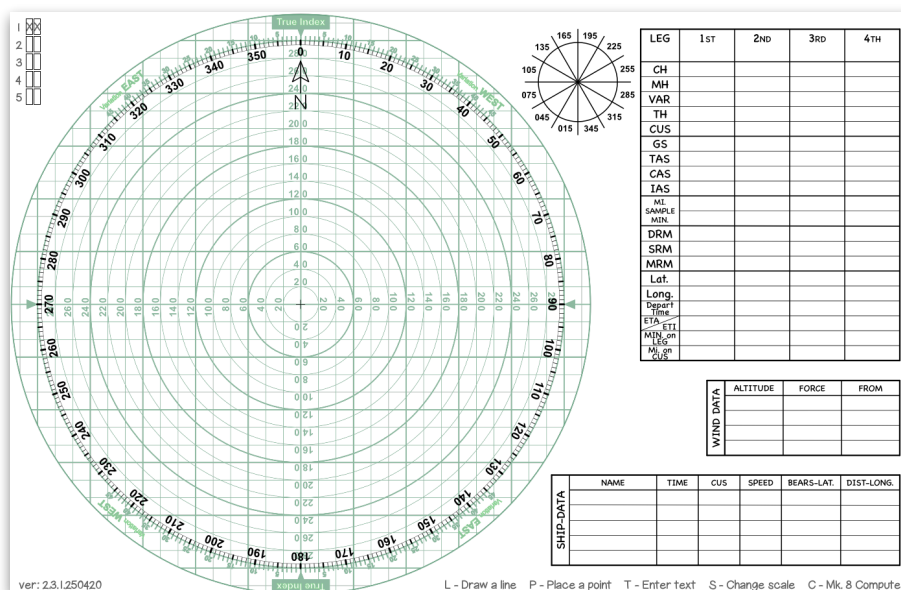
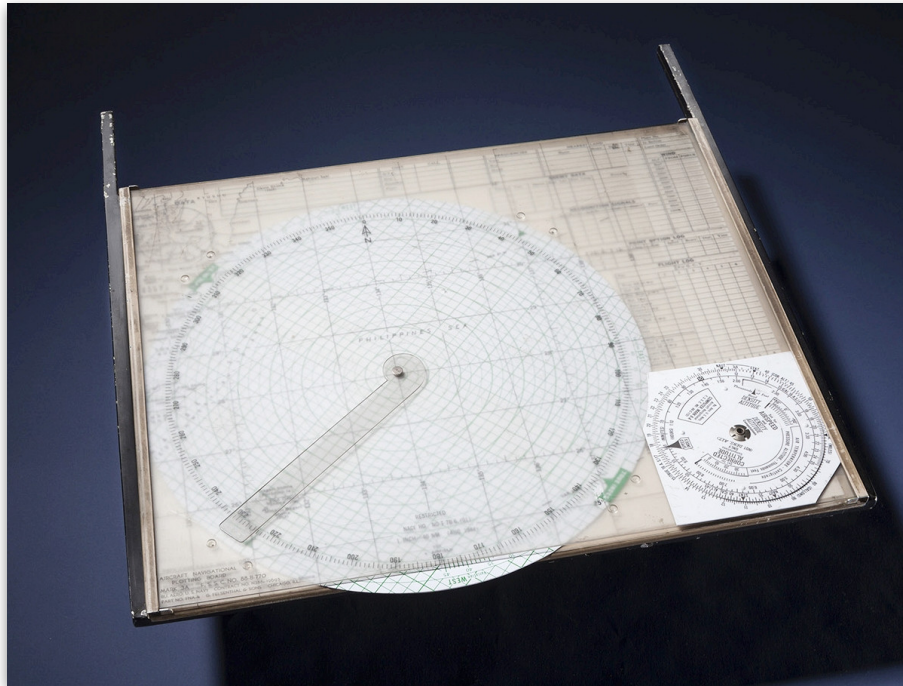


# Plotter ver. 2.3

## A (simple) simulation of a Mk. 3A plotting board.



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## Introduction

The Mk. 3A Plotting board was a ubiquitous navigation tool used by US Naval aviators in WW2. It could be used as a small area plot from which bearings and distances could be measured. It could also solve wind triangle and intercept problems as well as numerous other navigation tasks.

It was mounted to slides underneath the instrument panel and could be pulled out for use during flight.



*Fig 1.  
A Mk. 3A plotting board installed in an aircraft.*

The board also included a Mk. 8 Navigational computer attached to the right lower corner. This was a circular slide rule which could be used to solve time, speed, and distance problems as well as unit conversions and other mathematical problems related to navigation. The actual Mk. 8 also had functions to determine true airspeed, density altitude, and for altitude corrections. Only the true airspeed function is implemented in this program. And it is somewhat experimental.

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## How to Use

When you open the program you will start with a blank plot as in Fig. 2.

