PART FOUR
M16 AND M19 PLOTTING BOARDS

CHAPTER 11
INTRODUCTION

The M16 and M19 plotting boards are secondary means of fire control for all mortars. The computer can determine deflection, azimuth, and range. When plotting on the plotting board, he should only use a soft lead pencil. Computers NEVER use map pins, needles, ink pens, or grease pencils since these can damage the board.

11-1. M16 PLOTTING BOARD

The M16 plotting board consists of a base, azimuth disk, and a range arm or range scale arm (Figure 11-1).

a. **Base**. The base is a white plastic sheet, bonded to a magnesium alloy backing. The grid system printed on the base is to a scale of 1:12,500, making each square 50 meters by 50 meters and each large square 500 meters by 500 meters. At the center of the base is the pivot point to which the azimuth disk is attached. Extending up and down from the pivot point is the vertical centerline. The vertical centerline range scale is graduated every 50 meters, and numbered every 100 meters from 0 (pivot point) to 3,100 meters, with a total range from the pivot point of 3,200 meters. The vertical centerline ends with an arrowhead at the top of the board.

(1) The arrowhead, known as the *index mark pointer*, is used in determining azimuths and deflections to the nearest 10 mils. It points to the index mark of the vernier scale (0 mark), which is used to determine azimuths and deflections to the nearest mil. The vernier scale is divided every mil and numbered every 5 mils, with a total of 10 mils left and right of the 0.

(2) The secondary range scale, to the left of the vertical centerline, is numbered every 500 meters (from 0 to 6,000) with a total range of 6,400 meters. It is used to determine range when the mortar position is plotted at points other than the pivot point. Two additional range scales, 1:50,000 and 1:25,000, are on the right-hand edge of the base. They are used with maps in determining ranges.

b. **Azimuth Disk**. The azimuth disk, made of clear plastic, is roughened on one side so that it can be written on with a soft lead pencil. The azimuth scale on the outer edge is numbered every 100 mils (from 0 to 6300) and divided every 10 mils with a longer line at every 50 mils, giving a complete circle of 6400 mils.

