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What's New in SAS ODS Graphics Procedures 9.3

Overview

The *SAS ODS Graphics: Procedures Guide* contains new information explaining how styles are applied to graphs that are grouped and non-grouped.

The second edition added a new introductory section. The new introduction includes a detailed description of a typical program and an example of each supported plot type.

In addition, the procedures have the following changes and enhancements for SAS 9.3:

- inclusion with Base SAS and name change
- changes to the default ODS output
- new plot statements are available for the SGPLOT and SGPANEL procedures.
- new options and enhancements are available for the PROC SGPLOT, PROC SGPANEL, and PROC SGSCATTER statements.
- new options and enhancements are available for the existing plot statements in the SGPLOT and SGPANEL procedures.
- new options and enhancements are available for the axis statements in the SGPLOT and SGPANEL procedures.
- new options and enhancements are available for the SGRENDER procedure.
- enhancements are available for the SGDESIGN procedure.
- a new attribute map feature provides a mechanism for controlling the visual attributes that are applied to specific group data values in your graphs.
- a new annotation feature provides a mechanism for adding shapes, images, and annotations to graph output.

ODS Graphics Procedures Are Included with Base SAS

The ODS Graphics procedures, formerly called SAS/GRAPH Statistical Graphics procedures, are now available with Base SAS software. SAS/GRAPH software is not required in order to use the procedures.

*Note:* The ODS Graphics Designer, ODS Graphics Editor, and Graph Template Language have also moved to Base SAS.
Changes to the Default ODS Output

In Windows and UNIX operating environments, when the ODS Graphics procedures are executed in the SAS Windowing environment, the default behavior has changed as follows:

- HTML is the default ODS destination. If you close this destination and do not open another destination, then no destinations are open.
- HTMLBlue is the default style for the HTML destination. You can change this default style in the SAS Preferences.
- Graphs are no longer saved in the SAS current directory by default. They are saved in the directory that corresponds to your SAS Work library. You can specify a different directory in the SAS Preferences.

These changes do not apply when the procedures are run in batch mode. In addition, the z/OS operating environment continues to use the ODS LISTING destination as the default destination.

To create LISTING output, do one of the following:

- Specify LISTING in the Results tab in the SAS Preferences.
- Add the ODS LISTING statement to your SAS program.

New Plot Statements for the SGPLOT and SGPANEL Procedures

**BUBBLE Statement**

A new BUBBLE statement creates a bubble plot in which two variables determine the location of the bubble centers and a third variable controls the size of the bubble.

**HBARPARM and VBARPARM Statements**

New HBARPARM and VBARPARM statements create a horizontal or vertical bar chart based on a pre-summarized response value for each unique value of the category variable. You can also assign variables to the upper and lower limits.

**HIGHLOW Statement**

A new HIGHLOW statement creates a display of floating vertical or horizontal lines or bars that represent high and low values. The statement also gives you the option to display open and close values as tick marks and to specify a variety of plot attributes.
**LINEPARM Statement**

A new LINEPARM statement creates a straight line specified by a point and a slope. You can generate a single line by specifying a constant for each required argument. You can generate multiple lines by specifying a numeric variable for any or all required arguments.

**WATERFALL Statement (SGPLOT Only, Preproduction)**

A new WATERFALL statement creates a waterfall chart computed from input data. In the chart, bars represent an initial value of Y and a series of intermediate values identified by X leading to a final value of Y.

---

**Updates to the PROC SGPLOT, PROC SGPANEL, and PROC SGSCATTER Statements**

All three procedure statements include the following new options:

- The DATTRMAP= option specifies an SG attribute map data set.
- The SGANNO= option specifies an SG annotation data set.
- The PAD= option reserves space around the border of an annotated graph.

The UNIFORM= option in the SGPLOT procedure enables you to control axis scaling and legend marker attributes for the row and column axes independently.

---

**Updates to Plot Statements in the SGPLOT and SGPANEL Procedures**

**General Updates**

The following options and enhancements have been added to multiple plot statements:

- The ATTRID= option specifies the value of the ID variable in an attribute map data set. (This option is also used with the SGSCATTER procedure.)
- The CATEGORYORDER= option specifies the order in which the response values are arranged. This option affects bar charts, line plots, and dot plots.
- The CLIATTRS= and CLMATTRS= options now enable you to specify line attributes and fill attributes for confidence limits.
- The CURVELABELATTRS= and DATALABELATTRS= options specify options for setting text attributes for plot curves and labels.
- The DISCRETEOFFSET= option specifies an amount to offset graph elements from the category midpoints or from the discrete axis tick marks. This option affects bar charts, box plots.
• The following are new options for grouped data (using the GROUP= option):
  • The CLUSTERWIDTH= option specifies the cluster width as a ratio of the midpoint spacing when a group is in effect. This option affects any plot that can have a discrete axis.
  • The GROUPDISPLAY= option specifies how to display grouped graphics elements. This option affects any plot that can have a discrete axis. (The option is not available for the HBARPARM and VBARPARM statements.)
  • The GROUPORDER= option specifies the ordering of graph elements within a group. This option affects any plot that can have a discrete axis.

**BAND Statement**

The following options and enhancements are specific to the BAND statement:

• The CURVELABELLOWER= and CURVELABELUPPER= options specify labels for the plot’s upper and lower limits.
• The TYPE= option specifies whether the data points for the band boundaries are connected as a series plot or as a step plot.

**HBAR and VBAR Statements**

The following options and enhancements are specific to the HBAR and VBAR statements:

• The DATALABEL= option now enables you to specify a variable that contains values for the data labels.
• The DATASKIN= option specifies a special effect to be used on all filled bars.
• Some SAS styles display fill patterns for grouped bars.

*Note:* These options are also available with the new HBARPARM and VBARPARM statements. The DATALABEL and DATASKIN options are available with the new WATERFALL statement.

The VBAR and VBARPARM statements in the SGPLOT procedure have a DATALABELPOS= option, which specifies the location of the data label.

**HBOX and VBOX Statements**

The following options and enhancements are specific to the HBOX and VBOX statements:

• The CAPSHAPE= option specifies the shape of the whisker cap lines.
• The CONNECT= option specifies that a connect line joins a statistic from box to box.
• Boxes can be grouped. In addition to the GROUP= option, the GROUPDISPLAY= and GROUPORDER= options are available.
• The NOTCHES option shows the notches.
• The NOMEAN option hides the mean symbol.
• The NOMEDIAN option hides the median line.
• The NOOUTLIERS option hides the outliers.
• You can specify appearance attributes for these elements:
  • connect lines
  • data labels
  • box fills and lines
  • mean markers, median lines, outlier markers, and whisker and cap lines

**HISTOGRAM Statement**

The HISTOGRAM statement provides greater control over bins with the following options:

• BINSTART= specifies the X coordinate of the first bin.
• BINWIDTH= specifies the bin width.
• NBINS= specifies the number of bins.

