COMPASS DECLINATION DIAGRAM

Declination is the angular difference between any two norths. If you have a map and a compass, the one of most interest to you will be between magnetic and grid north. The declination diagram (Figure 6-8) shows the angular relationship, represented by prongs, among grid, magnetic, and true norths. While the relative positions of the prongs are correct, they are seldom plotted to scale. Do not use the diagram to measure a numerical value. This value will be written in the map margin (in both degrees and mils) beside the diagram.

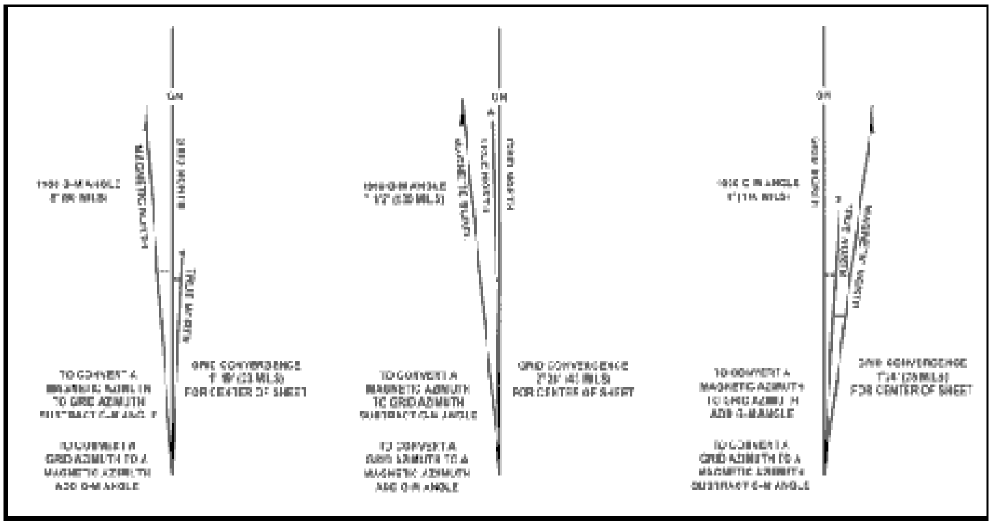

Figure 6-8. Declination diagrams.

a. **Location.** A declination diagram is a part of the information in the lower margin on most larger maps. On medium-scale maps, the declination information is shown by a note in the map margin.

b. **Grid-Magnetic Angle.** The G-M angle value is the angular size that exists between grid north and magnetic north. It is an arc, indicated by a dashed line, that connects the grid-north and magnetic-north prongs. This value is expressed to the nearest 1/2 degree, with mil equivalents shown to the nearest 10 mils. The G-M angle is important to the map reader/land navigator because azimuths translated between map and ground will be in error by the size of the declination angle if not adjusted for it.

c. **Grid Convergence**. An arc indicated by a dashed line connects the prongs for true north and grid north. The value of the angle for the center of the sheet is given to the nearest full minute with its equivalent to the nearest mil. These data are shown in the form of a grid-convergence note.

d. **Conversion.** There is an angular difference between the grid north and the magnetic north. Since the location of magnetic north does not correspond exactly with the grid-north lines on the maps, a conversion from magnetic to grid or vice versa is needed.

(1) ***With Notes***. Simply refer to the conversion notes that appear in conjunction with the diagram explaining the use of the G-M angle (Figure 6-8). One note provides instructions for converting magnetic azimuth to grid azimuth; the other, for converting grid azimuth to magnetic azimuth. The conversion (add or subtract) is governed by the direction of the magnetic-north prong relative to that of the north-grid prong.

(2) ***Without Notes***. In some cases, there are no declination conversion notes on the margin of the map; it is necessary to convert from one type of declination to another. A magnetic compass gives a magnetic azimuth; but in order to plot this line on a gridded map, the magnetic azimuth value must be changed to grid azimuth. The declination diagram is used for these conversions. A rule to remember when solving such problems is this: **No matter where the azimuth line points, the angle to it is always measured clockwise from the reference direction (base line). With this in mind, the problem is solved by the following steps:**

(a) Draw a vertical or grid-north line (prong). Always align this line with the vertical lines on a map (Figure 6-9).