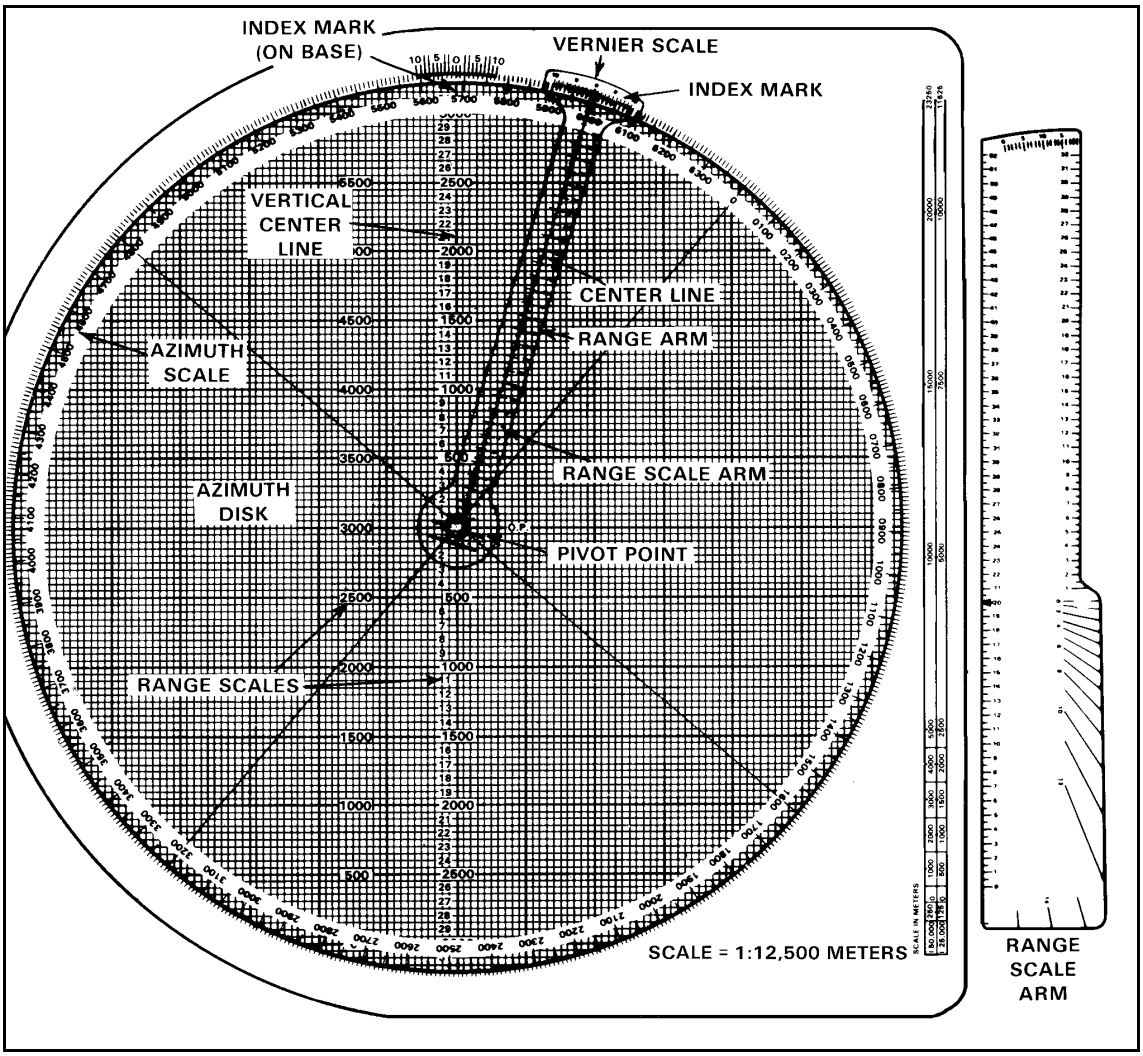

Figure 11-1. M16 plotting board.

c. **Range Arm**. The range arm, made of plastic, is used when the mortars are plotted at the pivot point. The arm has a vertical centerline with a range scale and a vernier scale, both of which are the same as on the base.

d. **Range Scale Arm**. The range scale arm, a transparent plastic device, has a knob with pivot pin, two range scales (one on each edge), a protractor on the right bottom, and a vernier scale across the top. The range scales are numbered every 100 meters and graduated every 50 meters. The protractor is graduated every 100 mils from 0 to 1600 mils.

11-2. M19 PLOTTING BOARD

The M19 plotting board consists of a rotating disk of transparent plastic and a removable range arm, both attached to a flat grid base (Figure 11-2).

