBC to locate and add weapons to a section. It does not have to be the No. 2 gun or adjusting piece.

(1) Press the WPN DATA switch. Use the multiple choice entry to select the desired section (A). With the weapon types displayed, select the caliber (107 mm).

(2) After the caliber of weapon is selected, the choice of carrier or ground-mount is next (except for the 60-mm mortar). The MBC defaults to **CARRIER: NO**. Ensure all weapons in the section are mounted the same. Using the multiple choice entry, select the CARRIER mode for the section. **CARRIER: NO** indicates the section is to be ground mounted. **CARRIER: YES** indicates the section is to be carrier mounted. The muzzle velocity is figured differently for ground mounted to carrier mounted. After entering the selection of carrier-mounted, press the SEQ switch and the display shows: **CARRIER MV ENTERED**. Carrier-mounted muzzle velocity corrections are entered into the memory of the MBC for that section.

(3) Press the SEQ switch. Enter the basepiece (BP) number using multiple choice entry (A2). The basepiece is just a reference for the MBC to locate the other mortars in that section. Time and effort are usually saved if one of the flank mortars is used as the basepiece.

(4) Press the SEQ switch. Enter the BP easting and northing grid coordinates. Most mortar locations are known to within eight-digit grid coordinates. To enter the coordinates, follow these instructions:

(a) Given the grid location for the basepiece as 04004700, enter the first four easterly digits by pressing the alphanumeric key for that number followed with a zero (0). Press the 0 key. The display should look like **this: E:0 _ _ _ _ N: _ _ _ _**. Enter the rest of the coordinates. The numeric function of the key is the only entry that can be made. The alpha characters are not part of the selection process for grid coordinates. The final display should show: **E:04000 N:47000**. Do the same if only a six-digit coordinate is known—for example 123456 is entered as 12300 45600.

NOTE: All easting and northing grid coordinates require five-digit entries.

(b) Press the SEQ switch. Use the multiple choice entry to enter the altitude (in meters) of the BP (0750). The altitude is a mandatory entry. If the altitude is unknown to the FDC, then an entry of 0000 is used. This entry tells the MBC to compute from sea-level. Altitude entries may be made from 9999 meters to a minus (-) 999 meters.

(c) Press the SEQ switch. Use a multiple choice entry to enter (in mils) the direction of fire (azimuth 0800) and referred deflection (2800).

(d) Press the SEQ switch and the display shows: **CONT END**. Select **CONT** (continue) if the rest of the section is to be entered at this time. If not, select **END** and the computer shows: **READY**.

(e) To continue entering weapons, select **CONT** and the MBC shows: **WPN:A_ NXT CLR**. Enter the weapon number (1) using the 1/ABC alphanumeric key.

(f) Press the SEQ switch. Use the multiple choice entry to enter weapon direction (1600 mils) and distance (035 meters) from the basepiece.

(g) Press the SEQ switch. Repeat the steps in paragraph (a) and (b) above until all guns in the section have been entered. Select **END** and the MBC display shows: **READY**.

f. **Ammunition Data Default Values.** If the AMMO DATA default values are suitable, the minimum initialization is complete. If suitable, the operator uses the AMMO DATA to select shell types for each ammunition type for the caliber in use. Powder temperature default is 70 degrees and is correctable. Three 107-mm ammunition types are weight correctable: the M329A1, M328A1, and XM630. When corrections are entered, the word **NO** on the right side of the display is changed to **CR**. Weight changes are entered in pounds or squares. When pounds or squares are entered, a conversion is made to show both unit entries.

(1) Press the AMMO DATA switch. The display shows: **60 81 107 TEMP**. Select the caliber of weapon being used (107 mm) by pressing the blue display switch (display switch No. 3) beneath the number 107.

(2) The display now shows: **HE: M329A1 :NO**. Flashing cursors are on the 2 and the N. These cursors indicate that changes may be made to the display. **HE: M329A1** is the default value for the 107-mm mortar, so no changes are needed for the round type. However, the round also comes in different weights as explained earlier. Square weight is usually given on the exterior of the boxes that the ammunition comes in. The FT 4.2-H-2 has charts (pages X through XII) on the mean weights of all rounds and their fuze combinations, except for the M329A2. The weight of the M329A2 round is standard and requires no changes to weight or squares. Once the entry has been made either by weight in pounds or in squares, press the SEQ switch and the display shows: **HE: M329A1 :CR**.

(3) Press the SEQ switch. Continue the above procedures until all the ammunition requirements are entered.

NOTE: The ammunition menus for all the mortars are similar in format.

g. **Expanded Initialization.** Expanded initialization includes the switches MET, FIRE ZONES, FO LOC (forward observer location), KNPT/TGT, and REG DATA. These data are initialized as they become available.

(1) Always manually initialize MET for entry of nonstandard MET data. If the MET switch is not used, the MBC uses standard (STD) conditions for MET data. When the MET is entered, ensure that the SET UP menu has the current data for the grid declination (GD) and latitude (LAT).

(2) Always manually initialize and update FIRE ZONES when needed.

(3) Manually initialize and update FO LOC when in the manual mode. When the MBC is DMD-supported, input is automatically entered when a valid observer location message is received. This is also a good time to update the SET UP menu. The communication data are **LISTEN ONLY: OFF, BIT RATE: 1200, KEYTONE: 1.4, and BLK:SNG.**

NOTE: The bit rate and transmit block mode are located in the SOI.

(4) Initialize and update KNPT/TGT at any time regardless of the mode of operation. The KNPT/TGT switch may be updated automatically by the use of the EOM, REPLOT, and SURV switches, or by receiving digital messages related to the KNPT/TGT.

(5) Manually initialize REG DATA to maintain a registration file when enough data are known from conducting a fire mission. Normally registration data are generated automatically by using the REG switch during fire mission processing. However, data manually entered with the REG DATA switch are automatically updated when the REG switch is used to compute registration.