Blue Ridge Mountain Rescue Group

Map & Compass - Land Navigation
Outline

Edited by: Brian A. Wheeler

October 1986

This class was taught during a one hour BRMRG weeknight session. The following weekend was a BRMRG field session covering the same material. The trainees had already been introduced to some of this information in the BRMRG Field Team Member Workshop. It would be possible to spend one session covering just map and compass and another on grid systems. However, this was an introductory course to be followed by the field practical session and more advanced training sessions.

I. Introduction to topographic maps

A. 7.5' maps and scale
B. Map Names
C. Map Years
D. Map Colors
E. Other border information
F. Contour Lines

Note: Pass out actual topo maps and the handouts attached. You also might use an overhead in this section.

II. Determining your position

A. The "N" in National method
B. The ASRC Grid
C. Introduction to UTM and Lat./Long.

Note: Use overhead and refer to map included in handouts to describe each of these methods.

III. The Magnetic Compass

A. True and Magnetic North
B. Compass Operation
C. Taking a magnetic bearing
D. Following a bearing in the field
E. Adjusting for declination

IV. Orienteering Methods

A. Collecting Features
B. Attack Points
C. Aiming Off

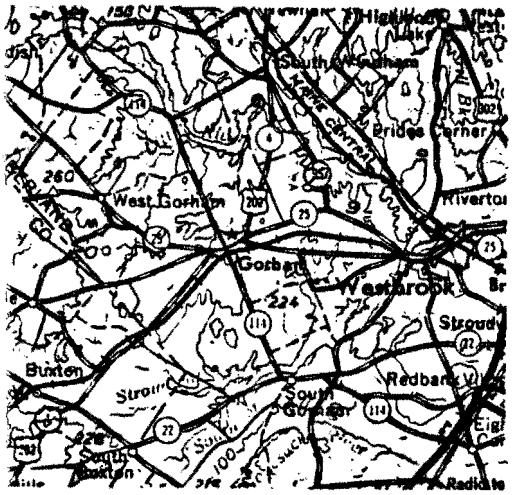
V. Topographic Interpretation

Note: If available, use actual slides of an area with a xeroxed map of the same region. Have students predict and observe features in slides.

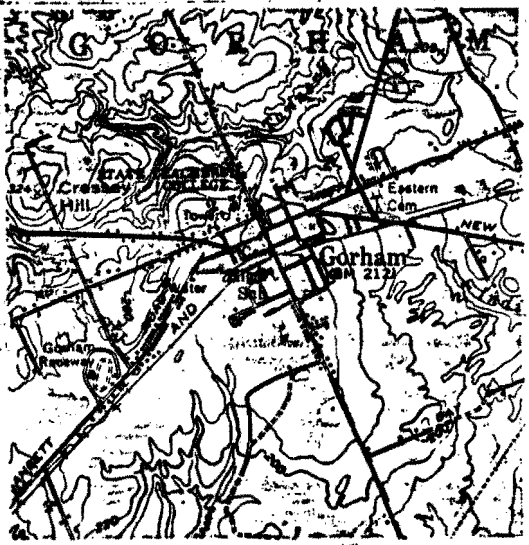
TOPOGRAPHIC MAP SERIES

Series	Scale	One Inch Represents	Standard Quadrangle Size (latitude & longitude)	Quadrangle Area (square miles)
7.5-minute	1:24,000[1]	2,000 feet	7.5 x 7.5 min.	49 to 71
15-minute	1:62,500[2]	about 1 mile	15 x 15 min.	197 to 282
Intermediate-scale quadrangle	1:100,000	over 1.5 miles	30 min. x 1°	1,145 to 2,167
U.S. 1:250,000[3]	1:250,000	about 4 miles	1° x 2°	4,580 to 8,669
International Map of the World[3]	1:1,000,000	about 16 miles	4° x 6°	73,734 to 102,759

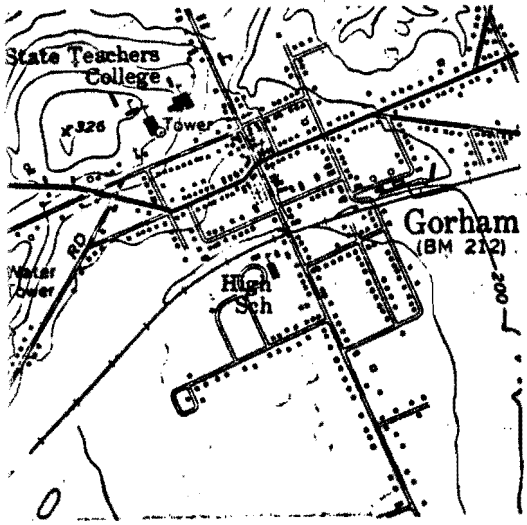
[1] For Alaska, the scale is 1:25,000 and for Puerto Rico, 1:20,000.
[2] For Alaska, the scale is 1:63,360 (1 inch represents 1 mile) and the quadrangle size is 15 x 20 to 36 minutes.
[3] Maps of Alaska and Hawaii vary from these standards.



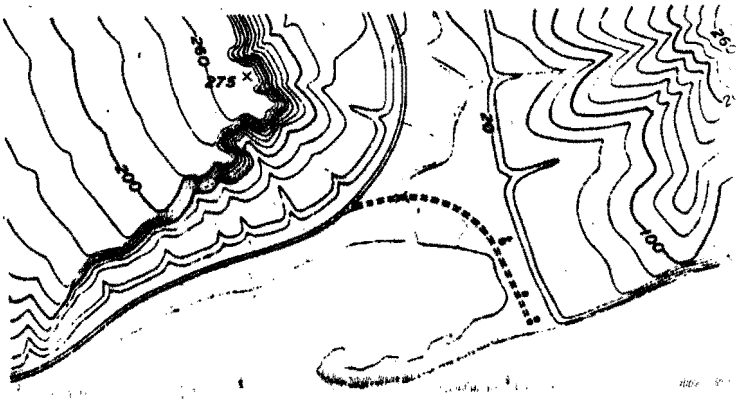
1:250,000 scale, 1 inch = about 4 miles. Area shown, 107 square miles.



1:62,500 scale, 1 inch = about 1 mile. Area shown, 6¾ square miles.



1:24,000 scale, 1 inch = 2,000 feet. Area shown, 1 square mile.



Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road
Road under construction, alinement known
Proposed road
Dual highway, dividing strip 25 feet or less
Dual highway, dividing strip exceeding 25 feet
Trail

Railroad: single track and multiple track
Railroads in juxtaposition
Narrow gage: single track and multiple track
Railroad in street and carline
Bridge: road and railroad
Drawbridge: road and railroad
Footbridge
Tunnel: road and railroad
Overpass and underpass
Small masonry or concrete dam
Dam with lock
Dam with road
Canal with lock

Buildings (dwelling, place of employment, etc.)
School, church, and cemetery — Cem
Buildings (barn, warehouse, etc.)
Power transmission line with located metal tower
Telephone line, pipeline, etc. (labeled as to type)
Wells other than water (labeled as to type) — Oil — Gas
Tanks: oil, water, etc. (labeled only if water) — Water
Located or landmark object; windmill
Open pit, mine, or quarry; prospect
Shaft and tunnel entrance

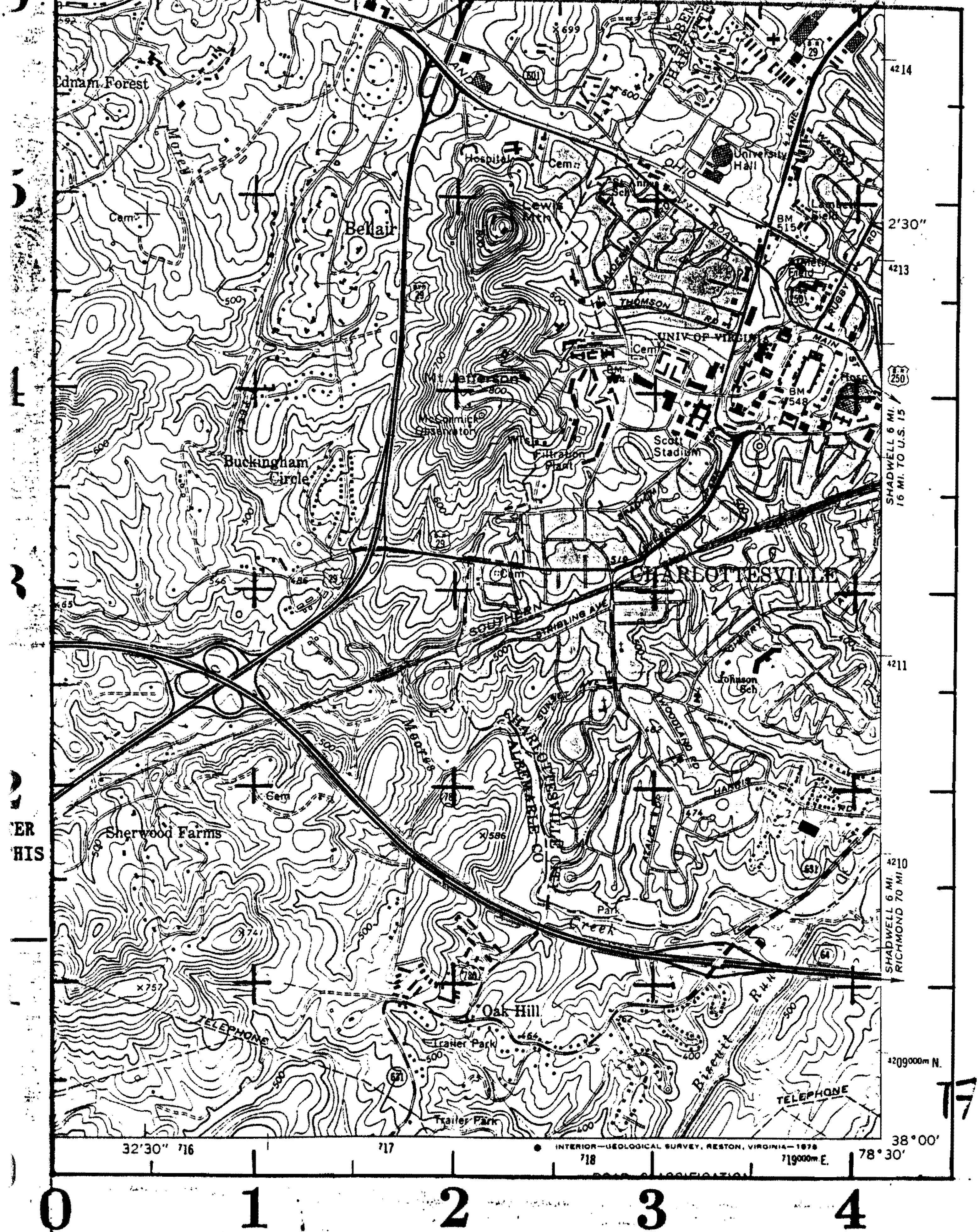
Horizontal and vertical control station:
Tablet, spirit level elevation — BM △5653
Other recoverable mark, spirit level elevation — △5455
Horizontal control station: tablet, vertical angle elevation — VABM △95/9
Any recoverable mark, vertical angle or checked elevation — △5775
Vertical control station: tablet, spirit level elevation — BM ×957
Other recoverable mark, spirit level elevation — ×954
Spot elevation — ×7369 — ×7369
Water elevation — 670 — 670

Boundaries: National
State
County, parish, municipio
Civil township, precinct, town, barrio
Incorporated city, village, town, hamlet
Reservation, National or State
Small park, cemetery, airport, etc.
Land grant
Township or range line, United States land survey
Township or range line, approximate location
Section line, United States land survey
Section line, approximate location
Township line, not United States land survey
Section line, not United States land survey
Found corner: section and closing
Boundary monument: land grant and other
Fence or field line

Index contour
Intermediate contour
Supplementary contour
Depression contours
Fill
Cut
Levee
Levee with road
Mine dump
Wash
Tailings
Tailings pond
Shifting sand or dunes
Intricate surface
Sand area
Gravel beach

Perennial streams
Intermittent streams
Elevated aqueduct
Aqueduct tunnel
Water well and spring
Glacier
Small rapids
Small falls
Large rapids
Large falls
Intermittent lake
Dry lake bed
Foreshore flat
Rock or coral reef
Sounding, depth curve
Piling or dolphin
Exposed wreck
Sunken wreck
Rock, bare or awash; dangerous to navigation

Marsh (swamp)
Submerged marsh
Wooded marsh
Mangrove
Woods or brushwood
Orchard
Vineyard
Scrub
Land subject to controlled inundation
Urban area



PALACHIAN SEARCH & RESCUE CONFERENCE - GRID OVERLAY TEMPLATE (Read This Component First)

INSTRUCTIONS

The instructions given here are intended to acquaint you with some general terms and rules as well as the basic parts and functions of your Silva System Compass.

A **BEARING** is a horizontal angle fixing a direction in respect to North.

A bearing, from one point to another, can be fixed either on the map (where direction North is marked by Meridians or Grid lines) — a map bearing, or in the field (where direction North is pointed out by the magnetic needle) — a field bearing.

A **MAP BEARING** is either a True Bearing or a Grid Bearing.

A **FIELD BEARING** is a Magnetic Bearing also called a Compass Bearing.

TWO EXACTLY OPPOSITE SETS OF RULES APPLY TO THE USE OF MAGNETIC COMPASS

MAP BEARING RULES (see col. 7—11) apply if you are working "from map to terrain".

Here map is broadly interpreted also to include charts, descriptions and even a mental knowledge of the terrain. In general, if you are seeking a spot or a direction on the terrain from printed or mental information available to you, then the set of rules "from map to terrain" will apply. Learn them first thoroughly.

FIELD BEARING RULES (see col. 19—23) apply if you are working "from terrain to map". For instance, if you see some object on the terrain and wish to plot its location or determine the bearing to it, then the set of rules, "from terrain to map" will apply. Don't forget that they are exactly opposite to the other set of rules.