**INSET and KEYLEGEND Statements**

The INSET and KEYLEGEND statements enable you to change text attributes with the following options:

• The TITLEATTRS= and TEXTATTRS= options in the INSET statement. The INSET statement applies to the SGPLOT procedure only.
• The TITLEATTRS= and VALUEATTRS= options in the KEYLEGEND statement

**VLINE Statement**

The VLINE statement in the SGPLOT procedure has a DATALABELPOS= option, which specifies the location of the data label.

---

**Axis Updates for the SGPANEL and SGPlot Procedures**

**Axis Updates for the SGPlot Procedure**

The XAXIS, X2AXIS, YAXIS, and Y2AXIS statements support several enhancements and new options:

• New LABELATTRS and VALUEATTRS options specify textual attributes for axis labels and axis tick value labels, respectively.
• A new REVERSE option specifies that the tick values are displayed in reverse (descending) order.
• New THRESHOLDMAX and THRESHOLDMIN options specify a threshold for displaying one more tick mark at the high end and the low end of the axis, respectively.
Axis Updates for the SGPANEL Procedure

The COLAXIS and ROWAXIS statements support several enhancements and new options:

- The same updates are supported as listed in “Axis Updates for the SGPLOT Procedure”.
- The REFTICKS option enables you to specify whether labels and values are added to the tick marks. (This option adds tick marks to the side of the panel that is opposite from the specified axis.)

Updates to the SGRENDER Procedure

You can use the SGRENDER procedure to render a graph from a SAS ODS Graphics Editor (SGE) file.

Updates to the SGDESIGN Procedure

The SGDESIGN procedure is supported on z/OS systems. However, the following limitations apply:

- The procedure does not render SGD files that were generated with the previous release of the ODS Graphics Designer. You must open the SGD file in the 9.3 version of the ODS Graphics Designer (on a Windows or UNIX system). Then save the file in the 9.3 format.
- SGD files must be transferred to the HFS file system of UNIX System Services in order to be rendered.

New Attribute Mapping Feature

A new attribute map feature provides a mechanism for controlling the visual attributes that are applied to specific group data values in your graphs. This feature uses SG attribute map data sets to associate data values with visual attributes. The data set uses reserved variable names for the attribute map identifier, the group value, and the attributes.

You can use attribute maps in the SGPLOT, SGPANEL, and SGSCATTER procedures. The procedure statement references the name of the SG attribute map data set, and plot statements specify the group and the attribute map identifier.
New Annotation Feature

A new annotation feature provides a mechanism for adding shapes, images, and annotations to graph output. For example, you can add text labels, lines, circles, rectangles, polygons, and images. This feature uses SG attribute data sets, which contain the commands for creating the annotation elements. The data set uses reserved variable names for the draw function and the attributes that control how the function is performed.

You can use annotation in the SGPLOT, SGPANEL, and SGSCATTER procedures. The procedure statement references the name of the SG annotation data set.
Recommended Reading

• SAS ODS Graphics: Getting Started with Business and Statistical Graphics
• Statistical Graphics Procedures by Example: Effective Graphs Using SAS
• Statistical Graphics in SAS: An Introduction to the Graph Template Language and the Statistical Graphics Procedures
• SAS Graph Template Language: User's Guide
• SAS Graph Template Language: Reference
• SAS Output Delivery System: User's Guide
• Output Delivery System: The Basics and Beyond
• Quick Results with the Output Delivery System

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Recommended Reading
Part 1

Introduction

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About the SAS ODS Graphics Procedures

The ODS Graphics procedures, sometimes called ODS Statistical Graphics procedures, use ODS Graphics functionality to produce plots for exploratory data analysis and for customized statistical displays. The procedures provide a simple, high-level syntax that enables you to produce sophisticated graphs by using a wide array of plot types and layouts. You can create scatter plots, histograms, bar charts, box plots, classification panels, scatter plot matrices, and many other types of statistical and business graphs. Your graphs can have titles, footnotes, legends, and other graphics elements.

The procedures support statistical analysis and can create simple or complex graphical views of your data. Though the procedures were initially designed to facilitate the production of standard statistical graphs, they are also well suited for the production of non-statistical or business graphs.

The ODS Graphics procedures create graphs that are based on the Graph Template Language (GTL). However, you do not need to know the details of templates and the GTL in order to use the ODS Graphics procedures. With very little coding effort, you can use the procedures to create the most commonly used graphs that are supported by the GTL.
There are five ODS Graphics procedures, each with a specific purpose:

**SGPLOT**
creates single-cell plots with a variety of plot and chart types and overlays.

**SGPANEL**
creates classification panels for one or more classification variables. Each graph cell in the panel can contain either a simple plot or multiple, overlaid plots.

*Note:* The SGPLOT and SGPANEL procedures largely support the same types of plots and charts. For this reason, the two procedures have an almost identical syntax. The main distinction between the two procedures is that the SGPANEL procedure produces a matrix of graphs, one for each level of a classification variable.

**SGSCATTER**
creates scatter plots and scatter plot matrices with optional fits and ellipses.

**SGRENDER**
produces graphs from graph templates that are written in the GTL. You can also render a graph from a SAS ODS Graphics Editor (SGE) file.

**SGDESIGN**
creates graphical output based on a graph file that has been created by using the ODS Graphics Designer application.

An ODS destination must be open to create output from these procedures. By default, the ODS HTML destination is open. You can use the ODS destination options and the ODS GRAPHICS statement options to control many aspects of your graph output. For more information, see Chapter 14, “Managing Your Graphics with ODS,” on page 649.

The procedures have two facilities that enable you to modify graph output:

- The SG annotation feature enables you to add shapes, images, and other annotations to graph output.
- SG attribute maps enable you to control the visual attributes that are applied to specific data values in your graphs. For example, if you create a graph that plots items sold in different countries, you can specify the display attributes for the sales data of each country by name. Attribute maps enable you to ensure that particular visual attributes are applied based on the value of the data rather than the position of the data in the data set.

The ODS Graphics procedures enable you to create complex statistical graphics that use the principles of effective graphics\(^1\) to accurately communicate the results of your analysis to your consumers. The minimal coding required enables you to focus on your statistical analysis instead of the visual appearance of your graphs.

**See Also**

- “Overview of ODS Graphics Software” on page 665
- *SAS Graph Template Language: User’s Guide*

---

\(^1\) For more information about the principles of effective graphics, see Cleveland (1993) and Robbins (2005).
Components of a Graph

In general, a graph is made of up of the following parts:

- titles and footnotes
- one or more cells that contain a composite of one or more plots
- legends, which can reside inside or outside a cell

The following figure shows the different parts of a graph:

**Figure 1.1 Components of a Graph**

1. **Graph**
   - a visual representation of data. The graph can contain titles, footnotes, legends, and one or more cells that have one or more plots.