The circular area to the left is the plotting area. The tables are for you to keep track of relevant navigation information. They are purely graphical. You cannot click on them or manipulate them in any way.

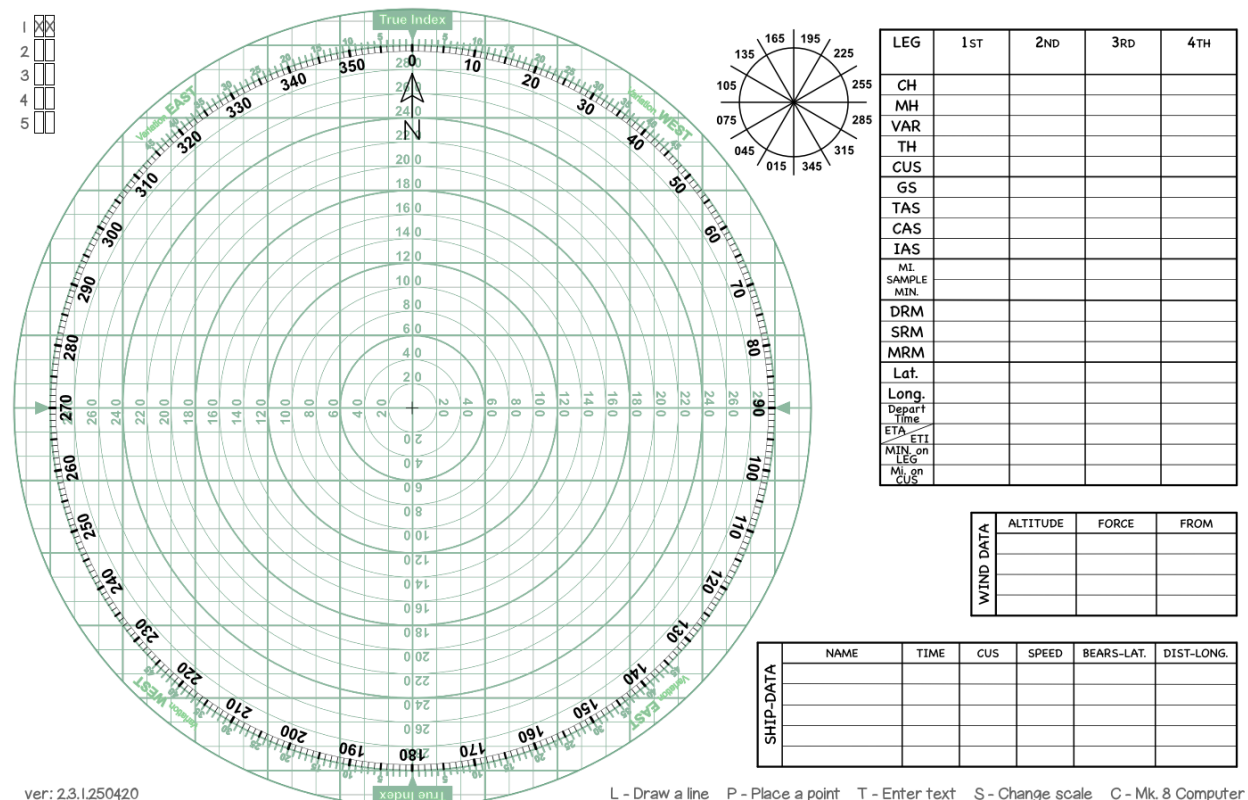


Fig. 2  
A blank Plotter screen.

### ROTATING THE GRAPH

When you are not performing some other action you can rotate the green graph by clicking in the plot area and dragging left or right. Use the index lines on the graph to turn it to a specific angle. This is used for plotting or measuring things with directions such as bearings or headings.

### LAYERS

Although it is not accurate to the physical plotting board I have included the ability to use layers to segregate items belonging to different parts of the plot. For example, one layer may

