THE OFFICIAL U.S. MILITARY PRECISION LENSATIC COMPASS INSTRUCTIONAL BOOKLET

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CAMMENGA

INSTRUCTIONAL BOOKLET

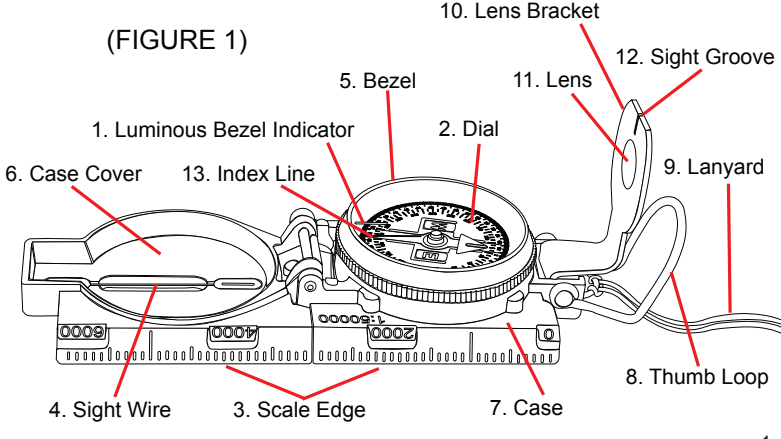
A. INTRODUCTION

The instructions in this booklet are for the CAMMENGA LENSATIC COMPASS currently being distributed by the U.S. Army and Troop Command. This compass is known throughout the world for its precision, reliability, versatility, ruggedness and much more. It has helped to save lives in times of war and provided many with recreational and commercial usefulness in times of peace.

The lensatic compass is used to determine “azimuths” or “compass bearings” (horizontal angles). It is also used to follow a course over the ground, orient or set a map, and determine position of objects in relation to a map.

B. PARTS OF THE LENSATIC COMPASS

(FIGURE 1)



1. Luminous Bezel Indicator: Used to mark an azimuth during day or night.

2. Dial: Displays direction in reference to Magnetic North. The Dial is divided into two scales;

a. Outer - (black printing) graduated in mils.
- 6400 mils to a circle
- Distance between black marks = 20 mils
- Distance between black numerals = 200 mils
- N=64(6400), e=16(1600), S=32(3200), W=48(4800) mils

b. Inner - (red printing) graduated in degrees
- 360 degrees to a circle
- Distance between red marks = 5 degrees
- Distance between red numerals - 20 degrees
- N-0, E=90, S=180, W=270 degrees

3. Scale Edge - 5-inch ruled scale (120 millimeters). Graduated at a ratio of 1:50,000. Distance on a 1:50,000-scale map can be measured up to 6000 meters or 3.7 miles. The scale edge is useful for measuring distances, orienting a map and aligning azimuths.

4. Sight Wire: Used along with the Sight Groove (12) of the Lens Bracket (10) to set a course of movement over the ground; or determine an azimuth by sighting on prominent terrain features while reading the Dial (2) using the Lens (11).

5. Bezel: Contains the Luminous Bezel Indicator (1). Has a serrated edge and rotates with a distinct clicking action. Each click moves the Luminous Bezel Indicator 3 degrees.

6. Case Cover: Closes to protect the compass and reduce carrying size. When opened wide (fig. 1), it can be used as a straight edge or ruler. When perpendicular (fig. 2), the Sight Wire (4) is used to set a course of movement.

7. Case: Contains and protects the Dial assembly.

8. Thumb-Loop: Locks the compass in the closed position. When opened, it facilitates holding the compass to sight an azimuth. (fig. 2).

9. Lanyard: A loop of braided nylon cord to secure the compass around the neck and ease access to it when carried in a shirt pocket.

10. Lens Bracket: When pushed all the way down it raises the Dial off the pivot. When the compass is not being used, it is important to raise the Dial in order to prevent damage to the pivot (point on which the Dial balances).

11. Lens: High quality magnifier (about 2.5 inch focal length) for reading the Dial when positioned about 30 degrees off perpendicular. Handle carefully with clean tissue. Caution: Close Lens Bracket against Bezel glass before closing case cover.

12. Sight Groove: Used to set a course of movement over the ground and to determine an azimuth when it is used along with the Sight Wire (4), the Index Line (13), and the Dial (2).