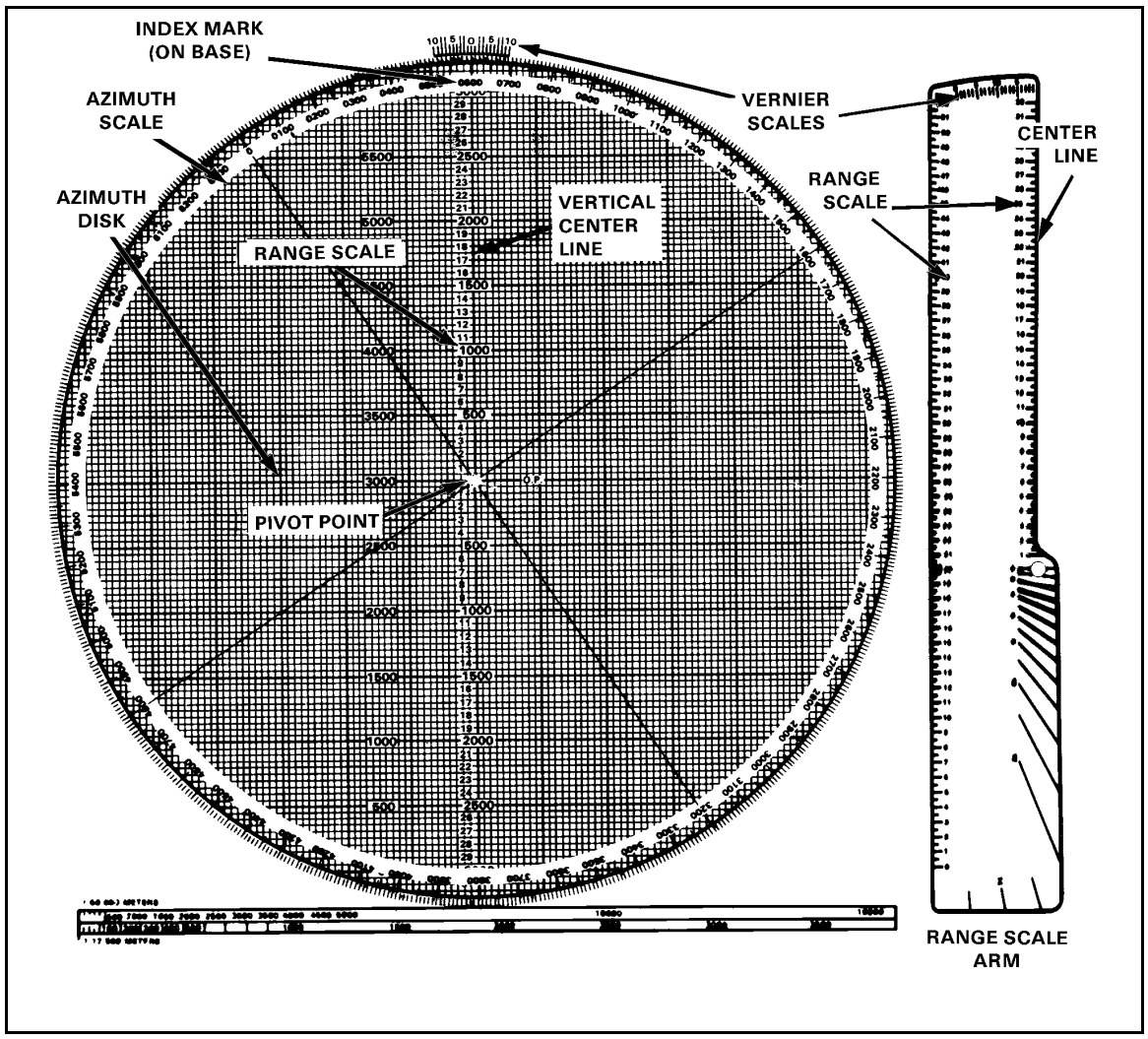

Figure 11-2. M19 plotting board.

a. **Base**. The base is a white plastic sheet bonded to a magnesium alloy backing. A grid is printed on the base in green at a scale of 1:25,000. The vertical centerline is graduated and numbered up and down from the center (pivot point) (from 0 through 32) in hundreds of meters with a maximum range of 3,200 meters. Each small grid square is 100 meters by 100 meters.

(1) The index mark points to the center of the vernier scale at the top edge of the plotting board. It is the point at which deflections or azimuths may be read to the nearest 10 mils. When plotting at the pivot point, the pivot point represents the location of the No. 2 mortar.

(2) In addition to the grid pattern, a vernier scale is printed on the base. It is used to obtain greater accuracy when reading the mil scale on the azimuth disk. The vernier scale permits the operator to read azimuths and deflections accurately to the nearest mil.