When you have learned the map bearing rules, you can reverse the procedure to practice the field bearing rules.

THE PARTS OF THE SILVA COMPASS

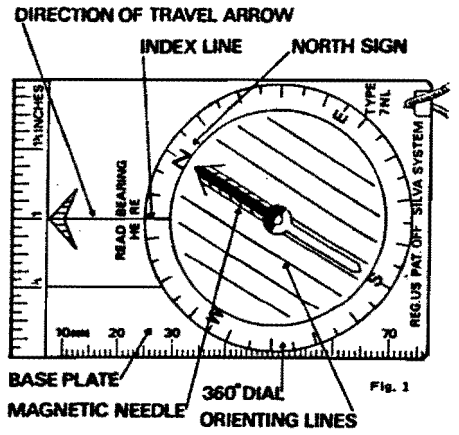


Fig. 1

MAP BEARING RULES

[redacted]

is to turn the dial until the bearing (the degree number or the compass point) you desire is shown at the index pointer.

The general principles outlined in these instructions apply to all SILVA-SYSTEM compasses, such as the liquid-filled Silva Explorer, Silva Voyager and Silva Ranger models. For a more thorough study of maps and compasses, one book recommended is "Be Expert with Map and Compass" by Bjorn Kjellstrom.

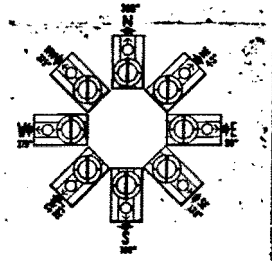
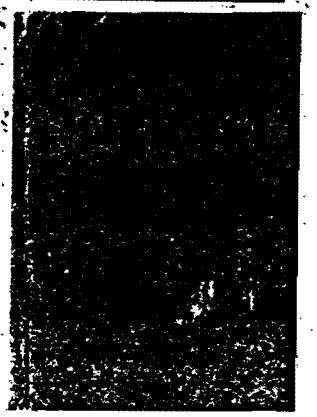


Fig. 2

The points of the compass are the cardinal (North, East, South, West) or intercardinal (NE, SE, SW and NW) directions.



[redacted]

Let us assume the bearing is set for 60 degrees.

Fig. 3

1. Hold compass in your hand level enough to permit magnetic needle to swing freely, and also having direction arrow pointing straight ahead.

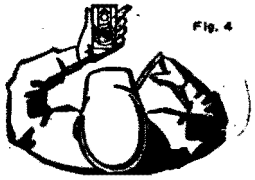


Fig. 4

2. Orient the compass (and yourself) as follows: while holding compass

as in above paragraph, turn yourself around together with the compass until the red north end of the magnetic needle points to the letter "N" on be dial.

3. Now look up in the direction of the direction of travel arrow — you are facing "bearing 60 degrees"!

[redacted]

Look straight ahead (the farther the better) and choose a landmark or a spot which is in the direction you are facing, as pointed out by the direction of travel arrow on the compass. Walk to that landmark or spot without looking at the compass. When you get there, repeat the procedure, use the compass to locate next landmark in the bearing 60 degrees and repeat again until you reach your destination.

[redacted]

Check your knowledge of the foregoing procedure by trying a simple test in your garden or local park. Place a coin or a marker on the ground between your feet. Set your Silva Compass for an arbitrary direction between 0 and 120 degrees, e. g. 40 degrees as shown. Face this bearing as instructed in column 8 and walk this bearing for 40 steps-stop!

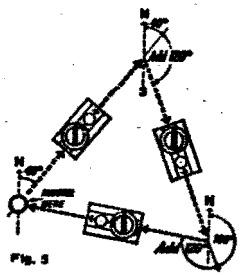


Fig. 5

Look at your compass again. Add 120 to your original 40 degrees — making it 160 degrees. Set this new bearing on your compass. Face this bearing by means of the compass (column 8), walk the new bearing of 160 degrees for 40 steps — and stop. Again, add 120 degrees to your last setting of 160 degrees — making it 280 degrees. Reset your compass, determine the new direction to walk and take 40 steps in the direction towards which the direction of travel arrow points now. Step!

Your coin or marker should be right at your feet if you have used your SILVA Compass properly and your walking was exact. If you did not succeed, try it again with another bearing at the start and add 120 degrees at each of the two turns, walking the same distance in each direction. You will succeed in finding your starting point — and this test is very good practice.

Also, let your friends try it! It can be a very enjoyable "garden-party-game".

[redacted]

Each map is like an aerial photograph of the terrain taken from high above and reduced to an accurate scale. When we say the map is made on the scale of 1:10.000 (one to ten thousand) it means that one unit on the map represents 10,000 units on the ground.

Note the scale on your own maps and learn what distances such units as 1 inch, 1/2 inch etc. (1, 2 mm, etc.) represent over the ground. An index like this of your own can be useful.

TAKING / MAP BEARING

THE SILVA SYSTEM — is simple as one, two and three!

The point you want to reach will not always lie exactly on a cardinal or intercardinal direction; it may be anywhere between these directions. Unless you have an accurate bearing, therefore, a small lake or cottage could be difficult to locate. Here your SILVA System Compass — in reality a combination of compass and protractor — is a great help and solves the problem in a very simple way. Just three hand adjustments and the line of travel (the bearing) is transferred from map to compass which then is ready to show you the way. A "flash" lesson in the Silva System is given on these columns.

COMPASS ON MAP

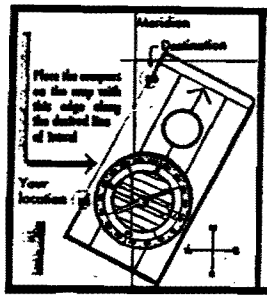


Fig. 6

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COMPASS ON MAP

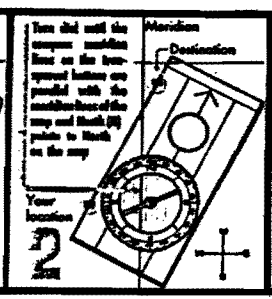

Fig. 7

13

COMPASS REMOVED FROM MAP (See fig. 4)

Fig. 8

14

(Sometimes called magnetic variation) is the angle between True North and Magnetic North. Maps are practically always based on True North which is static (see col. 3). A compass needle which is attracted by the magnetism of the earth, always points to Magnetic North — at least if it is not disturbed by nearby iron or steel objects.

When using the compass, keep it well clear of metallic objects, (knives, photo meters, lighters, even belt buckles); they can cause serious inaccuracies.

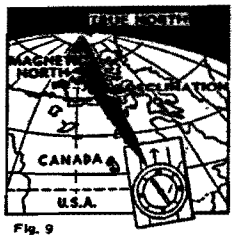

Fig. 9

15

The Magnetic North is located in the upper Hudson Bay area (Fig. 9) but moves slightly from year to year. Information about the amount of declination in any area is generally given on the topographic map of this area. If not, you can ask your county surveyor. At any area where your compass needle points East of True North it is "Easterly Declination", and if it points West it is "Westerly Declination". Where True and Magnetic North appear to be the same it is zero line.