13. Index Line: Black line etched on the crystal over the Dial. Used to read an azimuth.

C. DETERMINE DIRECTION (SIGHTING AN AZIMUTH)

1. Open the lensatic compass as shown in figure 2.

a. Case cover should be perpendicular (90°) to the case.

b. Tilt the Lens Bracket about 30° from perpendicular. Be sure the Dial floats freely.

2. Sight the lensatic compass.

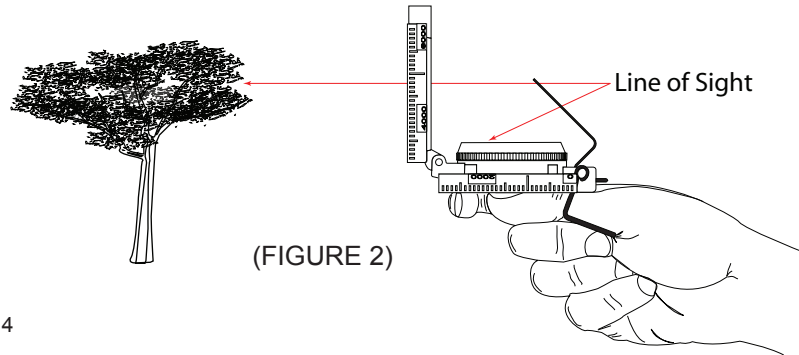
a. Insert thumb through Thumb Loop.

b. Hold the compass level on the platform formed by the thumb and bent index finger.

c. Raise the compass to eye level.

d. Align the center of the sighting groove in the Lens Bracket with the Sight Wire and a distant object.

3. Without moving your head, or the compass, read the azimuth through the Lens of the Lens Bracket. The azimuth, in degrees, is the red mark on the Dial lying directly under the Index Line of the compass crystal and in mils is the black mark on the outer perimeter of the Dial.



(FIGURE 2)

D. TO SET A COURSE (FOLLOW AN AZIMUTH)

1st Method

1. With the lensatic compass opened wide (fig. 1) and held level, turn it horizontally until the azimuth is directly under the black Index Line. Example: you want to follow an azimuth of 120 degrees. Position the Index Line over the 120 degree mark.

2. Holding the lensatic compass in this position, rotate the Bezel until the luminous indicator is over the North arrow of the Dial. The direction indicated by the open compass is the desired course. As long as the Bezel is not rotated, turning the open compass so that the Luminous Bezel Indicator is directly over the North arrow of the Dial can check the course.

2nd Method

1. Turn the fully opened lensatic compass and rotate the Bezel to align the Luminous Bezel Indicator, the black Index Line and the North arrow of the Dial.

2. Subtract the number of degrees, in your desired azimuth, from 360 degrees.

3. Keeping the North arrow under the Index Line, turn the Luminous Bezel Indicator to this result. Example: you want to follow a course of 120 degrees. Subtract 120 degrees from 360 degrees, leaving 240 degrees. Keeping the North arrow under the Index Line, rotate the Bezel until the Luminous Bezel Indicator is over 240 degrees.

4. Turn the compass until the North arrow lies directly under the Luminous Bezel Indicator. The direction indicated by the open case cover points the desired course.

3rd Method

1. Turn the fully opened compass and rotate the Bezel to align the lights in the case cover with the Luminous Bezel Indicator.

2. Rotate the Bezel counterclockwise to the azimuth desired. Each distinct click of the Bezel represents 3 degrees. Example: you want to follow a course of 120 degrees. Divide 120 by 3. The result is 40: therefore, rotate the Bezel 40 clicks counterclockwise.

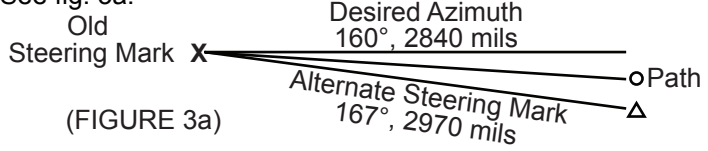
3. Turn the compass until the North arrow lies directly under the Luminous Bezel Indicator. The direction indicated by the lights in the case cover points the desired course.