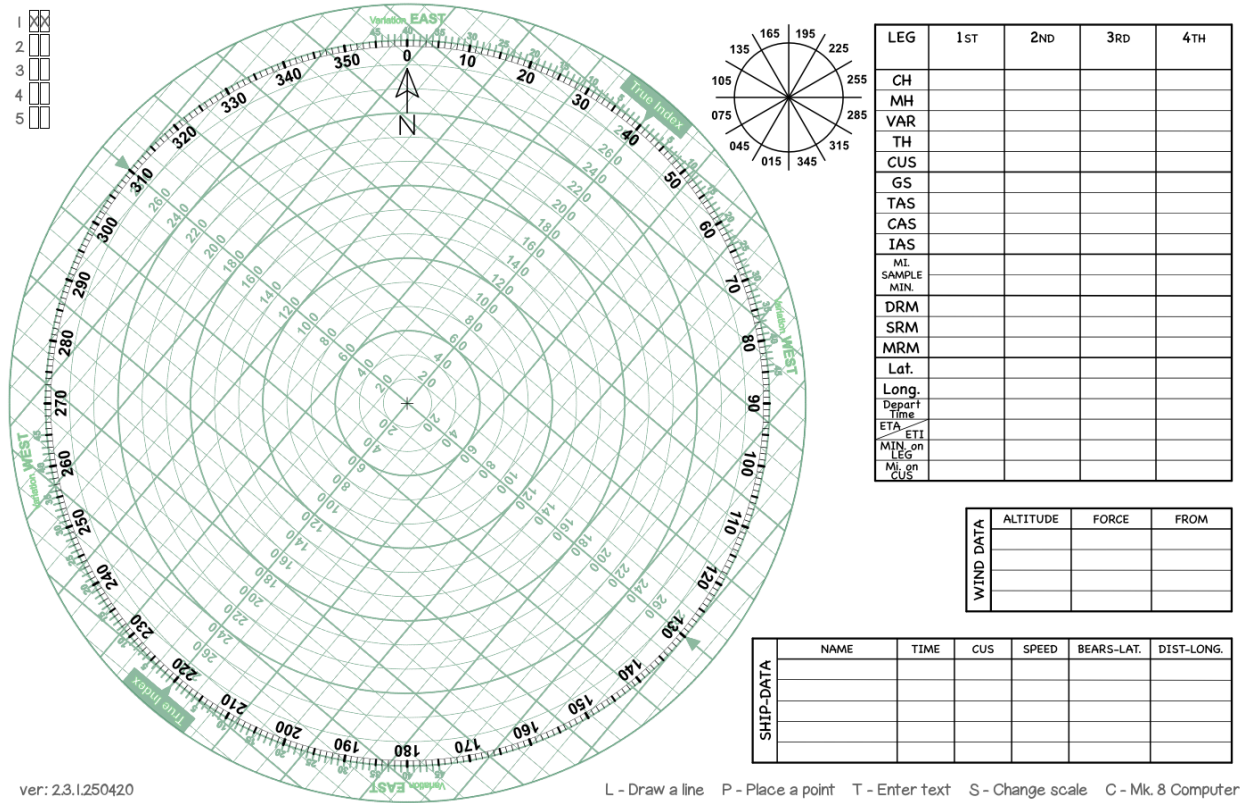


Fig. 3  
The graph rotated 40 degrees.

be used for the small area plot and another for a vector diagram. The screen area of this program is smaller than the actual surface area of the physical plotting board and so it tends to get crowded quickly.



Fig. 4  
The layer controls.

The layers are controlled by clicking on boxes in the upper left of the window (See Fig. 4). Each row represents a layer. On each layer the left box controls whether items drawn on that layer are visible or not. Clicking on a box toggles it on or off.

The right box is the working layer. When you click on one of these boxes the selected layer will become active and any new points, lines, or text that you enter will be associated with this layer. Only one layer can be the working layer at a time. The working layer's associated items are always displayed. When you select a new working layer the other layers will not be visible. You can display the contents of multiple layers by selecting a working layer and then clicking on the left side box for other layers you wish to be visible.

Items drawn outside of the plotting area are not associated with a layer and are always displayed.

## SCALE

The plotter has three scales with radii of 300, 200, and 150 NM.

You can cycle between them by pressing the 'S' key. When you change the scale only the current working layer is affected. That is to say that each layer has scale associated with it which will be selected automatically when that layer becomes the working layer.

If you are displaying the contents of more than one layer with different scales the items will not be adjusted to the scale of the working layer and measurements could be in error.

When using the plot to measure distances the result will be in nautical miles so the natural speed units to use are knots. Keep this in mind when flying a plane with the airspeed indicator calibrated in MPH.

## PLOTTING POINTS

Points are useful when using the plotter as a small area plot to indicate specific locations. They are drawn as a dot with a small surrounding circle.

To place a point press the 'P' key on the keyboard and the mouse cursor will change to crosshairs. Put the crosshairs where you want the point and click to place it.

You can cancel placing a point by pressing ESC

## DRAWING LINES

Lines are used for vectors, such as wind speed and direction, or headings.

To draw a line press the 'L' key on the keyboard and the cursor will be replaced with crosshairs as when placing points. Move the crosshairs to the beginning of the desired line and click and drag to the end of the line and release the mouse button. You can also click on the starting point and then click on the end point without holding down the mouse button as you move the cursor. As with points you can cancel by pressing ESC.



## ENTERING TEXT

Text can be used to label points on the graph or to enter data in the tables. To enter text press the 'T' key. Then, enter your text which will show near the cursor. Once your text has been entered use the mouse to move the text to your desired location and click to place it.

You can enter the degree symbol (°) by pressing CTRL-0 (CONTROL and ZERO).