ADJUSTING MAP BEARINGS FOR DECLINATION

When the compass is used with a map or in connection with map bearings, an adjustment should be made to allow for the declination. This is especially important if there is considerable declination in your area or if accuracy is quite important. With one turn of the dial you can make the proper allowance for any declination. You must do this every time you wish to apply a declination to a bearing. Here is how:

First find out the amount of declination in your area.
Second, turn the dial as per the following rule:

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For example, assume your map bearing is 14 degrees (fig. 10) and declination is 10 degrees West. Turn dial West 10 degrees (ADD). It will then read 24 degrees (fig. 11)

Fig. 10

Fig. 11

Conversly, if the declination was shown as 10 degrees East. Turn dial East 10 degrees (SUBTRACT) and it will then read 4 degrees.

17

Note. When you have made this allowance for declination you can face or follow an accurate magnetic bearing (see col. 8 and 9).

DECLINATION CAN BE IGNORED

when the compass is used without reference to maps, so that its use is based on field bearings exclusively. Also for rough compass work where accuracy is not too important, especially in areas where the declination is not great.

FIELD BEARING RULES

Working from Terrain to Map is achieved simply by reversing the Map to Terrain rules you have already learned.

TAKING A FIELD BEARING

1. Face the landmark (hill, buildings, etc.) on which you intend taking a bearing, either to plot on your map, or to give you a course to follow.

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2. Hold your compass with the direction of travel arrow pointing to the actual landmark and level enough to permit the needle to swing freely (fig. 4).

3. Turn the dial of the housing — without changing the position of the whole compass — until the orienting arrow in the housing is parallel with the magnetic needle and the red end is pointing to the letter "N" (fig. 5).

4. Now you can read on the dial at the index pointer the magnetic bearing to the actual landmark.

ADJUSTING FIELD BEARINGS FOR DECLINATION

Read again the instructions for adjusting map bearings for declination and do the same, but don't forget to "reverse the step"! That means that for declination West you now turn dial East (SUBTRACT) and for declination East you turn dial West (ADD) the amount of declination degrees. When a proper allowance for declination is made your compass will show the true bearing, and you can use it to plot on the map either the location of the object, which you have determined the bearing to or the location of yourself.

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PLOTTING LOCATIONS

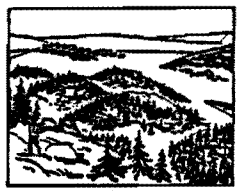

Fig. 12

Assume you want to plot on to your map the spot where you are standing in fig. 12. Your map is fig. 13.

Fig. 13

20

A good method for doing this is by means of "cross-bearings" to two previously plotted locations (a re-section). Your first job is to find two spots on the map which you recognize on the terrain. You deduce that the church is in the village of Hollister, and the lake must be Pike Lake. These, then are the chosen two points from which to take crossbearings. Proceed as follows:

1. Take a field bearing to the church and adjust for declination.

2. Put the compass on the map so that either side of the base plate intersects the symbol for the church at Hollister, and while keeping the edge of the compass' base plate on the symbol of the church, turn entire compass on the map until the compass orienting lines are parallel with the meridian lines on the map, and so that the orienting arrow points North on the map (fig. 14).

3. Draw a line on the map along the edge of the compass, intersecting the symbol for the church. Your position is somewhere along this line.

4. To establish your position along this line, you repeat the same procedure, but now you use the North end of Pike Lake as the object for this bearing. When you have drawn the line from Pike Lake you will find your exact position where the two lines cross — hill 815 (fig. 15).

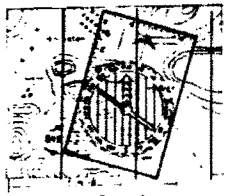

Fig. 14

21

Fig. 15

22

MAGNETIC INCLINATION

The directions of the lines of the magnetical force very from straight vertical at the magn. poles to horizontal only at an irregular line encircling the earth in the neighborhood of the equator. This line is called the magnetic equator (ME).

As a consequence the north end resp: the south end of the magn. needle has a tendency to dip down in the areas between the poles and the ME.

On the SILVA Compasses this tendency is reduced by the fact that the center of gravity is below the pivot point. Furthermore when needed, the needles are counter-balanced for the magn. zone (a latitudinal area of approx. 20° to 40°) within which they are expected to be used.

In case you as a globetrotter need a SILVA Compass balanced for other latitudes, the SILVA retailer or distributor is certainly prepared to advise you how to get it.

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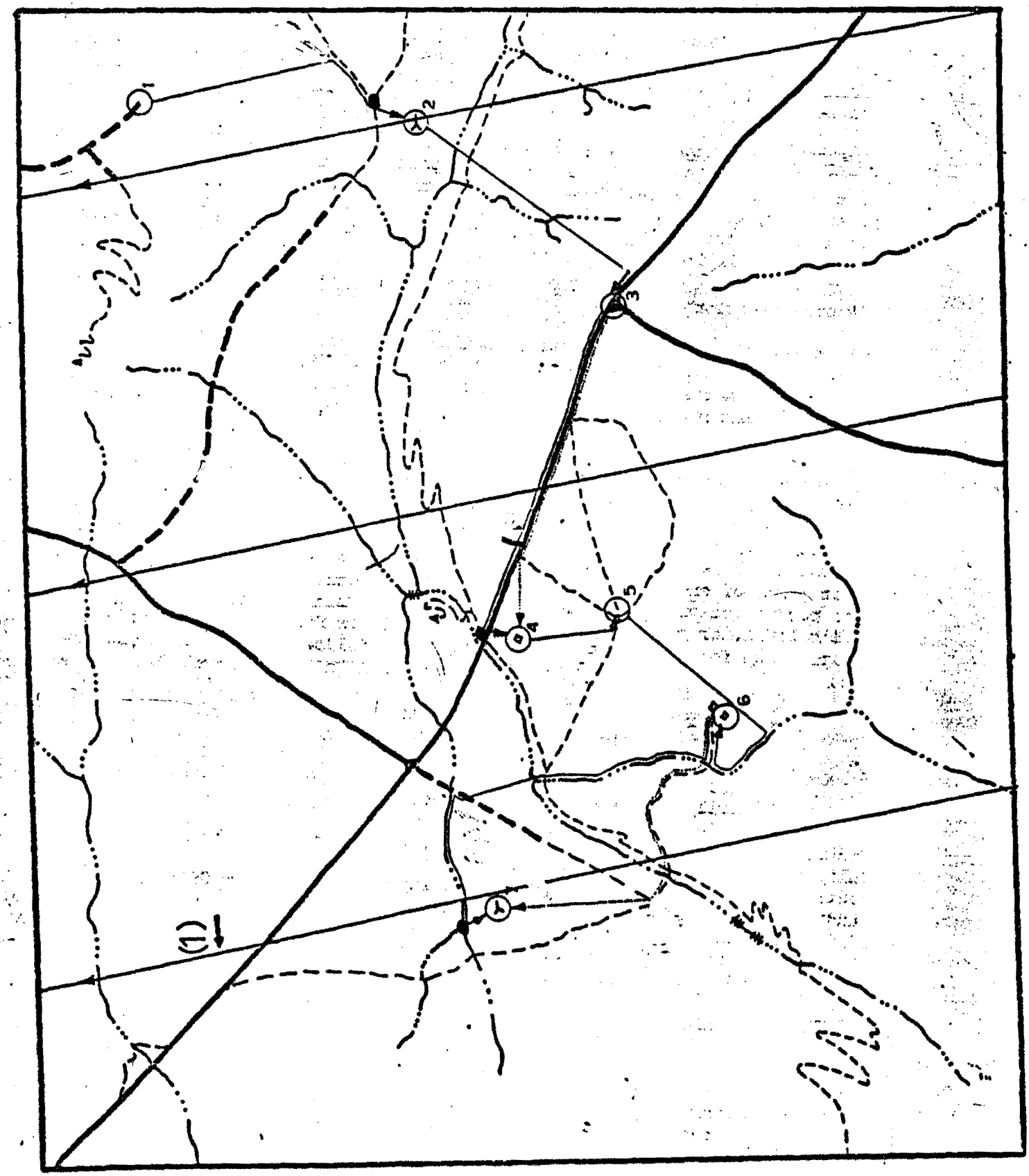


