CUSTOM GRAPH AXES WITH PROC G PLOT

Dale B. Peart, U.S. Geological Survey

ABSTRACT

Graphs for some technical publications are required to be in a certain format. In cases where HAXIS and VAXIS options are specified, complete control of ticks, axes, and labels for graphs can be achieved by using the NOAXES option of the PLOT statement, and MOVE and DRAW options of one or more NOTE statements. The SAS-code used to create left and right vertical axes, top and bottom horizontal axes, ticks inside the axes, and custom tick labels is explained. With this information, the user then can select from all available TITLE and FOOTNOTE options to customize the axes on SAS/GRAPH! plots.

Occasionally, after specifying ‘HAXIS’, SAS/GRAPH will displace the rightmost tick label to the left as if there was not enough room to center it below the tick. The HPOS option of the GOPTIONS statement and the HSPACE option of the PLOT statement can be used to solve this problem.

INTRODUCTION

Using SAS/GRAPH to display data in various ways generally is a very simple matter. PROC G PLOT offers many options to customize graphs in a variety of ways. However, it does not contain some features that are desirable in certain circumstances that would allow the user to easily control some aspects of the resultant graph. By utilizing the NOAXES or HSPACE options of the PLOT statement, the HPOS option of the GOPTIONS statement and move (.M) and draw (.D=) options of NOTE statements, the SAS programmer can achieve complete control of every aspect of the axes on the resultant graph.

DISCUSSION

Occasionally, SAS/GRAPH will be unable, or at least "think" it is unable, to center the rightmost tick label on the horizontal axis beneath the tick. This problem is demonstrated in figure 1 using SAS 79.6. Using SAS release 82.3, some improvement of the problem is realized (fig. 2), but the problem remains. All figures for this paper were generated using a Tektronix 4662 plotter. Figures 1 and 2 used the following code:

```
MACRO G PLOTS:
   DATA PeOT:
   INPUT NSD DAE DATE.;
   FORMAT DATE OC1£.
   CARDS:
      0    JAN83
      1.3  FEB83
      -2.5  MAR83
      4  APR83
   GOPTIONS OEV:TE=TEK4662 HSIZE=9 VSIZE=6.
   NOCHARACTERS.
   PROC G PLOT;
   PLOT NSD~DATE
   GPL TOPTS;
   TITLE 1H=9.F=SIMPLEX .A=90 'NOMINAL STANDARD DEVIATION';
   TITLE 2H=.9F=SIMPLEX .A=90 'FROM THEORETICAL VALUE';
   NOTE H=.9F=SIMPLEX .A=90 'HPOS=DEFAULT. HSPACE=DEFAULT';
   NOTE H=.9F=SIMPLEX .A=90 'HPOS=DEFAULT. HSPACE=DEFAULT';
```

Figure 1. Plot showing shifted tick label using SAS 79.6

Figure 2. Plot showing shifted tick label using SAS 82.3.

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Note that the default settings were used for HPOS and HSPACE, therefore SAS chose where to place the ticks and associated labels.
This problem is relatively easy to correct and usually can be done in one of two ways: First, decrease the number of character units between ticks with the HSPACE option of the PLOT statement (Fig. 3). HSPACE=14 was added to the previous code as an option in the PLOT statement. This produces an acceptable graph, but may not always be appropriate because the data is slightly more crowded. The second solution is to increase the number of character units available to the plotter by adding HPOS=75 to the GOPTIONS statement (Fig. 4). The default HPOS value for this plotter is 73.

![Figure 3. Plot showing correct alignment of tick label using HSPACE option.](image)

Figure 3. Plot showing correct alignment of tick label using HSPACE option.

![Figure 4. Plot showing correct alignment of tick label using HPOS option.](image)

Figure 4. Plot showing correct alignment of tick label using HPOS option.

Problems created by particular publication requirements may not always be solvable with a few simple SAS/GRAPH statements. In particular, if the data area of the graph needs to be enclosed, it is necessary at this time to use the DRAW(.D=) option of a NOTE, TITLE, or FOOTNOTE statement. If the HAXIS and VAXIS options have been specified, and HPOS and VPOS stay constant, the coordinates for the endpoints of the x and y axes will be constant regardless of the data to be plotted. In this situation, many graphs can be plotted together with one set of instructions to handle the special publication requirements. By estimating coordinates based on previous experience with similar graphs or by creating a grid based on the current settings for the plotter, one can determine the points at which the default x and y axes terminate. It is important to note that vertical lines are drawn at the left edge, and horizontal lines are drawn at the bottom edge of each character unit when the coordinates are given in whole numbers. Thus, if the x-axis terminates in character unit (69,9) as is true in figure 4, the coordinates necessary to begin the vertical line for the righthand y-axis are (70,9). Relative coordinates (those with + or - signs) are used from that point on to draw the required lines for the righthand y-axis and the top x-axis.

![Figure 5. Plot showing enclosed data area with default axes and labels.](image)

Figure 5. Plot showing enclosed data area with default axes and labels.

This produces a plot that defines all sides of the data area on the graph, which may or may not satisfy all the publication requirements.

It may be a requirement that the ticks be inside the axes and also that they be included on both sets of axes. SAS/GRAPH does not provide this option at this time; however, it can be accomplished by using the NOAXES option of the PLOT statement and MOVE and DRAW options of a few NOTE statements. In visualizing the resultant graph, if the y-axes are drawn in the same position as SAS/GRAPH drew them, the ticks at -6 on the y-axis and both the December and April ticks on the x-axis will form a small box in
their respective corners. This would be unacceptable as well as confusing. This problem is eliminated by moving the y-axes one-half character unit toward the center of the graph. This eliminates the small area between the y-axes and the data area but will not eliminate any data points. The y-axes are now congruent with the outermost ticks. Because the coordinates for drawing the right and top axes already have been determined, it is simple to change the x-coordinate by one-half unit, to move the y-axis, and complete the box with the addition of a few more relative coordinates to the existing NOTE statement. The position of the lower x-axis was not changed; leaving the one-half character-unit buffer in place.

From the previous work with HSPACE (fig 2) the default value is known to be 15. The coordinates for the ticks on the x and y axes can now be calculated. Similarly, the positions for the tick labels also can be calculated. It again is important to remember that the horizontal lines drawn with the DRANK(D) option are placed at the bottom of the character unit specified. This means that ticks on the y-axis will have y coordinates of the corresponding label, if the label is to be centered next to the tick. It also is important to realize that the first set of coordinates in any .D option is a dark vector (one that will not be drawn). Thus, a separate .D option is needed for each tick to prevent them joining with diagonal lines. The resultant code and figure (fig. 6) follow.

**REFERENCES**


**CONTACT**

Dale B. Peart
USGS WRD
Box 25046, MS412
Denver, CO 80225
(303) 234-4175

**SUMMARY**

By using the NOAXES or HSPACE options of the PLOT statement, the HPOS and VPOS options of the GOPTIONS statement, and move(.M) and draw(.D) commands, many different specific publication requirements can be met with relative ease. In addition, graphs can be customized for the individual user by using any of the options available in the TITLE, NOTE, or FOOTNOTE statements. For example, using the NOAXES option to eliminate the default axes, labels and ticks; NOTE statements can be used with move and draw commands to draw new axes, place ticks in the appropriate places, and label the axes. With this approach, the programmer is not limited to the default type style for axes labelling, but can now use any type style that may be desirable or appropriate.