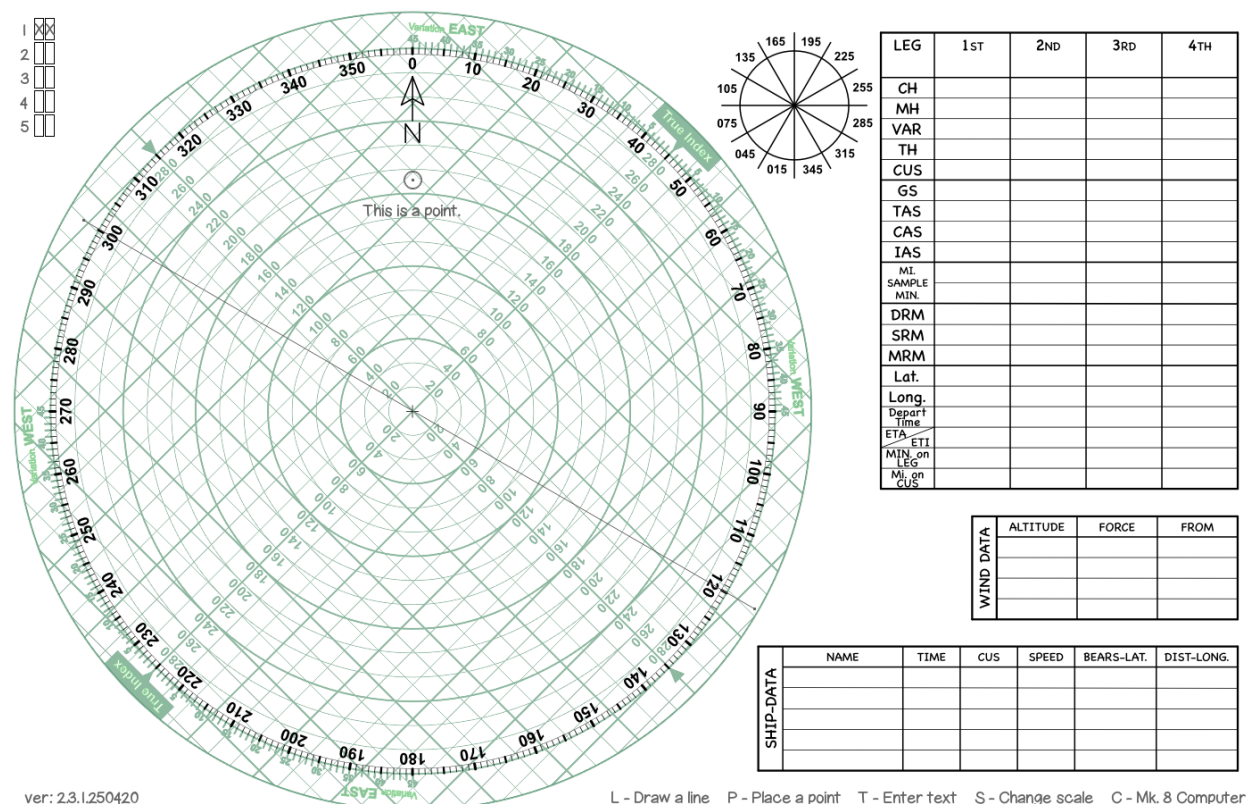


Fig. 5

The plot rotated to 45° with a line, a point, and some text.

## DELETING ITEMS

Points, lines and text can be deleted. To delete an item right-click on it to select it. The selected item will be displayed in red. Once you right-click the item nearest to the pointer will be selected. If you want to select a different item you can use the arrow keys or the left and right square bracket keys to move through the list of items in order of distance from the point you clicked. Repeatedly right clicking will also step through the visible items. Only items which are currently being displayed can be selected.

Once you've selected the correct item you can press the DELETE key or the 'D' key to delete. If you change your mind and do not want to delete anything press ESCAPE to cancel.

## SAVING AND OPENING

A plot can be saved by pressing CTRL-S (CMD-S on a Mac). If the plot has been saved already, or if it was opened from a file it will save silently. If it is a new plot which has not been previously saved a file dialog will open to allow you to select a path and a file name. If the plot has been saved previously and you want to select a new path or file name use SHIFT-CTRL-S.

Once saved a plot file can be opened by pressing CTRL-O (or CMD-O in a Mac).

If you exit the program and the plot has been modified since it was opened a dialog will appear to allow you to save the file before closing the program.