FIGURE 8-9: Orienteering Concepts

Small numbers are target point numbers; large numbers in parentheses are keys to explanations in the text.

(124)

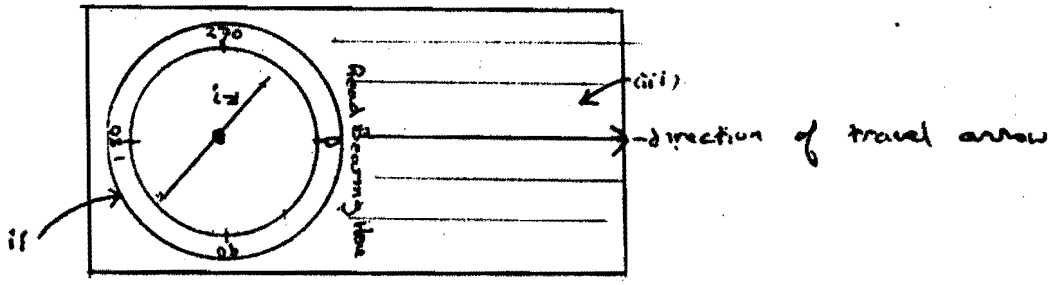
MAP AND COMPASS

A. Orienteering compasses are used for three purposes:

i) Orienting a map
ii) Measuring a distance on a map
iii) To establish a bearing and guide you on it

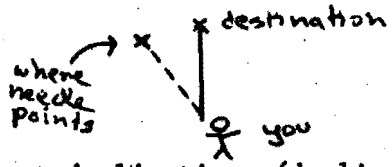
B. Parts of the compass:

i) Magnetic needle
ii) 360° dial, transparent (the needle housing), with parallel orienteering lines
iii) Rectangular transparent base, with direction of travel arrow



C. Magnetic north and true north

i) The red end of the needle does not point to true north (unfortunately) due to a large iron ore deposit somewhere near the Hudson Bay
ii) In Virginia, the needle points about 7° West of true north
iii) Therefore you must compensate, since if your'e told to go true north, and follow your needle, you will end up west of your intended destination.



iv) To compensate, for a west declination, (declination is the difference between true north and magnetic north, and varies geographically: in New Hampshire the declination is about 17° W, and in California there is an Eastern declination) add the number of declination degrees to the true north bearing. 'West is Best'

D. Determining a bearing:

i) If you have a map, and an origin and destination, and wish to find out the bearing you should follow, then here's watcha do:
ii) Orient the map to true north. (An oriented map is one that is turned so that map north and true north coincide). If you are outside this can be done by inspection. To do it with your compass, first of all

be sure you aren't near any large metal objects, such as cars! Then, set the declination on your compass, or in other words, turn the dial to 7°, for here in Virginia. Line up the edge of the compass with the edge of the map, and rotate map and compass as a unit until the red needle is centered in the needle housing arrow.

ii) Keep the map from moving.

iii) Place edge of compass along line from origin to destination, so that direction of travel arrow points in direction of target.

iv) Turn needle housing until arrow and needle coincide. This will give a magnetic bearing.

E. Following a Bearing:

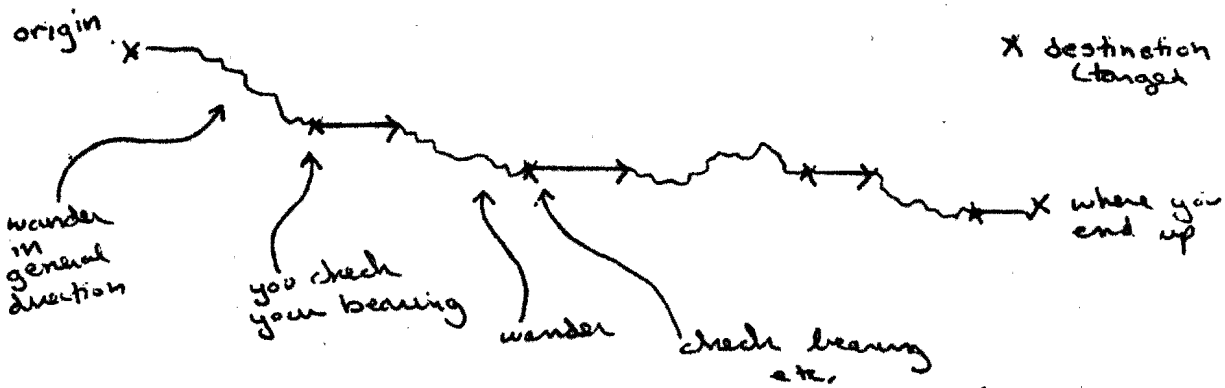
i) Memorize it

ii) Hold compass level in your palm, and rotate your entire body until needle fits in needle housing arrow.