(3) On the bottom of the base, a double map scale in meters with representative fractions of 1:50,000 and 1:12,500 is used to transfer to and from a map that has one of those scales.

b. **Azimuth Disk**. The rotating azimuth disk is made of plastic. It is roughened on the upper surface for marking and writing. A mil scale on the outer edge is used for plotting azimuths and angles. It reads clockwise to conform to the azimuth scale of a compass. The scale is divided into 10-mil increments (from 0 to 6400) and is numbered every 100 mils. Also, the disk has two black lines called *centerlines*. These centerlines are printed across the center of the disk from 0 to 3200 and from 1600 to 4800 mils.

c. **Range Scale Arm**. The range scale arm is used when the mortars are plotted at the pivot point. It is made of plastic and can be plugged into the pivot point. Two range scales are on the range scale arm. On the right edge is a range scale that corresponds to the range scale found on the vertical centerline. An alternative range scale ranging from 0 to 6,000 meters is on the left edge of the range scale arm and is used when plotting away from the pivot point. The vernier scale at the upper end of the range scale arm is used to read azimuths or deflection when plotting at the pivot point without rotating the disk back to the vertical centerline. The direction of the FO can be kept indexed at the index point. The vernier scale on the range scale arm is read in reverse of the one on the grid base. The left portion is read for azimuth, and the right portion is read for deflection. The protractor lines below the range scale arm knob may be used to place a sector of fire on the disk.

(1) To read azimuth to 1 mil, read the left portion, starting at 0, and read to the 10 in the center.

(2) To read deflections, start at the right edge of the range scale arm and read to 10.

11-3. CAPABILITIES

The straightedge of the plotting board should always be on the user's right. Each plot is circled and numbered for identification. To avoid distortion, the computer should place his eye directly over the location of a plot and hold the pencil perpendicular to the board. The plot should be so small that it is difficult to see. The computer must be careful when placing a plot on the disk since a small plotting error could cause the final data to be off by as much as 25 meters in range and more than 10 mils in deflection.

a. To determine azimuths, read the first three numbers from the azimuth disk, left of the index mark. Read the fourth number, or the last mil, by using the azimuth disk and the right side of the vernier scale (Figure 11-3).

b. For example, consider the azimuth 3033 in Figure 11-3. The first and second numbers are the first 100-mil indicator to the left of the index mark (30). To obtain the third number, count the 10-mil graduations between the 100-mil indicator and the index mark (3). The fourth number, or last mil, is read by counting the 1-mil graduations from 0 to the right on the vernier scale until one of the 1-mil graduations align with one of the 10-mil graduations on the azimuth disk (3).

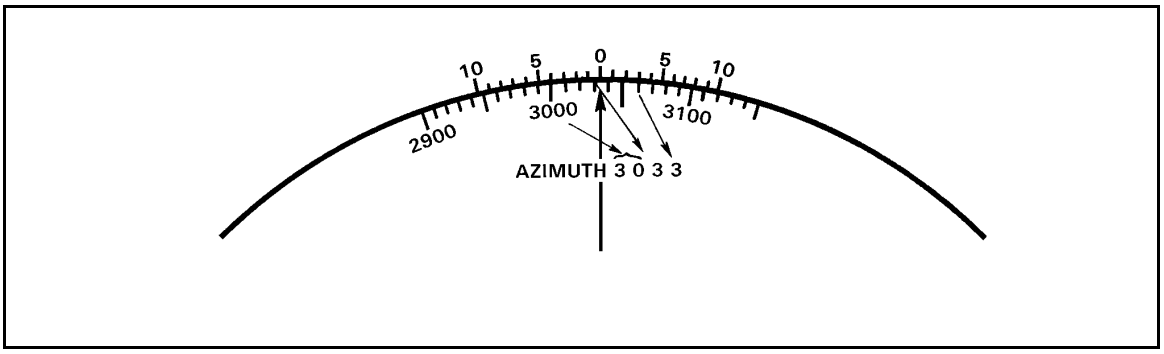

Figure 11-3. The vernier scale.