## MARK 8 COMPUTER

The Mk. 8 calculator can be opened (and closed) by tapping the 'C' key. It will appear over the graph area as in Fig. 6. To use it click in the area of the inner ring and drag left or right to turn it to the desired position. There is some acceleration in its movement, the further you drag your mouse the faster the ring turns. For precise positioning it is easier to get near the correct

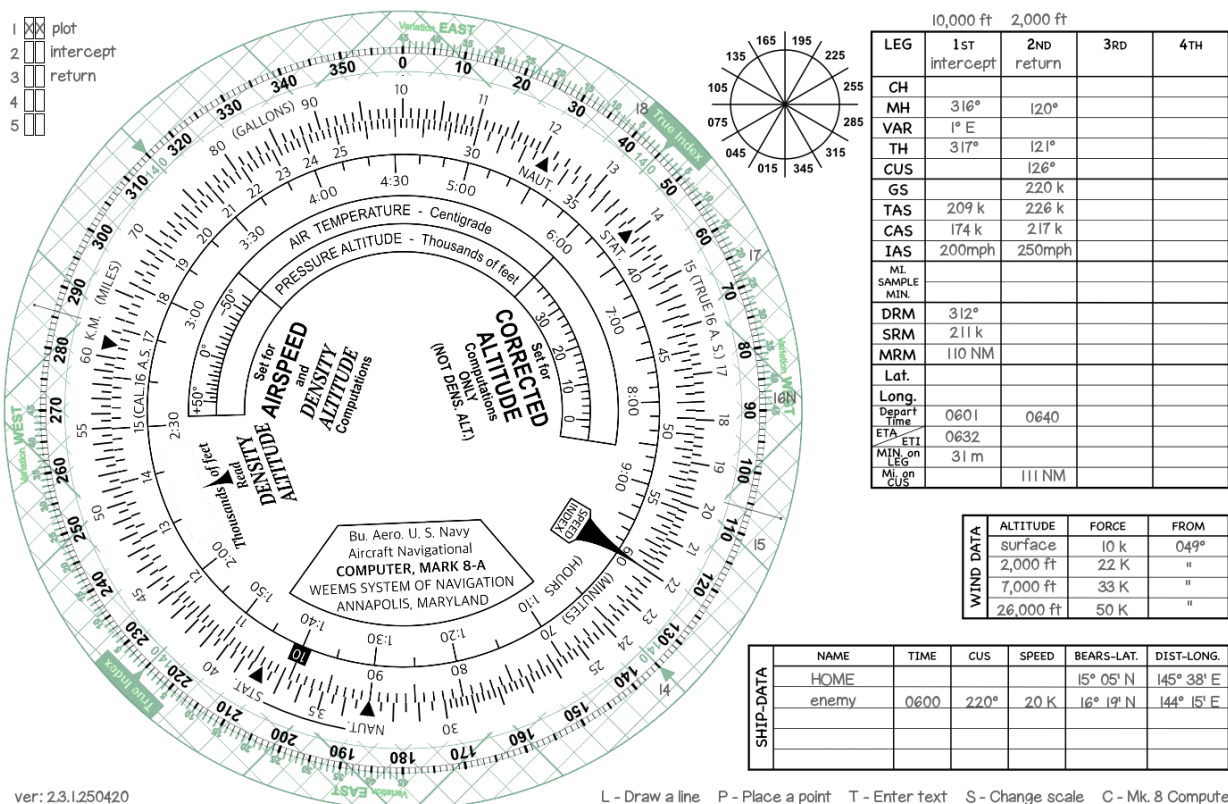


Fig. 6  
A plot with the Mk. 8 computer open.

position and then to release the mouse button and then click again and only move it a small distance.

You cannot create new lines or points with the calculator open but you can add text the the area outside of the plot area. You cannot delete items with the calculator open.

Instructions for using the calculator are WAY beyond the scope of this document. It functions very similarly to E6B calculators and instructions for these are readily available on the web.

## SAVING AN IMAGE

An image of the current plot can be saved by pressing CTRL-I (or CMD-I). By default the image is saved in .png format.

## MAP

There is a map of the Marianas islands available for display. You can toggle it on and off with the 'M' key. The map adjusts for the currently selected scale but you must use a graph center point of 15° N, 145° E for the map to be correctly placed with regards to latitude and longitude.