iii) Travel in that direction

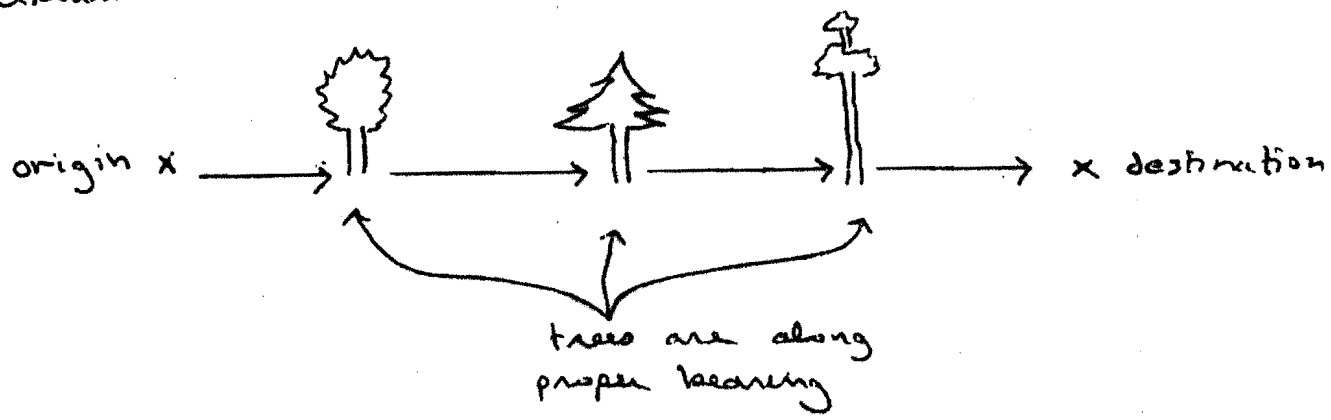
iv) In order to stay on the proper bearing, it is best to orient on intermediate targets, such as trees. You pick a tree in your direction of travel, go to it, take a bearing on another tree, etc.

v) A good method of staying on a bearing is by teamwork. Send a member ahead of you, and correct him verbally to keep him on the bearing, catch up with him, etc. This can be very fast and accurate, if your're in practice.



↑What happens if you don't have intermediate targets↑

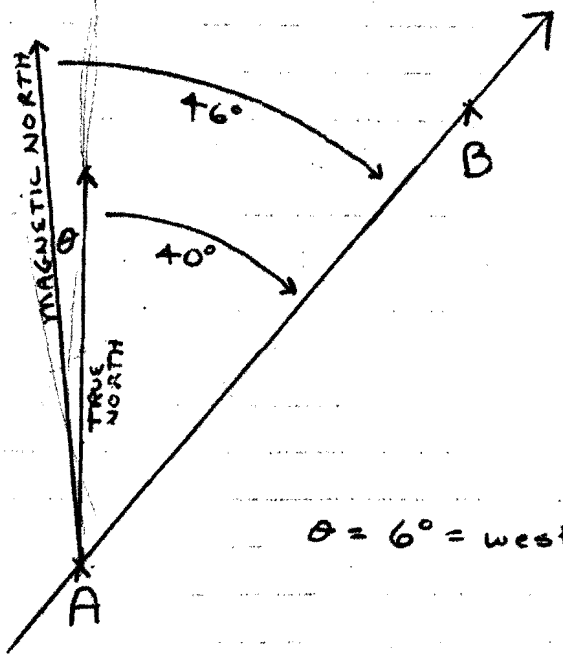
Better method...



True North and Magnetic North

Due to iron ore deposits in the earth, (near Hudson Bay) the needle of your compass does not point to true north, except in certain areas of the world. (Virginia isn't one of them, unfortunately!)

So: to adjust for declination, (which is the difference between true N and magnetic N), remember remember the following:



$\theta = 6°$ = west declination.

From Point A to Point B, the true bearing is 40°, while the magnetic bearing, the one you set your compass at, is 40° + 6°, = 46°, where 6° is West is the declination in most of Virginia.

If Virginia had an East declination, you would subtract it from a true bearing to get a magnetic bearing.

"West is Best" add
"East is Least" subtract

TOPOGRAPHIC MAP SERIES

Series	Scale	One Inch Represents	Standard Quadrangle Size (latitude & longitude)	Quadrangle Area (square miles)
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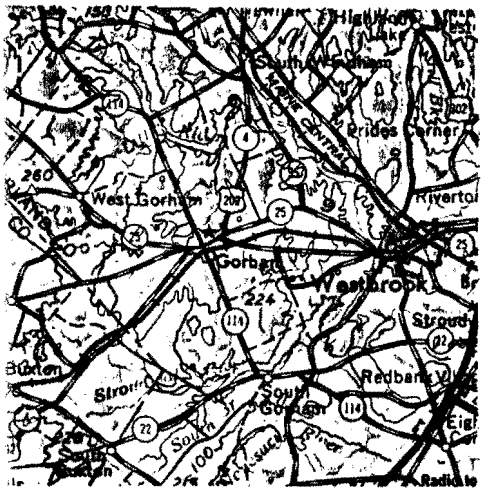
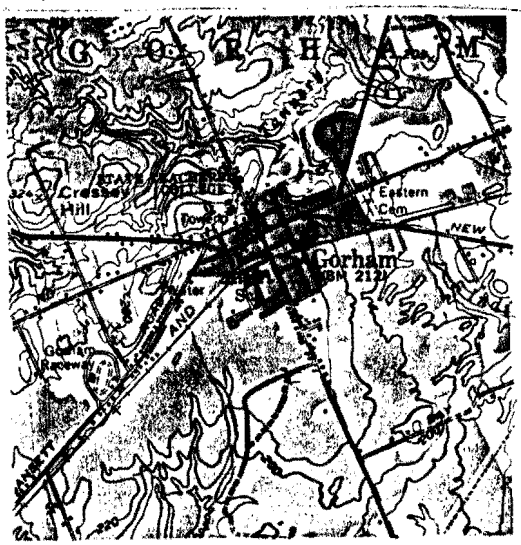
Intermediate-scale quadrangle	1:100,000	over 1.5 miles	30 min. x 1°	1,145 to 2,167
U.S. 1:250,000[3]	1:250,000	about 4 miles	1° x 2°	4,580 to 8,669
International Map of the World[3]	1:1,000,000	about 16 miles	4° x 6°	73,734 to 102,759

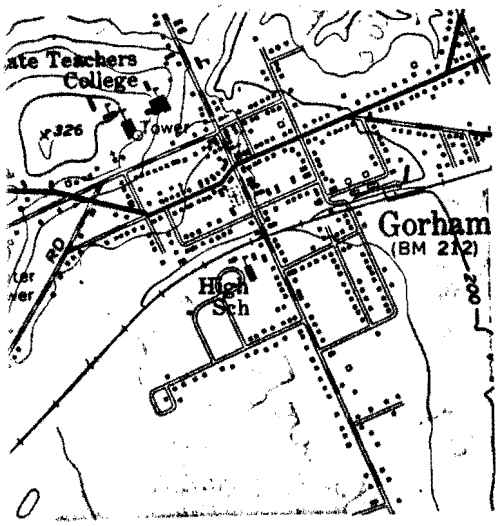
[1] For Alaska, the scale is 1:25,000 and for Puerto Rico, 1:20,000.
[2] For Alaska, the scale is 1:63,360 (1 inch represents 1 mile) and the quadrangle size is 15 x 20 to 36 minutes.
[3] Maps of Alaska and Hawaii vary from these standards.