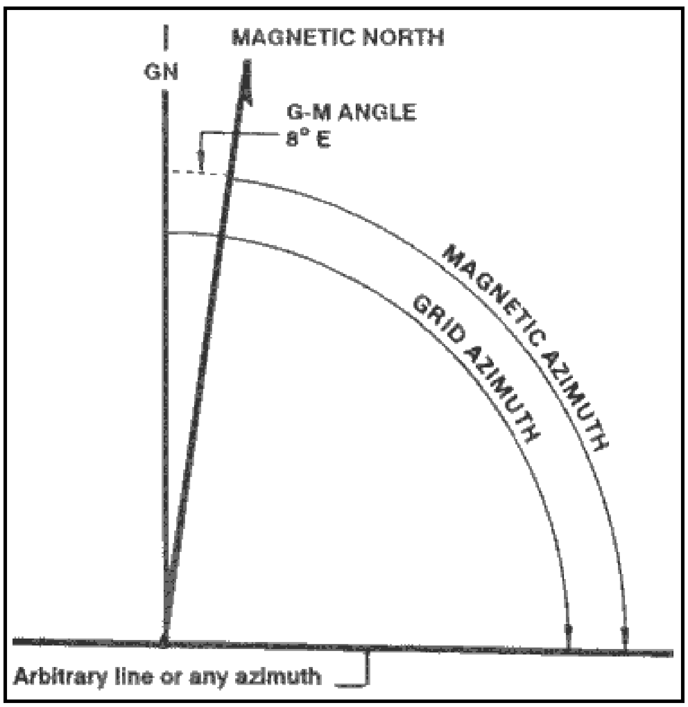

Figure 6-9. Declination diagram with arbitrary line.

(b) From the base of the grid-north line (prong), draw an arbitrary line (or any azimuth line) at a roughly right angle to north, regardless of the actual value of the azimuth in degrees (Figure 6-9).

(c) Examine the declination diagram on the map and determine the direction of the magnetic north (right-left or east-west) relative to that of the grid-north prong. Draw a magnetic prong from the apex of the grid-north line in the desired direction (Figure 6-9).

(d) Determine the value of the G-M angle. Draw an arc from the grid prong to the magnetic prong and place the value of the G-M angle (Figure 6-9).

(e) Complete the diagram by drawing an arc from each reference line to the arbitrary line. A glance at the completed diagram shows whether the given azimuth or the desired azimuth is greater, and thus whether the known difference between the two must be added or subtracted.

(f) The inclusion of the true-north prong in relationship to the conversion is of little importance.

e. **Applications.** Remember, there are no negative azimuths on the azimuth circle. Since 0 degree is the same as 360 degrees, then 2 degrees is the same as 362 degrees. This is because 2 degrees and 362 degrees are located at the same point on the azimuth circle. The grid azimuth can now be converted into a magnetic azimuth because the grid azimuth is now larger than the G-M angle.

(1) When working with a map having an east G-M angle:

(a) To plot a magnetic azimuth on a map, first change it to a grid azimuth (Figure 6-10).