2. **Cell**
   - a distinct rectangular subregion of a graph that can contain plots, text, and legends.

3. **Title**
   - descriptive text that is displayed above any cell or plot areas in the graph.

4. **Plot**
   - a visual representation of data such as a scatter plot, a series line, a bar chart, or a histogram. Multiple plots can be overlaid in a cell to create a graph.
Legend
refers collectively to the legend border, one or more legend entries (where each entry has a symbol and a corresponding label) and an optional legend title.

Axis
refers collectively to the axis line, the major and minor tick marks, the major tick mark values, and the axis label. Each cell has a set of axes that are shared by all the plots in the cell. In multi-cell graphs, the columns and rows of cells can share common axes if the cells have the same data type.

Footnote
descriptive text that is displayed below any cell or plot areas in the graph.

Creating Single-Cell Graphs

The SGPLOT procedure creates single-cell graphs with a wide range of plot types including density, dot, needle, series, bar, histograms, box, and others. The procedure can compute and display loess fits, polynomial fits, penalized B-spline fits, and ellipses. You can also add text, legends, and reference lines. Options are available for specifying colors, marker symbols, and other attributes of plot features. You can customize the axes by using axis statements such as XAXIS and YAXIS.

Plot statements can be combined to create more informative plots and charts. The following example shows two series plots that are overlaid in a single graph. Each plot is assigned to a different vertical axis. Data labels have been added for easy reference.

```sas
title "Power Generation (GWh)";
proc sgplot data=sashelp.electric(where=(year >= 2001 and customer="Residential"));
xaxis type=discrete;
series x=year y=coal / datalabel;
series x=year y=naturalgas /
datalabel y2axis;
run;
title;
```
The following example creates a graph with a histogram, a normal density curve, and a kernel density curve.

```
proc sgplot data=sashelp.class;
    histogram height;
    density height;
    density height / type=kernel;
run;
```

For more information about the SGPLOT procedure and the procedure syntax, see Chapter 7, “SGPLOT Procedure,” on page 276.

---

### Creating Multi-Cell Graphs

The SGPANEL procedure creates a panel for the values of one or more classification variables. Each graph cell in the panel can contain either a single plot or multiple overlaid plots.

The SGPANEL procedure supports most of the plots and overlays that the SGPLOT procedure supports. For this reason, the two procedures have an almost identical syntax. As with the SGPLOT procedure, options are available for specifying colors, marker symbols, and other attributes.

The procedure syntax supports four types of panel layouts: PANEL, LATTICE, COLUMNLATTICE, and ROWLATTICE.

The following example creates a panel of loess curves using the default PANEL layout. In the PANEL layout, each graph cell represents a specific crossing of values for one or more classification variables. A label above each cell identifies the crossing of values that is represented in the cell. By default, cells are created only for crossings that are represented in the data set.

```
title1 "Cholesterol Levels for Age > 60";
proc sgpanel data=sashelp.heart(
    where=(AgeAtStart > 60)) ;
    panelby sex / novarname;
    loess x=weight y=cholesterol / clm;
run;
title1;
```

The following example creates a panel of box plots in a LATTICE layout. The graph cells are arranged in rows and columns by using the values of two classification variables. Labels above each column and to the right of each row identify the
classification value that is represented by that row or column. A cell is created for each crossing of classification values.

```
title1 "Distribution of Cholesterol Levels";
proc sgpanel data=sashelp.heart;
  panelby weight_status sex / layout=lattice novarname;
  hbox cholesterol;
run;
title1;
```

For more information about the SGPANEL procedure and the procedure syntax, see Chapter 6, “SGPANEL Procedure,” on page 78.

### Creating Paneled Scatter Plots

The SGSCATTER procedure creates a paneled graph for multiple combinations of variables.

The procedure syntax supports the following features:

- three types of graph layouts: PLOT, COMPARE, and MATRIX
- basic scatter plots
- fit and confidence plots: loess curves, regression curves, penalized B-spline curves, and ellipses
- distribution plots: histograms and density curves (in the diagonal cells of a matrix)
- legends

The following example creates a panel using the PLOT layout. The PLOT statement creates a paneled graph of scatter plots where each cell has its own independent set of axes.

```
proc sgscatter data=sashelp.cars;
  plot mpg_highway*weight msrp*horsepower / group=type;
run;
```
The following example creates a panel using the COMPARE layout. The COMPARE statement creates a paneled graph that uses common axes for each row and column of cells. Cells are created for all crossing of the X and Y variables.

```sas
proc sgscatter data=sashelp.cars;
    compare y=mpg_highway
        x=(weight enginelse size horsepower)
        / group=type;
run;
```

The following example creates a panel using the MATRIX layout. The MATRIX statement creates a matrix of scatter plots where each cell represents a different combination of variables. In the diagonal cells, you can place labels or histograms with or without density curves.

```sas
proc sgscatter data=sashelp.iris
    (where=(species eq "Virginica"));
    matrix petallength petalwidth sepallength
        / ellipse=(type=mean)
        diagonal=(histogram kernel);
run;
```

For more information about the SGSCATTER procedure and the procedure syntax, see Chapter 9, “SGSCATTER Procedure,” on page 523.

---

**Rendering Graphs from GTL Templates or ODS Graphics Editor Files**

The SGRENDER procedure creates graphical output from templates that are created using the Graph Template Language (GTL). You can use the GTL to create many different types of plots, paneled graphs, and matrices, some of which cannot be created with the ODS Graphics procedures.

The SGRENDER procedure can also produce graphical output from graphs that were edited in the SAS ODS Graphics Editor. An ODS Graphics Editor file (SGE) is created in SAS by using the SGE = ON option in the ODS destination statement. The SGRENDER procedure enables you to run one or more graphs in batch mode and render
the graphs to any ODS destination using any of the supported ODS options. For more information about the editor, see the *SAS ODS Graphics Editor: User's Guide*.

The following example shows a layout that you can create by using the GTL and the SGRENDER procedure.

```sas
proc template;
  define statgraph surface;
  begingraph;
    layout overlay3d;
      surfaceplotparm x=height y=weight z=density;
      endlayout;
    endgraph;
  end;
run;

proc sgrender data=sashelp.gridded template=surface;
run;
```

For more information about the SGRENDER procedure, see Chapter 8, “SGRENDER Procedure,” on page 513. For more information about the GTL, see *SAS Graph Template Language: User's Guide*.

### Producing Graphs That Were Created with ODS Graphics Designer

The SGDESIGN procedure creates graphical output based on a graph file (SGD) that has been created by using the SAS ODS Graphics Designer application.

Here are the main features of the SGDESIGN procedure:

- By default, the procedure uses the data set or data sets that are currently referenced by the SGD file.
• The procedure can generate any graph type that can be created in the ODS Graphics Designer.