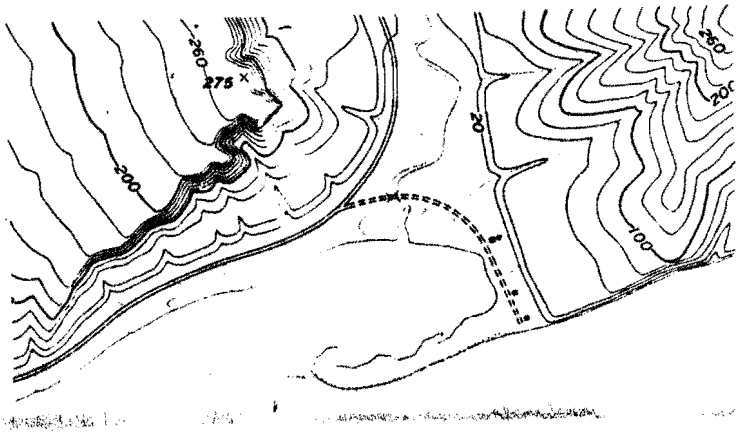
1:250,000 scale,
1 inch = about
4 miles.
Area shown,
107 square miles.



1:62,500 scale,
1 inch = about
1 mile.
Area shown,
6¾ square miles.



1:24,000 scale,
1 inch = 2,000
feet.
Area shown,
1 square mile.



[illegible]

The instructions given here are intended to acquaint you with some general terms and rules as well as the basic parts and functions of your Silva System Compass.

A BEARING is a horizontal angle fixing a direction in respect to North.

A bearing, from one point to another, can be fixed either on the map (where direction North is marked by Meridians or Grid lines) — a map bearing, or in the field (where direction North is pointed out by the magnetic needle) — a field bearing.

A MAP BEARING is either a True Bearing or a Grid Bearing.

A FIELD BEARING is a Magnetic Bearing also called a Compass Bearing.

[illegible]

MAP BEARING RULES (see col. 7—11) apply if you are working "from map to terrain".

Here map is broadly interpreted also to include charts, descriptions and even a mental knowledge of the terrain. In general, if you are seeking a spot or a direction on the terrain from printed or mental information available to you, then the set of rules "from map to terrain" will apply. Learn them first thoroughly.

FIELD BEARING RULES (see col. 19—23) apply if you are working "from terrain to map". For instance, if you see some object on the terrain and wish to plot its location or determine the bearing to it, then the set of rules, "from terrain to map" will apply. Don't forget that they are exactly opposite to the other set of rules.

When you have learned the map bearing rules, you can reverse the procedure to practise the field bearing rules.

[illegible] SILVA COMPASS

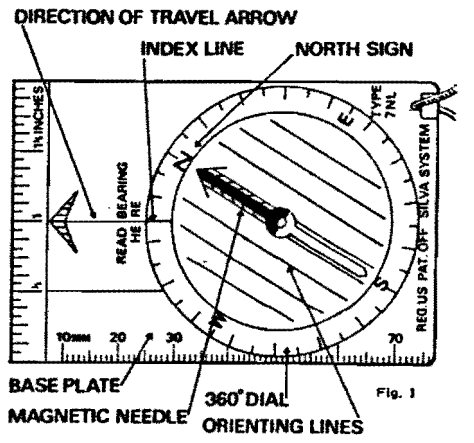


Fig. 1

MAP BEARING RULES

[illegible]

is to turn the dial until the bearing (the degree number or the compass point) you desire is shown at the index pointer.

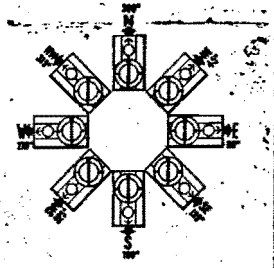
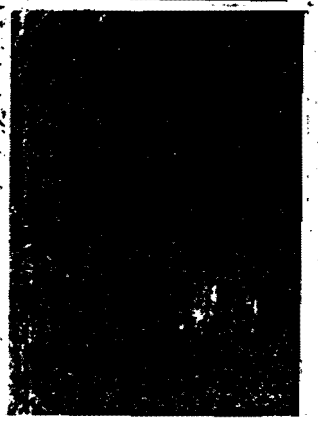


Fig. 2

The points of the compass are the cardinal (North, East, South, West) or intercardinal (NE, SE, SW and NW) directions.

The general principles outlined in these instructions apply to all SILVA-SYSTEM compasses, such as the liquid-filled Silva Explorer, Silva Voyager and Silva Ranger models. For a more thorough study of maps and compasses, one book recommended is "Be Expert with Map and Compass" by Bjorn Kjellstrom.



[illegible]

Let us assume the bearing is set for 60 degrees.

Fig. 3

1. Hold compass in your hand level enough to permit magnetic needle to swing freely, and also having direction arrow pointing straight ahead.

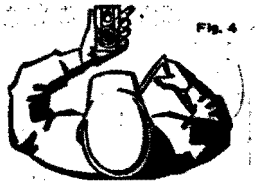


Fig. 4

2. Orient the compass (and yourself) as follows: while holding compass as in above paragraph, turn yourself around together with the compass until the red north end of the magnetic needle points to the letter "N" on he dial.

3. Now look up in the direction of the direction of travel arrow — you are facing "bearing 60 degrees"!

[illegible]

Look straight ahead (the farther the better) and choose a landmark or a spot which is in the direction you are facing, as pointed out by the direction of travel arrow on the compass. Walk to that landmark or spot without looking at the compass. When you get there, repeat the procedure, use the compass to locate next landmark in the bearing 60 degrees and repeat again until you reach your destination.

[illegible]

Check your knowledge of the foregoing procedure by trying a simple test in your garden or local park. Place a coin or a marker on the ground between your feet. Set your Silva Compass for an arbitrary direction between 0 and 120 degrees, e. g. 40 degrees as shown. Face this bearing as instructed in column 8 and walk this bearing for 40 steps-stop!

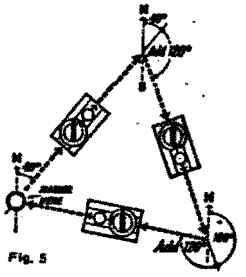


Fig. 5

Look at your compass again. Add 120 to your original 40 degrees — making it 160 degrees. Set this new bearing on your compass. Face this bearing by means of the compass (column 8), walk the new bearing of 160 degrees for 40 steps — and stop. Again, add 120 degrees to your last setting of 160 degrees — making it 280 degrees. Reset your compass, determine the new direction to walk and take 40 steps in the direction towards which the direction of travel arrow points now. Stop!

Your coin or marker should be right at your feet if you have used your SILVA Compass properly and your walking was exact. If you did not succeed, try it again with another bearing at the start and add 120 degrees at each of the two turns, walking the same distance in each direction. You will succeed in finding your starting point — and this test is very good practice.

Also, let your friends try it! It can be a very enjoyable "garden-party-game".

[illegible]

Each map is like an aerial photograph of the terrain taken from high above and reduced to an accurate scale. When we say the map is made on the scale of 1:10,000 (one to ten thousand) it means that one unit on the map represents 10,000 units on the ground.

Note the scale on your own maps and learn what distances such units as 1 inch, 1/2 inch etc. (1, 2 mm, etc.) represent over the ground. An index like this of your own can be useful.

TAKING / MAP BEARING

THE SILVA SYSTEM — is simple as one, two and three!