E. PROCEEDING ALONG AN AZIMUTH

1. With your lensatic compass pointing along a desired azimuth, find an easily identified object that is in line with the Sight Groove of the Lens Bracket and the Sight Wire (fig. 2). This “steering mark” should be distinct from surroundings. It should be visible at all times along the route and should be identifiable when reached.

2. If your steering mark is lost to view, stop, re-sight and select a new steering mark immediately.

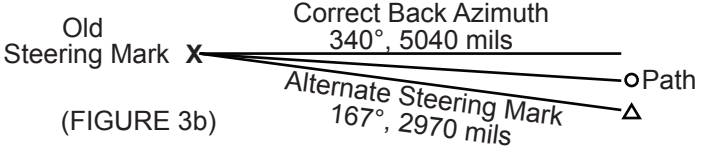
3. If a good steering mark is not in line with your desired azimuth, select an alternative steering mark off to the side. See fig. 3a.



(FIGURE 3a)

a. Head for the point on the travel path that is beside the alternative steering mark. At this position sight a back azimuth to the old steering mark. A back azimuth is 180 degrees away from a traveled azimuth. If traveled azimuth is less than 180 degrees, add 180 degrees. If traveled azimuth is more than 180 degrees, subtract 180 degrees.

b. The correct back azimuth of the desired azimuth is 340 degrees which is 180 degrees plus the desired azimuth of 160 degrees; therefore, you will have to move perpendicular to your path until you can sight a back azimuth of 340 degrees to the old steering mark. You are now back on your correct originally desired course.



(FIGURE 3b)

4. In darkness, use steering marks that are closer together and have a distinct silhouette against the sky.

F. DECLINATION ADJUSTMENT (ORIENTING A MAP)

1st Method - Using the maps declination diagram. (see fig. 4, section I)

Place the fully opened lensatic compass on map with the scale edge alongside the Magnetic North line of the declination diagram. Adjust the map (with compass on it) so that the compass cover points to Magnetic North (North arrow of compass is pointing directly to the Index Line). The map is now oriented to the terrain.

2nd Method - With no declination diagram shown on the map.

1. Find the magnetic declination value in the map margin. This will state the difference between True North and Magnetic North to be so many degrees East or West. Example: Magnetic declination 11 degrees West means The North arrow of the lensatic compass will point 11 degrees West of True North.

2. Place the fully opened compass on the map with the scale edge alongside a North/South meridian (longitudinal line, grid line). The case cover should be pointing toward the top of the map.

3. Turn the map and the compass together until the North arrow of the Dial is the same number of degrees East or West of the Index Line as stated on the map. The map is now oriented to the terrain.

3rd Method - When your position on the map is known.

1. Select a prominent terrain feature on the ground that can also be located on the map.

2. Sight an azimuth from your position on the ground to the selected terrain feature.

3. Align the fully opened compass on the map so that the scale edge runs through the selected terrain feature and your known position.

4. Turn the map and compass together until the azimuth sighted lies under the Index Line. The map is now oriented to the terrain.

G. LOCATING POSITION USING INTERSECTION

1. Orient the map to the terrain.

2. Sight an azimuth to any visible terrain feature that appears on the map.

3. Place the fully opened lensatic compass on the map with the scale edge running through the terrain feature and with the compass reading the same as the azimuth sighted. Draw a line along the scale edge.

4. Pick another visible terrain feature and sight its azimuth. For greater accuracy the two lines should be approximately right angles.

5. Repeat step 3.

6. The point of intersection accurately locates your position on the map.

7. From here you can determine the azimuth of bearing to any terrain feature shown on the map as long as your map is oriented.

H. NIGHT-TIME USE

1. To set a course, follow instructions in the 3rd method under section D. TO SET A COURSE.

2. With your course determined, hold the lensatic compass open and level in both hands, with the index finger of the right hand along the side of the compass.

3. Position the compass approximately halfway between the chin and the belt, keeping the North arrow under the Luminous Bezel Indicator.

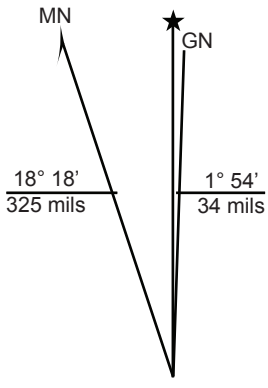
4. Proceed forward in the direction that your index finger is pointed.