• You can render the graph to any ODS destination by using standard ODS syntax. When it renders the graph, the procedure applies the style of the active destination rather than the style that was used in the SGD file.

• As with all the ODS Graphics procedures, you can use the ODS GRAPHICS statement options to control many aspects of your graphics.

• If the SGD file has been defined with dynamic variables, these variables can be initialized with the DYNAMIC statement of the procedure. You can use dynamic variables to generate the same graph with different data variables, a different data set, and different text elements.

• The procedure supports SAS statements such as FORMAT, LABEL, BY, and WHERE. These statements can be applied only if the DATA= option is used with the procedure.

For more information about the SGDESIGN procedure and the procedure syntax, see Chapter 5, “SGDESIGN Procedure,” on page 67.

About ODS Destinations and Styles

ODS manages all output created by the procedures and enables you to control the output destination and format. ODS also enables you to control the style and other output features.

About ODS Destinations

ODS destinations determine where your graph output is sent and how the output is formatted. For example, the HTML destination creates an HTML file that points to the graph image file. The LISTING destination sends output to an image file. The output image can be displayed by opening the image file from the Results window.

For creation of ODS graphs, a valid ODS destination must be open. You can open destinations by specifying an ODS destination statement. In the SAS windowing environment on Windows and UNIX systems, the HTML destination is open by default. (The default destination for batch mode is LISTING.) If you keep the default HTML destination open and open another, the resultant output is sent to the Web as well as to the other specified destination. With the exceptions of the HTML and LISTING destinations, you must also close the destination before output is generated.

The ODS destination statement is used at the beginning and end of the program to open and close destinations.

For example, the following statements open and close an ODS LISTING destination.

```sas
ods listing;       /* opens the destination */
/* procedure statements and other program elements here */
ods listing close; /* closes the destination */
```

Depending on the options available for the destination, you can specify options such as the filename or the path to an output directory. For more information, see “Specifying a Destination” on page 649.
About ODS Styles

ODS styles determine the overall appearance of your output. By default, ODS applies a style to all output. A style is a template, or set of instructions, that determines the colors, fonts, line styles, fill colors, and other presentation aspects of your output. Each destination has a default style associated with it. For example, the default style for the PDF destination is Printer, and the default style for the HTML destination is HTMLBlue.

The ODS Graphics procedures automatically obtain their default appearance attributes from the current ODS style. However, you can use appearance options in your plot statements to override the default style attributes.

To change the style that is applied to your output, specify the STYLE= option on your ODS destination statement.

For example, suppose you want to change the overall look of your graph for the HTML destination to the Analysis style. Do this by specifying STYLE=ANALYSIS in the ODS HTML destination statement as follows:

`ods html style=analysis;`

For more information, see Chapter 13, “Controlling the Appearance of Your Graphs,” on page 619.

SAS ships predefined styles in the STYLES item store in SASHELP.TMPLMST. Some of these predefined styles are described in “Recommended Styles” on page 621. To see all available styles, see “Viewing a Style Template” on page 622.

About the SAS Sample Library

Many of the examples in this guide also reside in the SAS Sample Library. These examples include the name of the sample library member in their syntax description.

How you access the code in the sample library depends on how it is installed at your site.

- In most operating environments, you can access the sample code through the SAS Help facility. Select Help ⇒ SAS Help and Documentation. On the Contents tab, select Learning to Use SAS ⇒ Sample SAS Programs ⇒ Base SAS ⇒ Samples.

- In other operating environments, the SAS Sample Library might have been installed in your file system. If the SAS Sample Library has been installed at your site, ask your on-site SAS support personnel where the library is located.

References


Chapter 2

Elements of a Program

A Typical Program

Your programs must include at least one procedure (PROC step), which in turn contains a number of statements related to the procedure. The programs can also include ODS statements, ODS GRAPHICS statements, and Base SAS statements. In addition, the programs can specify an annotation data set or an attribute map data set.
The sample program below identifies the basic elements of a typical program.

```sas
ods html style=statistical;
ods graphics on / width=4.5in;
title "Electric Power Generation";
proc sgplot data=cshelp.electric;
  where (year >= 2002) and (customer="Residential");
  series x=year y=coal / datalabel;
  series x=year y=naturalgas / datalabel y2axis;
  xaxis type=discrete;
  yaxis label="Coal (GWh)";
  y2axis label="Natural Gas (GWh)";
r
run;
title;
ods graphics on / reset=all;
ods html style=htmlblue;
```

Here is the output for the sample program.

![Electric Power Generation Graph](image)

The following sections describe each element of the program in more detail and explain how the elements relate to one another.

### The PROC Step

The descriptions in this topic refer to the example that is shown in “A Typical Program” on page 13.
About the PROC Step

A group of SAS procedure statements is called a PROC step.

The PROC step consists of the following:

- a beginning procedure (PROC) statement with options
- typically, statements specifying plot types, variables, and options
- an ending RUN statement

These statements can identify and analyze the data in SAS data sets. They can generate the graphics output and control the appearance of the output. Statements can define variables and perform other operations on your data. You can also specify global statements and options within the PROC step.

Procedure Statements and Options

The procedure statement identifies which procedure you are invoking, such as the SGPLOT procedure, the SGPANEL procedure, and so on.

The statement also specifies which input data set is to be used. A data set is not required for all of the procedures. For example, the SGRENDER procedure defaults to the most recently created SAS data set if none is provided. The SGDESIGN procedure defaults to the data set or data sets that are currently defined in the SGD file.

The statement can include options that are related to the procedure. For example, the DESCRIPTION= option can be used with several procedures to provide a description for the output image.

Plot Statements and Options

Plot statements are used within the procedure to identify the type of plot that you want the procedure to produce. The SGPLOT and SGPANEL procedures require at least one plot statement.

Multiple plot statements can be used, as shown in the example. A SERIES statement is used to create a series plot that shows power generation from coal. A second SERIES statement creates a series plot that shows power generation from natural gas.

Options are available for specifying colors, marker symbols, and other attributes of plot features. In the example, both series plots specify that data labels are displayed. The second SERIES statement uses the Y2AXIS option to plot natural gas power output along the Y axis on the right side of the plot.

The SGPLOT procedure also enables you to add a text inset to a plot using the INSET statement (not shown in the example). The INSET statement adds a text box within the axes of the plot. Options are available for specifying the visual attributes of the text box and the text.

(Optional) Legend Statement and Options

By default, legends are created automatically for some plots, depending on their content. The graph shown in the example has an automatically generated legend.
You can manually add a legend to the graph for the SGPLOT, SGPANEL, and SGSCATTER procedures. When you manually add a legend, options are available for specifying the legend title, its position in the graph, and other attributes.