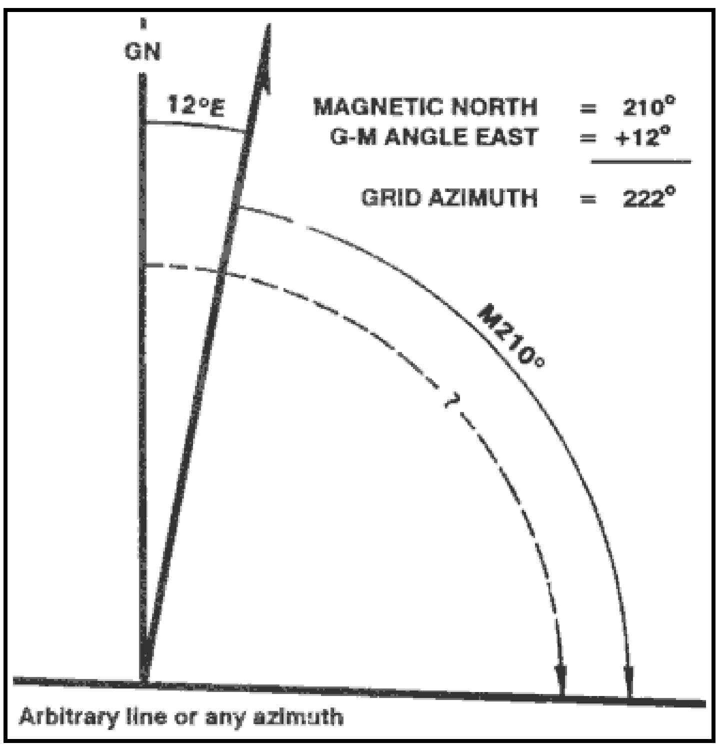

Figure 6-10. Converting to grid azimuth.

(b) To use a magnetic azimuth in the field with a compass, first change the grid azimuth plotted on a map to a magnetic azimuth (Figure 6-11).

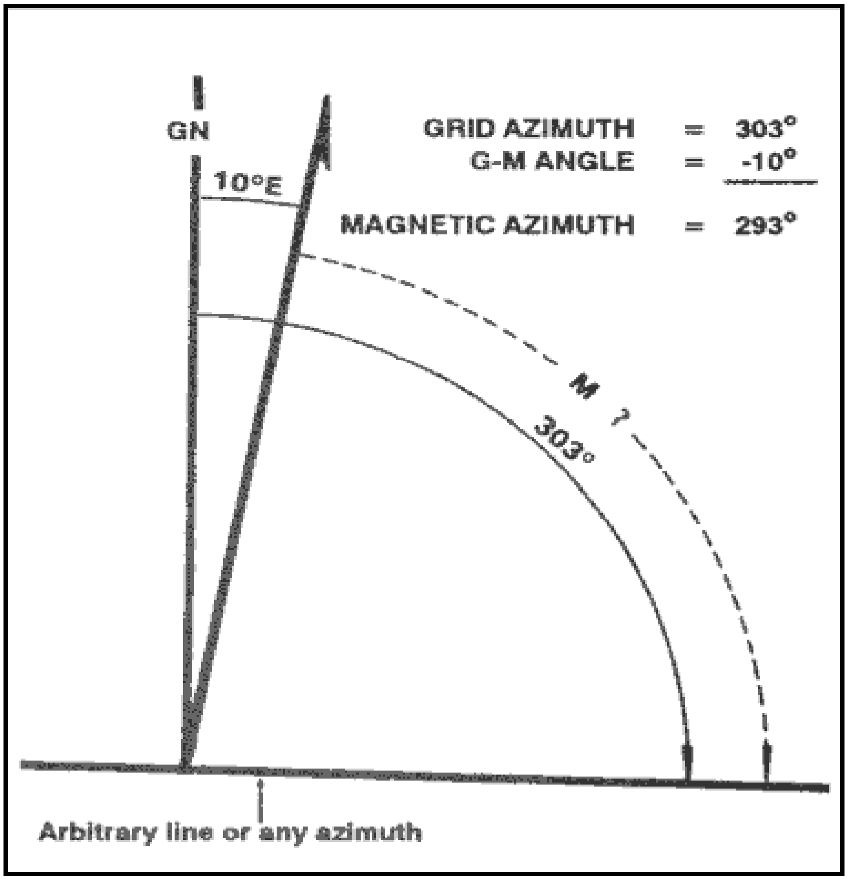

Figure 6-11. Converting to magnetic azimuth.

(c) Convert a grid azimuth to a magnetic azimuth when the G-M angle is greater than a grid azimuth (Figure 6-12).