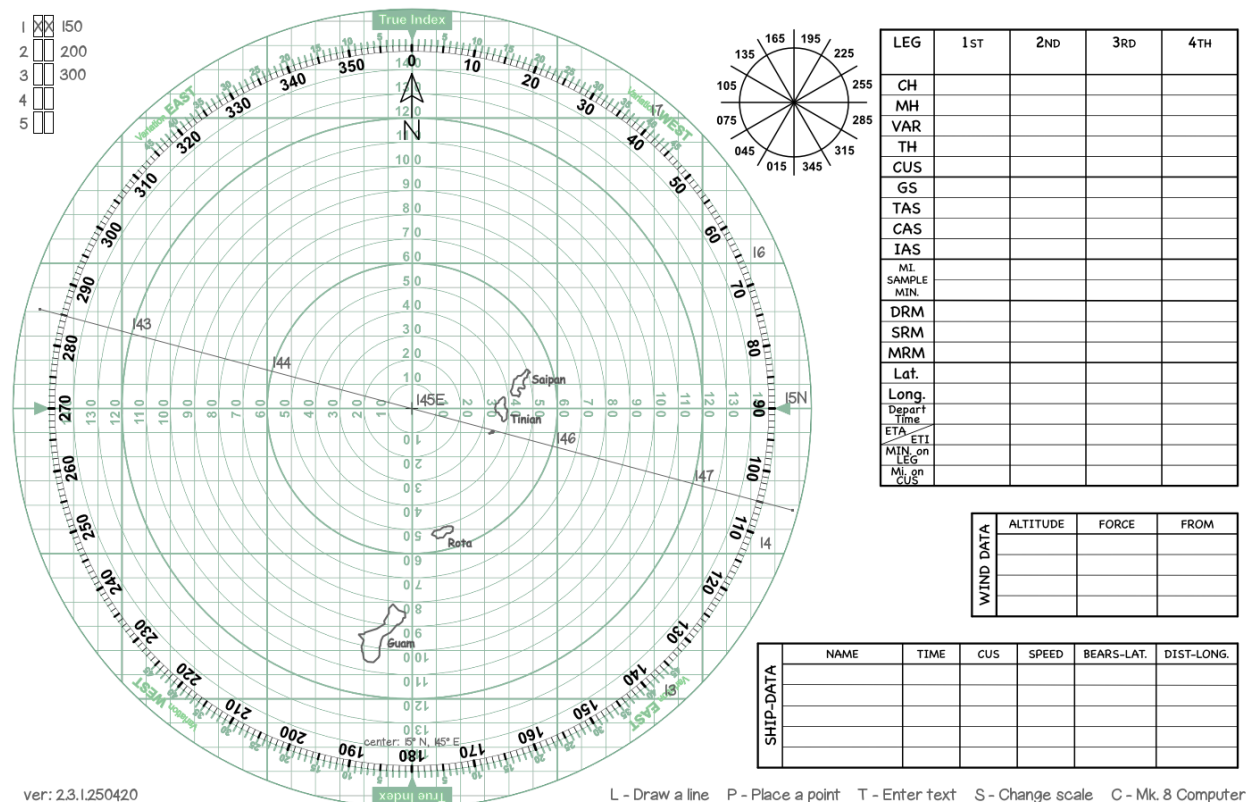


Fig. 7  
A plot with the map visible.



If you would like to use the map more as a 'spider plot' it can be repositioned. Tap the 'X' key and then click and drag the map to your new desired location. You can return the map to its default position with CTRL-X (CMD-X on a Mac).

Whether the map is displayed or not and its location is saved per sheet. So you can have the map displayed on one sheet, say for a small area plot, but not on another which is being used for a vector diagram. You can also have maps with different center positions on different sheets.

## BOLD LINES

Plotter uses thin lines and circles by default. If you want to make them darker and more clearly visible you can use the 'B' key to toggle between bold and normal mode. Bold mode will reduce precision somewhat.

## CALIPERS

You can bring up a series of parallel lines by pressing the 'H' key. The center line is composed of two, closely spaced, lines to make it identifiable.