**(Optional) Axis Statements and Options**

The SGPLOT and SGPANEL procedures contain statements that enable you to change the type and appearance for the axes of the graph. By default, the type of each axis is determined by the types of plots that use the axis and the data that is applied to the axis. You can change the type of axis that is used for a plot. For example, to display independent data values rather than a range of numeric values on the axis, specify the `TYPE=DISCRETE` option. (Not all plot types support discrete axes.)

The SGPLOT procedure supports the use of secondary axes, as shown in the example. Secondary axes are denoted as X2 and Y2 axes. The secondary axes support the same options as the primary axes.

When you use an axis statement, options are available for showing or hiding axis features, such as ticks and labels, and for specifying other attributes. The graph shown in “A Typical Program” on page 13 has three axis statements. The first statement changes the X axis to be discrete. The other two statements change the labels for the Y and Y2 axes.

**Other Required Statements**

The SGPANEL and SGSCATTER procedures include some important statements that are not shown in the example. These statements are required with the procedure statement.

The SGPANEL procedure requires a PANELBY statement. This statement specifies one or more classification variables for the panel, the layout type, and other options for the panel. For more information, see “PANELBY Statement” on page 87.

The SGSCATTER procedure requires one of these three statements:

```
PLOT  creates a paneled graph of scatter plots where each graph cell has its own independent set of axes.
COMPARE creates a shared axis panel, also called an MxN matrix.
MATRIX  creates a scatter plot matrix.
```

For more information, see Concepts: SGSCATTER Procedure on page 525.

**SAS Statements**

The ODS Graphics procedures support a number of SAS statements. Some of these, such as the TITLE statement, are global statements.

A global statement is a statement that you can specify anywhere in a SAS program. A global statement sets values and attributes for all the output created after that global statement is specified in the program. The specifications in a global statement are not confined to the output generated by any one procedure. However, they do apply to all the output generated thereafter in the program, unless they are overridden by a procedure option or another global statement.
As shown in “A Typical Program” on page 13, the TITLE statement is used toward the
beginning and end of the program. The first statement specifies the title. The second
statement cancels the current title.

The example program also uses a WHERE statement to subset the data that is used in
the graph. In the example, the WHERE statement selects observations based on their
date (2002 or greater) and the type of customer (residential).

For more information, see Chapter 4, “SAS Statements That Are Used with ODS
Graphics Procedures,” on page 51.

**ODS Statements**

The ODS Graphics procedures use ODS destination statements to control where the
output goes and how it looks. Although ODS statements are not required in every
program, they are necessary if you want to generate graphs for destinations other than
the default HTML destination. Some other destinations include LISTING, RTF, and
PDF.

You can use the STYLE= option in the ODS destination statement to change the style
that is applied to your output. As shown in “A Typical Program” on page 13, the ODS
destination statement is used at the beginning and end of the program to modify the
default style. The beginning statement specifies a different style. The end statement
sets the HTML style back to its default of HTMLBlue. The ODS destination
statement can also be used to open a different destination.

Depending on the options available for the destination, you can specify other features
such as the name of the output file or the directory where images are stored.

An ODS destination must be open to create output from the procedures. If you want to
use a destination other than the default, you should always open the destination before
calling the procedure. Opening a non-default destination results in output being sent both
to HTML by default as well as to the additional specified destination. Conserve system
resources by using the ODS destination statement at the end of the SAS program to close
a destination that was opened in that program.

**See Also**

- “Understanding ODS Destinations” in Chapter 3 of SAS Output Delivery System:
  User's Guide

**ODS GRAPHICS Statement Options**

You can use the ODS GRAPHICS statement options to control many aspects of your
graphics. The ODS GRAPHICS statement is a global statement that can be used
anywhere in your program. The settings that you specify remain in effect for all graphics
until you change or reset these settings with another ODS GRAPHICS statement.

As shown in “A Typical Program” on page 13, the ODS GRAPHICS statement is used
at the beginning and end of the program to modify the size of the graph. The beginning
Using an Annotation Data Set

The SG annotation feature enables you to add shapes, arrows, text, images, and other annotations to graph output.

Two main steps are required to add annotation elements to a graph:

1. Create an SG annotation data set, which contains the commands for creating the annotation elements.
2. Modify the procedure to use the SG annotation data set. You can use annotation in the SG PLOT, SG PANEL, and SG SCATTER procedures.

For more information, see Chapter 10, “Annotating ODS Graphics,” on page 557.

Using an Attribute Map Data Set

The attribute map feature enables you to control the visual attributes that are applied to specific data values in your graphs. For example, if you create a graph that plots items sold in different countries, you can specify the display attributes for the sales data of each country by name.

Attribute maps apply only to group data. Attribute maps enable you to ensure that particular visual attributes are applied based on the value of the data instead of the position of the data in the data set.

Two main steps are required for attribute mapping:

1. Create an SG attribute map data set, which associates data values with particular visual attributes. Each observation defines the attributes for a group value.
2. Modify the procedure and its plot statements to use the data in the SG attribute map. You can use attribute maps in the SG PLOT, SG PANEL, and SG SCATTER procedures (not all plot statements support attribute maps).

For more information, see Chapter 12, “Using SG Attribute Maps to Control Visual Attributes,” on page 605.
Chapter 3
Overview of Plots and Charts

Basic Plots and Charts

About Basic Plots and Charts
You can use the SGPLOT and SGPANEL procedures to produce basic plots and charts.
The plot and chart statements include options for controlling how the output is displayed. Many of the options are unique to the particular plot or chart. However, some general options apply to most of the basic plots and charts.

For example, options enable you to do the following:

- specify colors, line attributes, and other visual features.
- group the data by the values of a variable. A separate plot is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.
- use a secondary axis (X2 or Y2). This option is available only for the SG PLOT procedure.
- reference an ID variable in attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.

The basic plots and charts are described in the following sections. If you run the examples, your output might differ somewhat depending on the size of your graphics. The examples here were specified to be a particular size using the following statement:

```
ods graphics on / width=4in;
```

### About Band Plots

A band plot creates a band that highlights part of the plot and shows upper and lower limits. The input data should be sorted by the X or Y variable.

The following examples show upper and lower mean weight values for a class of students. The first two examples use the SGPLOT procedure to show the same band plotted along the X axis and the Y axis, respectively. The third example uses the SGPANEL procedure to show a matrix that is paneled by gender.

```sas
title "Weight Limits on the Y Axis";
proc sgplot data=sashelp.classfit;
where age > 12;
band x=name lower=lowermean upper=uppermean;
run;
title;
```

```sas
title "Weight Limits on the X Axis";
proc sgplot data=sashelp.classfit;
where age > 12;
band y=name lower=lowermean upper=uppermean;
run;
title;
```
Options are available that enable you to customize the band plot and enhance its appearance. For example, you can do the following:

- add labels to the upper and lower edges of the band, specify how the labels are positioned, and set other attributes for the labels
- specify fill and outline attributes
- specify legend labels and plot transparency

*Note:* This list does not include all available options.