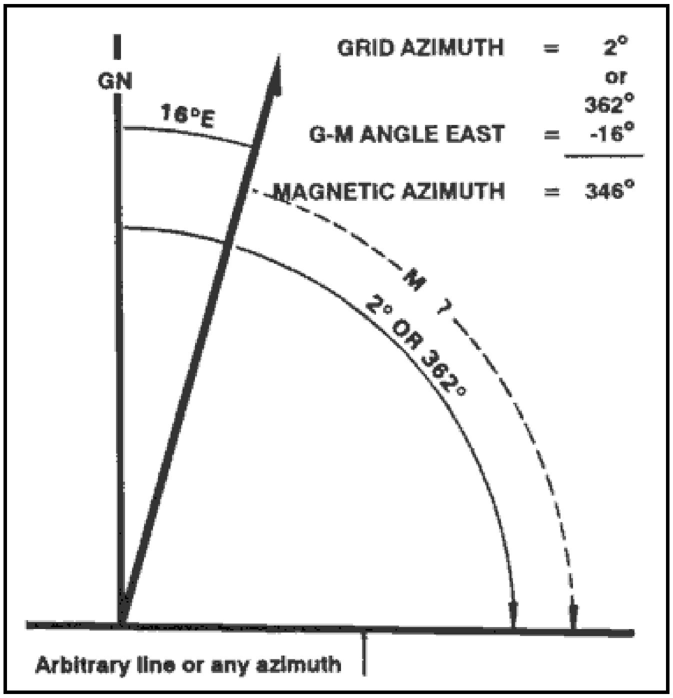

Figure 6-12. Converting to a magnetic azimuth when the G-M angle is greater.

(2) When working with a map having a west G-M angle:

(a) To plot a magnetic azimuth on a map, first convert it to a grid azimuth (Figure 6-13).

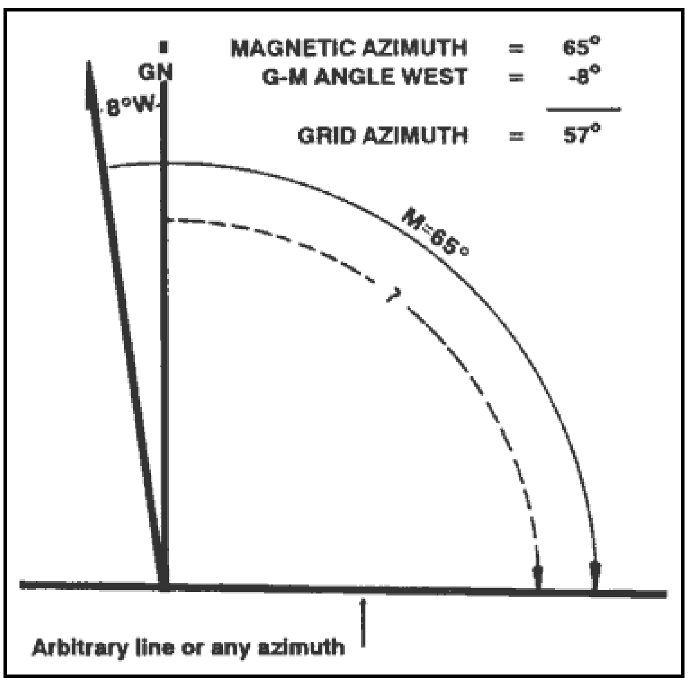

Figure 6-13. Converting to a grid azimuth on a map.

(b) To use a magnetic azimuth in the field with a compass, change the grid azimuth plotted on a map to a magnetic azimuth (Figure 6-14).