I. DEFINITIONS

1. Azimuth - A horizontal angle in respect to North (360 degrees, 6400 mils). The number directly under the black Index Line reads an azimuth on the Dial in either degrees or mils. Example: azimuth of 90 degrees or 1600 mils (read 16) is due East.

(FIGURE 4)

2. North - Generally, a topographical map shows three Norths in the declination diagram. (fig. 4)



a. True North - The actual position of the North Pole of the earth's surface. (shown in figure 4 by a ray or line tipped with a star).

b. Magnetic North - An irregular and wavering magnetic force which tends to run generally Northward and Southward, causing a compass to point variously, depending on location. (Shown in figure 4 by a ray tipped with MN And/or a single barbed spear).

c. Grid North - The North indicated by the map meridians running longitudinally. Because of the earth's curvature, these lines are often pulled a little away from the true meridian in order to provide a straight line, rectangular layout of grid lines. (shown in figure 4 by a ray tipped with GN.)

3. Magnetic Declination - The horizontal angle (difference in degrees) between Magnetic North, Grid North, and True North. Magnetic declination varies from area to area and from time to time: Generally about 1' (one minute) per year (There are 60 minutes to one degree). The declination will be shown in the marginal information on your map. When the lensatic compass is used with a map, an adjustment should be made to allow for the declination.

J. GENERAL INFORMATION

Readings should never be taken near visible masses of iron or electrical circuits, because of their effects on the compass magnet. The following are suggested as approximate safe distances to insure proper functioning of the compass:

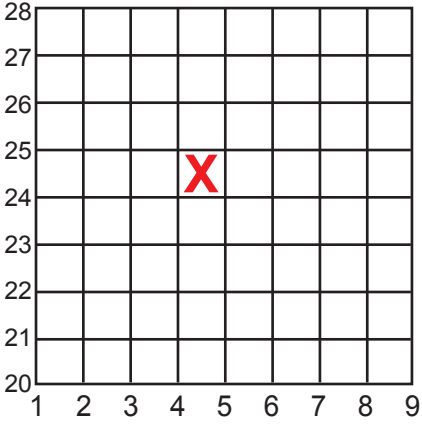
a. High tension power lines	55 meters (60 yards)
b. Car, truck, camper	18 meters (20 yards)
c. Telephone lines, wire fences	10 meters (11 yards)
d. Rifle, metal boxes, etc.	0.5 meters (1.5 feet)

The map scale index is usually found in the marginal information on a map. Corresponding ground distances of some commonly used map scales are shown below:

Fractional Scale	Simple Conversion
1:24,000	1 in = 2000 ft
1:25,000	1 mm = 100 m
1:50,000	1 mm = 50 m
1:62,500	1 in ~ 1 mi
1:100,000	1 cm = 1 km
1:125,000	1 in ~ 2 mi
1:250,000	1 in ~ 4 mi

Coordinates are determined using the North/South and East/West lines on a map (grid lines). Positions are determined on a map by intersecting coordinates. The lower left is the origin and coordinates are read to the right and then up. (see fig. 5)

The position of “X” is read 04-24. Read the number from the left to the right, then from the bottom to the top. For greater accuracy, each of the boxes created by the grid lines can be divided into 10 imaginary lines in both directions. Since the position of “X” is not directly on one of the grid line intersections, repeat the steps explained above with these imaginary lines. The position of “X” would then be read 045-245.



(FIGURE 5)

The CAMMENGA LENSATIC COMPASS uses induction damping to slow the rotation of the magnet. Induction damping allows the Dial to seek Magnetic North and come to a complete rest in much less time than a unit without induction damping. It is a velocity dependent force; that is, as the speed of the oscillation of the Dial comes to rest, the damping force is zero. Induction damping proves to be far superior to liquid damped compasses which are subject to leakage and eventual failure.

The CAMMENGA LENSATIC COMPASS features:

• A Dial balanced on a precision made synthetic sapphire jeweled bearing.
• Induction damping by means of a copper damping shell so that Dial comes to rest within six seconds.
• A rubber cup sealing the copper damping shell, making the compass waterproof.
• Operational temperature ranges from -50 degrees F. to +160 degrees F.

For more information on the CAMMENGA LENSATIC COMPASS, and other products offered by CAMMENGA, please visit www.cammenga.com

APPENDIX