**See Also**

- “BAND Statement” on page 90 (SGPANEL procedure)
- “BAND Statement” on page 284 (SGPLOT procedure)

### About Bubble Plots

Bubble plots show the relative magnitude of the values of a variable. The values of two variables determine the position of the bubble on the plot, and the value of a third variable determines the size of the bubble.

The following examples show the height and weight values for a class. The size of each bubble is determined by the student’s age. Examples are provided for the SGPLOT and the SGPANEL procedures.
proc sgpanel data=sashelp.class;
  panelby sex;
  bubble x=height y=weight size=age;
run;

Options are available that enable you to customize the bubble plot and enhance its appearance. For example, you can do the following:

- control the size of the largest and the smallest bubble
- specify fill and outline attributes, and data labels and their attributes
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page

*Note:* This list does not include all available options.

**See Also**
- “BUBBLE Statement” on page 96 (SGPANEL procedure)
- “BUBBLE Statement” on page 290 (SGPLOT procedure)

**About High-Low Charts**

High-low charts show how several values of one variable relate to one value of another variable. Typically, each variable value on the horizontal axis has several corresponding values on the vertical axis.

The following examples show the stock trend for IBM during a particular year. The first two examples use the SGPLOT procedure to show the same plot along the X axis and the Y axis, respectively. The third example uses the SGPANEL procedure to show a paneled graph for Intel and Microsoft stock prices in the same year. Optional values have been specified for the closing stock prices, which are represented as tick marks on the high-low lines.

```sas
proc sgplot data=sashelp.stocks
   (where=(date >= "01jan2005"d and stock = "IBM");
  highlow x=date high=high low=low
      / close=close;
run;
title "Stock Trend for IBM";
proc sgplot data=sashelp.stocks
   (where=(date >= "01jan2005"d and stock = "IBM"));
  highlow x=date high=high low=low
      / close=close;
run;
title;
```
Options are available that enable you to customize the high-low chart and enhance its appearance. For example, you can do the following:

- use bars instead of lines to represent the data. If you use bars, then you can specify the fill and outline attributes for the bars.
- show tick marks for the open and closing values.
- specify labels and arrowheads for the high and low values.
- control the display of grouped data. For example, you can specify whether the groups are overlaid or clustered, the width of each cluster, and the order of lines or bars within a group.
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

*Note:* This list does not include all available options.

**See Also**

- “HIGHLOW Statement” on page 137 (SGPANEL procedure)
- “HIGHLOW Statement” on page 335 (SGPLOT procedure)

**About Lines**

**About Reference Lines**

You can add horizontal or vertical reference lines to your graphics. You can draw a reference line for each value of a specified variable. Or you can specify one or more explicit values for the reference lines.
The following examples show the height values for a class of students. A horizontal reference line is overlaid on a series plot to show the average height. Examples are provided for the SGPLOT and the SGPANEL procedures.

In the first example, a value of 60.8 is specified for the reference line. The second example uses the MEANS procedure to obtain the averages for males and females in the class. The SGPANEL procedure then specifies the variable that contains these averages in order to obtain the reference lines.

```sas
proc sgplot data=sashelp.class;
where (sex="F");
series x=name y=height;
refline 60.8;
run;
```

```sas
proc means data=sashelp.class mean;
var height;
class sex;
output out=classAverages mean=averageWeight;
run;

data classHeightAverage;
set sashelp.class work.classAverages;
run;
proc sgpanel data=classHeightAverage;
panelby sex / uniscale=row spacing=8;
series x=name y=height;
refline averageWeight;
run;
```

Options are available that enable you to customize the reference line and enhance its appearance. For example, you can do the following:

- specify a horizontal or vertical line. In the SGPLOT procedure, you can associate the line with a secondary axis.
- specify line attributes, labels, and label attributes.
- specify legend labels and line transparency.
- specify an amount to offset all lines from discrete axis values.
- extend the plot axes to contain the reference lines.

*Note:* This list does not include all available options.

**About Parameterized Lines**

Parameterized lines are straight lines specified by a point and a slope. The statement must be used with another plot statement that is derived from data values that provide
boundaries for the axis area. For example, the LINEPARM statement can be used with a scatter plot or a histogram.

The following example shows weight with respect to height for a class of students. A single line is generated by specifying values for the point and for the slope. The line in the example approximates a line of best fit.

```sas
proc sgplot data=sashelp.class
   noautolegend;
scatter x=height y=weight;
lineparm x=50 y=50 slope=3.89;
run;
```

You can generate multiple lines by specifying a numeric variable for any or all required arguments. Examples are provided for the SGPLOT and the SGPANEL procedures. The following two examples create lines of best fit for male and female participants in a heart disease study. The lines show weight with respect to height.

The examples first sort the data set by male and female participants. The sorted data is output to a data set named HEART.

```sas
proc sort data=sashelp.heart(keep=height weight sex)
   out=heart;
by sex;
run;
```

The examples then use the REG procedure and output the regression statistics to a data set named STATS. The STATS data set includes the slope and the Y-intercept for the regression.

```sas
proc reg data=heart
   outest=stats(rename=(height=slope));
by sex;
model weight=height;
run;
```

Finally, the examples merge the HEART and the STATS data sets.

```sas
data heartStats;
merge heart stats(keep=intercept slope sex);
run;
```

The first example uses the SGPLOT procedure to show lines of best fit for females and males in the study. The regression lines are labeled and have their own legend.
The following example uses the SGPANEL procedure to create the same information, which is paneled by gender.

Options are available that enable you to customize the line and enhance its appearance. For example, you can do the following:

- specify line attributes, labels, and label attributes
- specify legend labels and line transparency
- prevent the line from being extended beyond the axis offset

**Note:** This list does not include all available options.

### See Also

- “REFLINE Statement” on page 183 (SGPANEL procedure)
- “REFLINE Statement” on page 390 (SGPLOT procedure)
- “LINEPARM Statement” on page 161 (SGPANEL procedure)
- “LINEPARM Statement” on page 366 (SGPLOT procedure)

### About Needle Plots

Needle plots use vertical line segments, or needles, to connect each data point to a baseline.

The following examples show the stock trend during a particular year. Examples are provided for the SGPLOT and the SGPANEL procedures. Each example specifies an optional baseline value on the Y axis.
title "Stock Trend for IBM"
proc sgplot data=sashelp.stocks
  (where=(date >= "01jan2005"d and stock = "IBM"));
  needle x=date y=close / baseline=80;
run;
title;

Options are available that enable you to customize the needle plot and enhance its appearance. For example, you can do the following:

- specify a baseline value, as shown in the example.
- add markers to the tips of the needles and specify marker attributes.
- add data labels and specify label attributes.
- control the display of grouped data. For example, you can specify whether the groups are overlaid or clustered, the width of each cluster, and the order of needles within a group.
- specify an amount to offset all needle lines from discrete X values.
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Note: This list does not include all available options.