The point you want to reach will not always lie exactly on a cardinal or intercardinal direction; it may be anywhere between these directions. Unless you have an accurate bearing, therefore, a small lake or cottage could be difficult to locate. Here your SILVA System Compass — in reality a combination of compass and protractor — is a great help and solves the problem in a very simple way. Just three hand adjustments and the line of travel (the bearing) is transferred from map to compass which then is ready to show you the way. A "flash" lesson in the Silva System is given on these columns.

COMPASS ON MAP

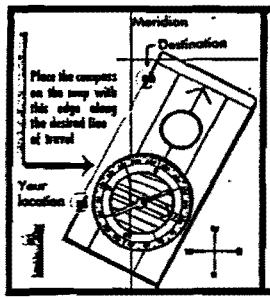


Fig. 6

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COMPASS ON MAP

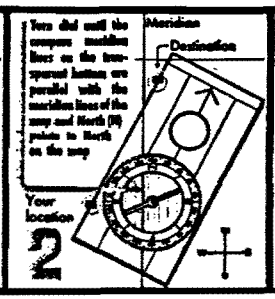

Fig. 7

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COMPASS REMOVED FROM MAP (See fig. 4)

Fig. 8

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MAGNETIC DECLINATION

(Sometimes called magnetic variation) is the angle between True North and Magnetic North. Maps are practically always based on True North which is static (see col. 3). A compass needle which is attracted by the magnetism of the earth, always points to Magnetic North — at least if it is not disturbed by nearby iron or steel objects.

When using the compass, keep it well clear of metallic objects, (knives, photo meters, lighters, even belt buckles); they can cause serious inaccuracies.

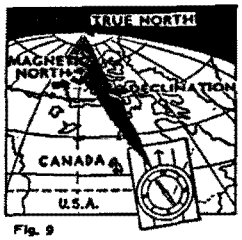

Fig. 9

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The Magnetic North is located in the upper Hudson Bay area (Fig. 9) but moves slightly from year to year. Information about the amount of declination in any area is generally given on the topographic map of this area. If not, you can ask your county surveyor. At any area where your compass needle points East of True North it is "Easterly Declination", and if it points West it is "Westerly Declination". Where True and Magnetic North appear to be the same it is zero line.

ADJUSTING MAP BEARINGS FOR DECLINATION

When the compass is used with a map or in connection with map bearings, an adjustment should be made to allow for the declination. This is especially important if there is considerable declination in your area or if accuracy is quite important. With one turn of the dial you can make the proper allowance for any declination. You must do this every time you wish to apply a declination to a bearing. Here is how:

First find out the amount of declination in your area.
Second, turn the dial as per the following rule:

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FROM MAP TO TERRAIN

Declination West, turn dial West
Declination East, turn dial East

FROM TERRAIN TO MAP

Reverse the steps!

For example, assume your map bearing is 14 degrees (fig. 10) and declination is 10 degrees West. Turn dial West 10 degrees (ADD). It will then read 24 degrees (fig.11)

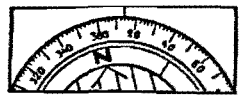

Fig. 10

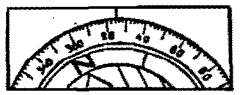

Fig. 11

Conversly, if the declination was shown as 10 degrees East. Turn dial East 10 degrees (SUBTRACT) and it will then read 4 degrees.

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Note. When you have made this allowance for declination you can face or follow an accurate magnetic bearing (see col. 2 and 5).

DECLINATION CAN BE IGNORED

when the compass is used without reference to maps, so that its use is based on field bearings exclusively. Also for rough compass work where accuracy is not too important, especially in areas where the declination is not great.

FIELD BEARING RULES

Working from Terrain to Map is achieved simply by reversing the Map to Terrain rules you have already learned.

TAKING A FIELD BEARING

1. Face the landmark (hill, buildings, etc.) on which you intend taking a bearing, either to plot on your map, or to give you a course to follow.

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2. Hold your compass with the direction of travel arrow pointing to the actual landmark and level enough to permit the needle to swing freely (fig. 4).

3. Turn the dial of the housing — without changing the position of the whole compass — until the orienting arrow in the housing is parallel with the magnetic needle and the red end is pointing to the letter "N" (fig. 8).

4. Now you can read on the dial at the index pointer the magnetic bearing to the actual landmark.

ADJUSTING FIELD BEARINGS FOR DECLINATION

Read again the instructions for adjusting map bearings for declination and do the same, but don't forget to "reverse the step"! That means that for declination West you now turn dial East (SUBTRACT) and for declination East you turn dial West (ADD) the amount of declination degrees. When a proper allowance for declination is made your compass will show the true bearing, and you can use it to plot on the map either the location of the object, which you have determined the bearing to or the location of yourself.

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PLOTTING LOCATIONS

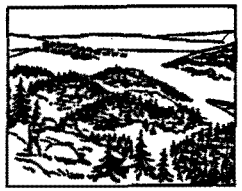

Fig. 12

Assume you want to plot on to your map the spot where you are standing in fig. 12. Your map is fig. 13.

Fig. 13

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A good method for doing this is by means of "cross-bearings" to two previously plotted locations (a re-section). Your first job is to find two spots on the map which you recognize on the terrain. You deduce that the church is in the village of Hollister, and the lake must be Pike Lake. These, then are the chosen two points from which to take crossbearings. Proceed as follows:

1. Take a field bearing to the church and adjust for declination.

2. Put the compass on the map so that either side of the base plate intersects the symbol for the church at Hollister, and while keeping the edge of the compass' base plate on the symbol of the church, turn entire compass on the map until the compass orienting lines are parallel with the meridian lines on the map, and so that the orienting arrow points North on the map (fig. 14).

3. Draw a line on the map along the edge of the compass, intersecting the symbol for the church. Your position is somewhere along this line.

4. To establish your position along this line, you repeat the same procedure, but now you use the North end of Pike Lake as the object for this bearing. When you have drawn the line from Pike Lake you will find your exact position where the two lines cross — hill 815 (fig. 15).

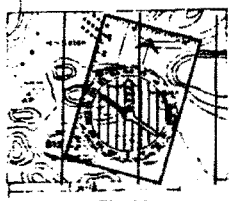

Fig. 14

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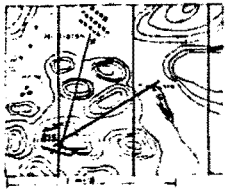

Fig. 15

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MAGNETIC INCLINATION

Important for globetrotters

The directions of the lines of the magnetical force vary from straight vertical at the magn. poles to horizontal only at an irregular line encircling the earth in the neighborhood of the equator. This line is called the magnetic equator (ME).

As a consequence the north end resp; the south end of the magn. needle has a tendency to dip down in the areas between the poles and the ME.

On the SILVA Compasses this tendency is reduced by the fact that the center of gravity is below the pivot point. Furthermore when needed, the needles are counter-balanced for the magn. zone (a latitudinal area of approx. 20° to 40°) within which they are expected to be used.

In case you as a globetrotter need a SILVA Compass balanced for other latitudes, the SILVA retailer or distributor is certainly prepared to advise you how to get it.

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