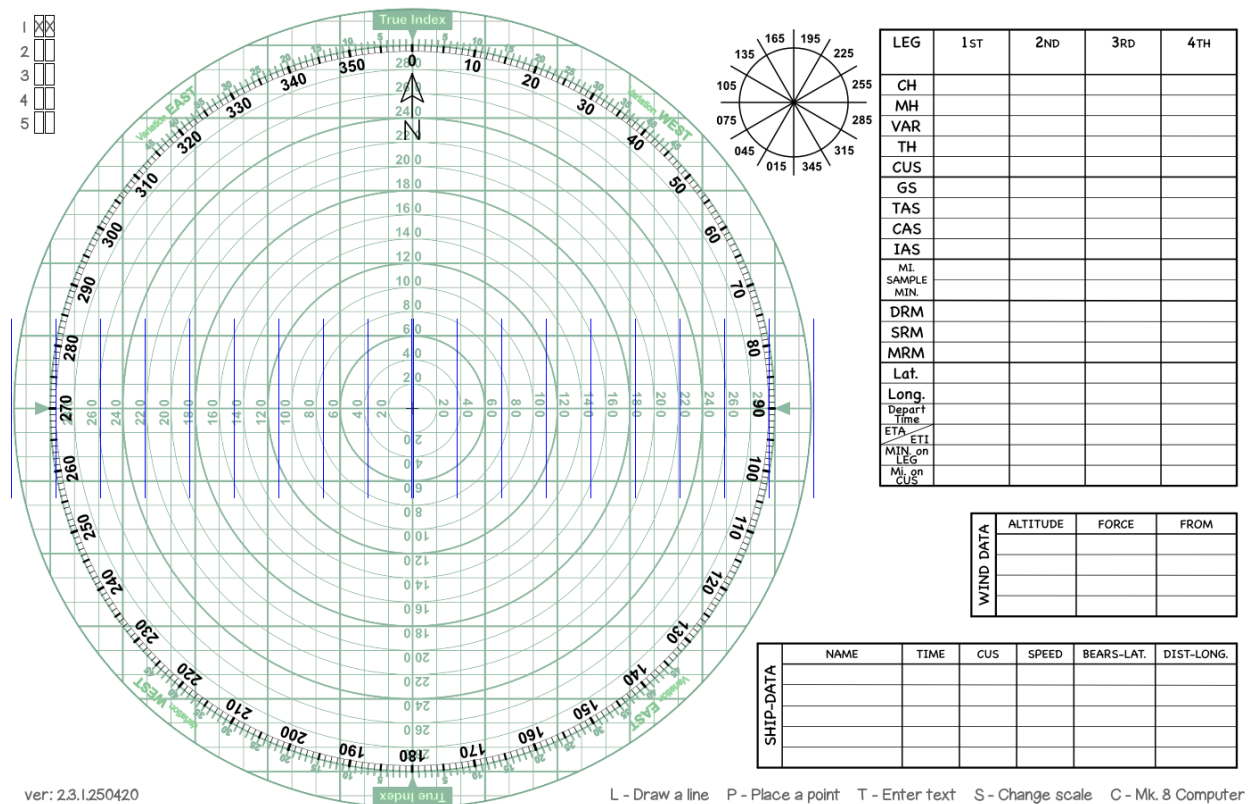


Fig. 8  
A blank plot with calipers.

The calipers will rotate with the plot as in Fig. 9.

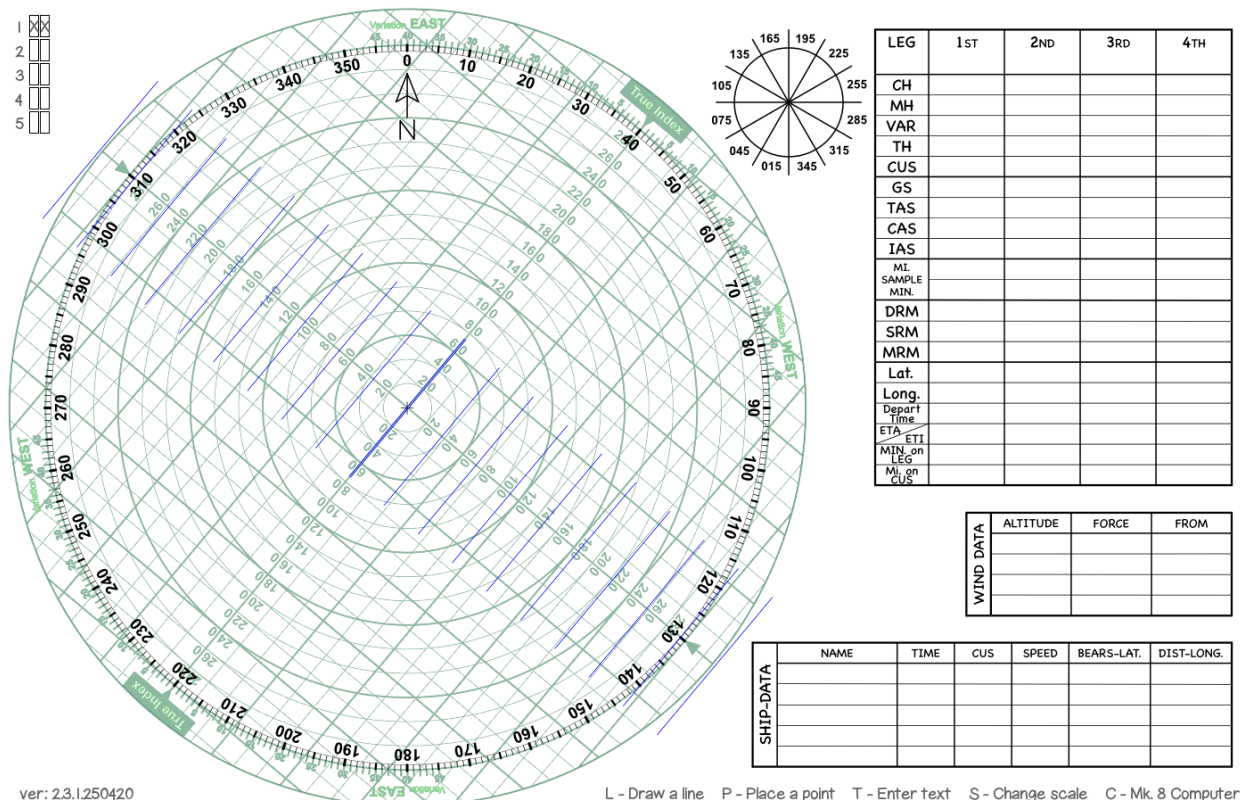


Fig. 9  
Plot with calipers rotated to 40°.