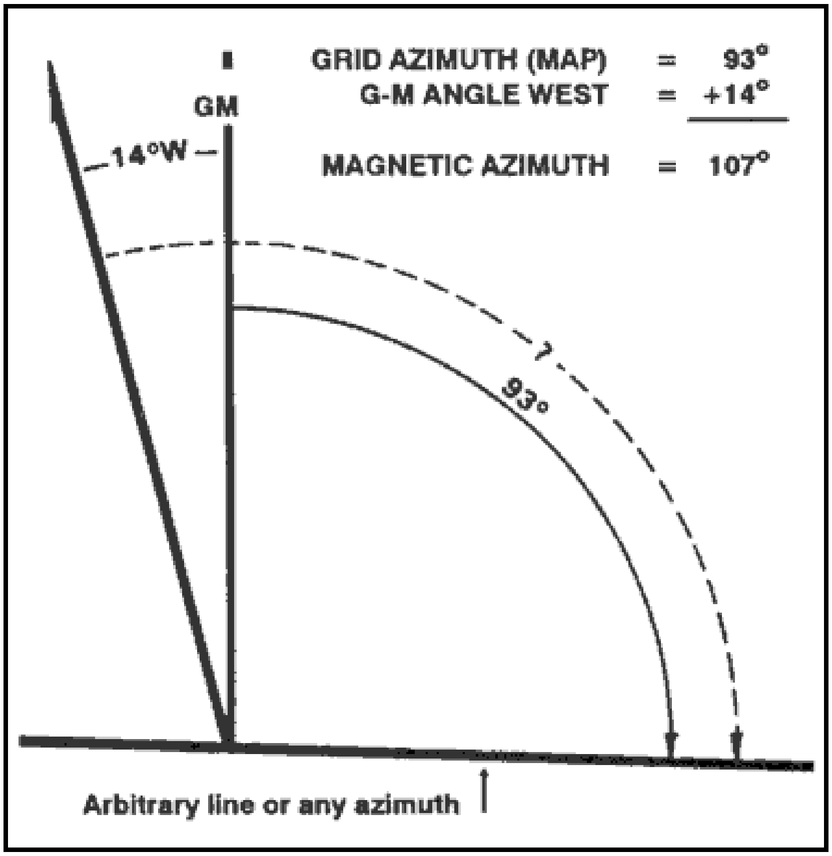

Figure 6-14. Converting to a magnetic azimuth on a map.

(c) Convert a magnetic azimuth when the G-M angle is greater than the magnetic azimuth (Figure 6-15).

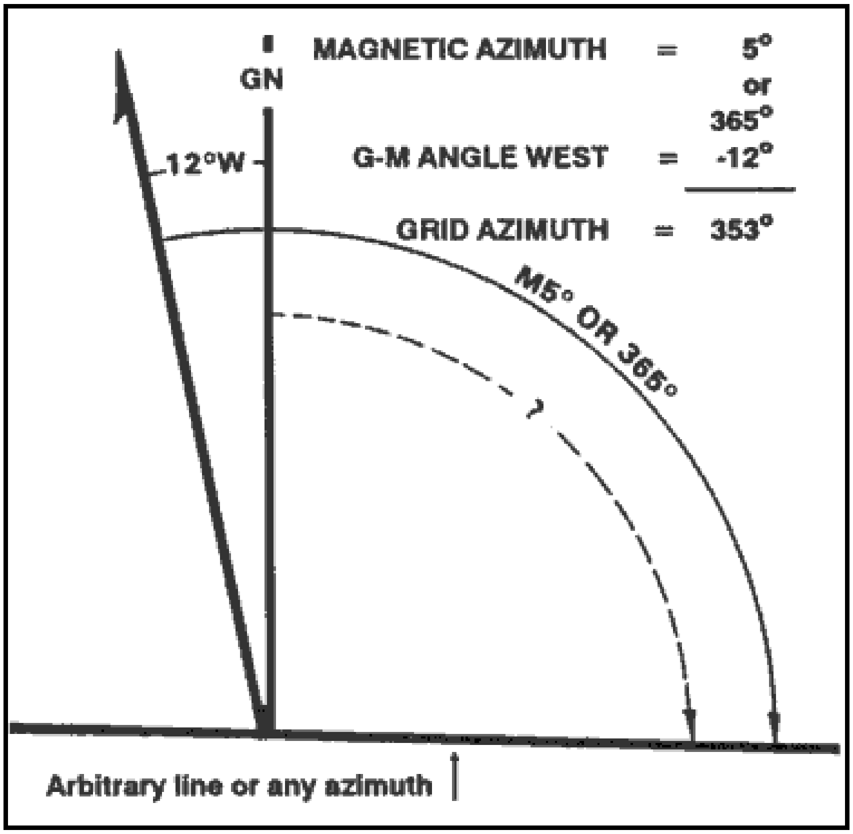

Figure 6-15. Converting to a grid azimuth when the G-M angle is greater.

(3) The G-M angle diagram should be constructed and used each time the conversion of azimuth is required. Such procedure is important when working with a map for the first time. It also may be convenient to construct a G-M angle conversion table on the margin of the map.

NOTE: When converting azimuths, exercise extreme care when adding and subtracting the G-M angle. A simple mistake of 1° could be significant in the field.