See Also
- “NEEDLE Statement” on page 171 (SGPANEL procedure)
- “NEEDLE Statement” on page 377 (SGPLOT procedure)

About Scatter Plots

Scatter plots show the relationship of one variable to another, often revealing concentrations or trends in the data. Typically, each variable value on the horizontal axis can have any number of corresponding values on the vertical axis.

The following examples show the relationship of height to weight for a class of students. Examples are provided for the SGPLOT and the SGPANEL procedures. The third example includes error bars.
Options are available that enable you to customize the scatter plot and enhance its appearance. For example, you can do the following:

- add and customize error bars. The previous example shows error bars.
- specify how many times observations are repeated for computational purposes.
- specify marker attributes, data labels, and label attributes.
- specify an amount to offset all markers from discrete axis values.
- control the display of grouped data. For example, you can specify whether the groups are overlaid or clustered, the width of each cluster, and the order of markers within a group.
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

*Note:* This list does not include all available options.

**See Also**

- “[SCATTER Statement” on page 192 (SGPANEL procedure)
About Series Plots

Series plots display a series of line segments that connect observations of input data. The following examples show series plots of stock trends. Examples are provided for the SGPLOT and the SGPANEL procedures.

```
title "Stock Trend for IBM";
proc sgplot data=sashelp.stocks
    (where=(date >= "01jan2002"d and stock = "IBM"));
    series x=date y=close;
run;
title;
```

```
title "Stock Trend for IBM and Microsoft";
proc sgp panel data=sashelp.stocks
    (where=(date >= "01jan2002"d and
            (stock = "IBM" or stock = "Microsoft")));
    panelby stock;
    series x=date y=close;
run;
title;
```

Options are available that enable you to customize the series plot and enhance its appearance. For example, you can do the following:

- specify line and marker attributes, data labels, curve labels, and label attributes.
- specify an amount to offset all markers from discrete axis values.
- control the display of grouped data. For example, you can specify whether the groups are overlaid or clustered, the width of each cluster, and the order of lines within a group.
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Note:** This list does not include all available options.

**See Also**

- “SERIES Statement” on page 198 (SGPANEL procedure)
- “SERIES Statement” on page 406 (SGPLOT procedure)
About Step Plots

Step plots display a series of horizontal and vertical line segments that connect observations of input data. The plots use a step function to connect the data points. The vertical line can change at each step.

The following examples show step plots of stock trends. Examples are provided for the SGPLOT and the SGPANEL procedures.

```sas
title "Stock Trend for IBM";
proc sgplot data=sashelp.stocks
  (where=(date >= "01jan2004" and stock = "IBM"));
  step x=date y=close;
run;
```

```sas
title "Stock Trend for Intel and Microsoft";
proc sgpanel data=sashelp.stocks
  (where=(date >= "01jan2004" and
          (stock = "Intel" or stock = "Microsoft")));
  panelby stock;
  step x=date y=close;
run;
```

Options are available that enable you to customize the step plot and enhance its appearance. For example, you can do the following:

- add and customize markers and error bars.
- specify line attributes, data labels, curve labels, and label attributes.
- specify an amount to offset all step lines from discrete axis values.
- control the display of grouped data. For example, you can specify whether the groups are overlaid or clustered, the width of each cluster, and the order of lines within a group.
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Note:** This list does not include all available options.

**See Also**

- “STEP Statement” on page 204 (SGPANEL procedure)
- “STEP Statement” on page 413 (SGPLOT procedure)
About Text Insets

A text inset provides an easy way to add text to a graphic. You can insert a text string as well as a series of label-value pairs.

The following example shows a linear regression curve with a text inset in the upper left corner. Text insets are available only for the SGPLOT procedure. The SGPANEL procedure does not support text insets.

```sas
proc sgplot data=sashelp.class;
  reg x=height y=weight / CLM;
  inset (*Confidence level (*ESC*)
    {unicode alpha} = "0.05")
    {unicode alpha} = "0.05");
run;
```

Options are available that enable you to customize the text inset and enhance its appearance. For example, you can do the following:

- show or hide a border
- position the text box within the plot
- specify text attributes, add a title, and specify title attributes
- align the labels and values when you specify label-value pairs

**Note:** This list does not include all available options.

**See Also**

“INSET Statement” on page 356 (SGPLOT procedure)

About Vector Plots

Vectors are directed line segments. A vector plot is a two-dimensional graphic that uses vectors to represent both direction and magnitude at each point.

The following examples show the relationship of height to weight for a class of students. Examples are provided for the SGPLOT and the SGPANEL procedures. Both examples specify optional X and Y origins and data labels.
Options are available that enable you to customize the vector plot and enhance its appearance. For example, you can do the following:

- specify the origin, as shown in the examples.
- specify line attributes, data labels, and data label attributes. You can also show or hide the arrows, change the arrowhead shape, and the change the arrow direction.
- specify legend labels and plot transparency.

*Note:* This list does not include all available options.

**See Also**

- “VECTOR Statement” on page 238 (SGPANEL procedure)
- “VECTOR Statement” on page 447 (SGPLOT procedure)

## Fit and Confidence Plots

### About Fit and Confidence Plots

You can use the SGPLOT and SGPANEL procedures to produce fit plots and ellipses (the ellipses plot is available with the SGPLOT procedure only). Fit plots represent the line of best fit (trend line) with confidence limits.

The plot statements include many options for controlling how the output is displayed. The options that are available depend on the plot type. However, some general options...
apply to most of the fit and confidence plots. For example, options enable you to do the following:

- add confidence limits (CLM) to the plot. When you add CLM limits, you can specify the confidence level, the transparency for the confidence limits, and other visual attributes. You can add CLM limits to loess, penalized B-spline, and regression plots.

- add prediction limits (CLI) for the individual predicted values. When you add CLI limits, you can specify the text that appears for the limits and other visual attributes. You can add CLI limits to penalized B-spline and regression plots.

- control the appearance of the markers and the fit line. You can also specify a smoothing parameter.

- add and customize curve and data labels.

- specify legend labels. You can also show or hide the legend entries for the CLM limits, the CLI limits, and the fit line.

- group the data by the values of a variable. A separate plot is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.

- specify the value of an ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.

*Note:* Not all of these features are available for all of the plots. Also, the list does not include all available options.