The spacing between the lines can be adjusted by tapping the 'J' key and then clicking and dragging left, to decrease the spacing, or right, to increase the spacing. They can be repositioned by pressing the 'G' key and then clicking and dragging them to a new position. Pressing CTRL-G (CMD-G) will return the calipers to their starting position.

The length of the caliper lines can be increased or decreased with the arrow keys or with the left and right square brackets.

While the calipers can be used to mark off a distance for measurement I don't find this very useful. It adds extra work for no real gain in measurement accuracy in my experience. Their main utility is when making a plot at a high or low latitude. When you draw the cross line for measuring longitudes it does not extend completely across the graph. So items located on the left or right edges are difficult to place.

Using the calipers you can mark off a regular interval consistent with the longitude spacing allowing you to place these difficult items. See figure 10 for an example.

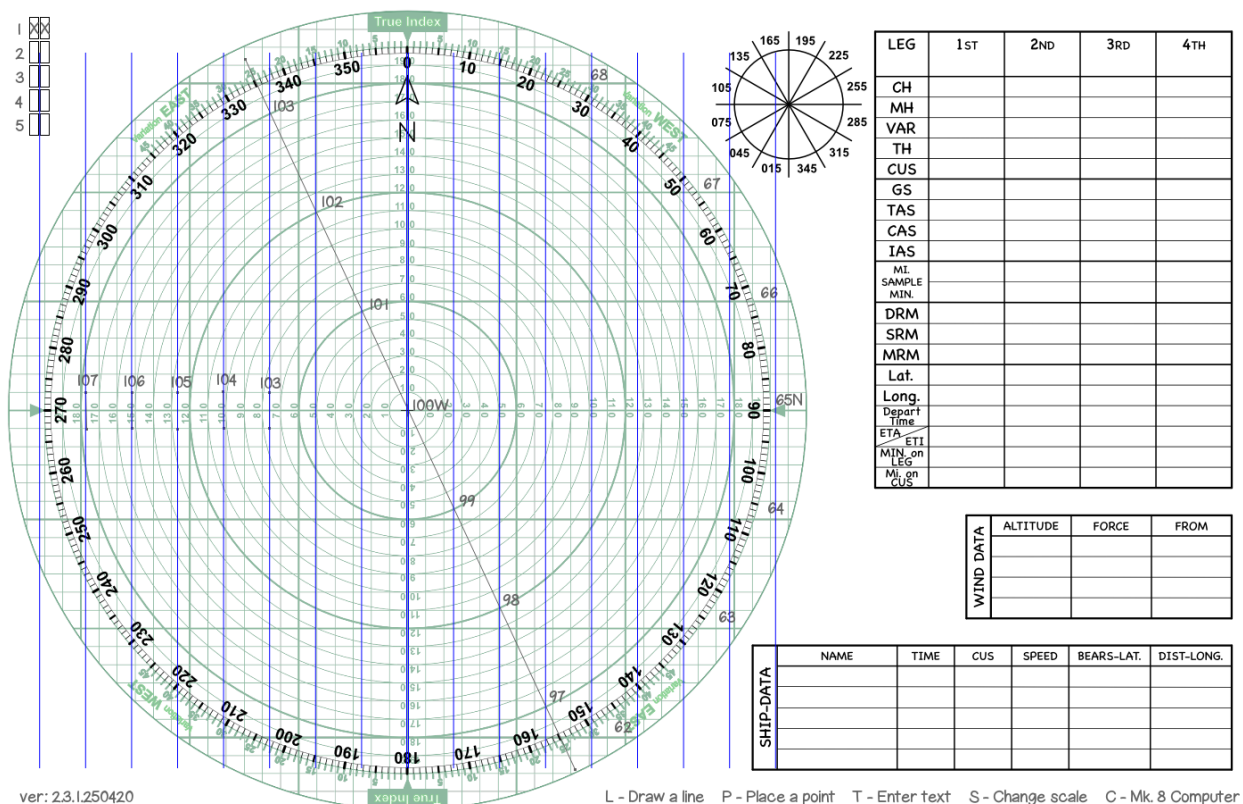


Fig. 10  
Calipers used to mark off longitude at 65° latitude.

## CLEARING DATA

Items can be deleted as a group. Press CTRL-C (CMD-C) followed by CTRL-P to delete all visible items on the plot, or CTRL-S to delete all visible items on the screen (i.e. the plot and the data area). In both cases items which are not currently displayed will not be deleted. Pressing any key other than CTRL-P or CTRL-S will cancel the operation.