The fit and confidence plots are described in the following sections. If you run the examples, your output might differ somewhat depending on the size of your graphics. The examples here were specified to be a particular size using the following statement:

```ods graphics on / width=4in;```

### About Ellipse Plots

Ellipse plots create a confidence elliptical curve computed from input data. In order to produce useful output, the ELLIPSE statement should be used with another plot statement that uses numeric axes. Ellipses are available only for the SGPLOT procedure. The SGPANEL procedure does not support ellipses.

The following example shows the relationship of height to weight for a class of students. The example consists of a scatter plot and two ellipses.

Here are the noteworthy features of the example:

- Both ELLIPSE statements use TYPE=PREDICTED. This is the default.

- One ELLIPSE statement uses ALPHA=.2 and the other uses ALPHA=.05.

- The automatically generated legend, which contains an entry for each ellipse and for the scatter plot, has been suppressed. Only the ellipses require a legend.

- A legend was created that contains entries only for the ellipses. Each ELLIPSE statement specifies a legend label and a plot name. The KEYLEGEND statement uses the NAME value to determine the entries in the legend.
proc sgplot data=sashelp.class
   noautolegend;
scatter x=height y=weight;
ellipse x=height y=weight /
   alpha=.2
   name="eighty"
   legendlabel="80% Prediction";
ellipse x=height y=weight /
   alpha=.05
   name="ninetyfive"
   legendlabel="95% Prediction";
keylegend "eighty" "ninetyfive";
run;

See Also
"ELLIPSE Statement" on page 306 (SGPLOT procedure)

About Loess Plots

A loess plot includes a scatter plot of two numeric variables along with an overlaid nonlinear fit line that enables you to perform locally weighted polynomial regression. You can specify the degree of the local polynomials to use for each local regression. You can also change the default smoothing technique that is applied to the fit.

The following examples show the relationship of height to weight and the line of best fit for a class of students. Examples are provided for the SGPLOT and the SGPANEL procedures. In both examples, the automatically generated legend for the fit line is not needed and has been suppressed.

proc sgplot data=sashelp.cars
   noautolegend;
where (origin = "Europe");
loess x=weight y=mpg_highway;
run;
proc sgpanel data=sashelp.cars
noautolegend;
where (origin = "Europe");
panelby drivetrain;
loess x=weight y=mpg_highway;
run;

See Also

- “LOESS Statement” on page 165 (SGPANEL procedure)
- “LOESS Statement” on page 371 (SGPLOT procedure)

About Penalized B-Spline Plots

A penalized B-spline curve includes a scatter plot of two numeric variables along with an overlaid nonlinear fit line. You can specify the degree of the local polynomials to use for each local regression. You can also change the default smoothing technique that is applied to the fit.

The following examples show the relationship of height to weight and the line of best fit for a class of students. Examples are provided for the SGPLOT and the SGPANEL procedures. In both examples, the automatically generated legend for the fit line is not needed and has been suppressed.

proc sgplot data=sashelp.class
noautolegend;
pbspline x=height y=weight;
run;
See Also

- “PBSPLINE Statement” on page 176 (SGPANEL procedure)
- “PBSPLINE Statement” on page 383 (SGPLOT procedure)

About Regression Plots

A regression plot includes a scatter plot of two numeric variables along with an overlaid linear or nonlinear fit line that enables you to perform a regression analysis. You can specify one of three types of regression equation: linear, quadratic, or cubic. You can display confidence limits for mean predicted values or individual predicted values.

The following examples show the relationship of height to weight and the line of best fit for a class of students. Examples are provided for the SGPLOT and the SGPANEL procedures. The first two examples show the same plot with a linear and a cubic fit line, respectively. The third example shows a paneled graph. In all three examples, the automatically generated legend for the fit line is not needed and has been suppressed.
Distribution Plots

About Distribution Plots

You can use the SGPLOT and SGPANEL procedures to produce plots that characterize the frequency or the distribution of your data.

The plot statements include many options for controlling how the output is displayed. The options that are available depend on the plot type. The following sections describe each plot and the options that are available.

The distribution plots are described in the following sections. If you run the examples, your output might differ somewhat depending on the size of your graphics. The examples here were specified to be a particular size using the following statement:

```
ods graphics on / width=4in;
```

About Box Plots

A box plot summarizes the data and indicates the median, upper and lower quartiles, and minimum and maximum values. The plot provides a quick visual summary that easily shows center, spread, range, and any outliers. The SGPLOT and the SGPANEL procedures have separate statements for creating horizontal and vertical box plots.

The following examples show product sales summaries. Examples are provided for the SGPLOT and the SGPANEL procedures.

```
proc sgpanel data=sashelp.class
   noautolegend;
   panelby sex;
   reg x=height y=weight;
run;
```
The following two examples use the SGPLOT procedure to create a horizontal and a vertical plot, respectively.

```
proc sgplot data=sashelp.prdsale;
  hbox actual;
run;
```

```
proc sgplot data=sashelp.prdsale;
  vbox actual;
run;
```

The following two examples use the SGPANEL procedure to create a horizontal and a vertical plot, respectively. The box plots are paneled by product type.

```
proc sgpanel data=sashelp.prdsale;
  panelby prodtype;
  hbox actual;
run;
```

```
proc sgpanel data=sashelp.prdsale;
  panelby prodtype;
  vbox actual;
run;
```
Options are available that enable you to customize the box plot and enhance its appearance. For example, you can do the following:

- control the box width, the whisker cap shape, and the visual attributes for the mean marker, median line, and the connect lines. You can also hide the whisker caps, mean marker, median line, and the outliers.
- specify data labels and font attributes for the labels.
- specify the method to use for computing the percentiles for the plot.
- group the data by the values of a variable. A separate plot is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.
- control the display of grouped boxes. For example, you can specify whether the boxes are overlaid or clustered, and the width of each cluster.
- specify an amount to offset graph elements from the category midpoints or from the discrete axis tick marks.
- specify legend labels and plot transparency.
- assign the analysis variable to the secondary axis (X2 or Y2). This option is available only for the SG PLOT procedure.
- specify the value of an ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.

Note: This list does not include all available options.

See Also
- “HBOX Statement” on page 126 (SGPANEL procedure)
- “VBOX Statement” on page 227 (SGPANEL procedure)
- “HBOX Statement” on page 324 (SGPLOT procedure)
- “VBOX Statement” on page 436 (SGPLOT procedure)

About Density Plots

After creating a histogram, you might use a density plot to fit various distributions to the data. The most common density plot uses the normal distribution, which is defined by the mean and the standard deviation.

A density plot can be used by itself, combined with another density plot, and overlaid on a histogram.

The following examples show a density plot overlaid on a histogram. Examples are provided for the SG PLOT and the SG PANEL procedures.
The SGPANEL example shows output that is paneled by gender. The UNISCALE=ROW option specifies that only the shared row axes are identical. The column axes vary based on the values of the height for the respective genders.

Options are available that enable you to customize the density plot and enhance its appearance. For example, you can do the following:

- control the visual attributes of the density line.
- specify a kernel distribution instead of normal. You can also specify the scaling that is used for the response axis.
- specify legend labels and plot transparency.

*Note:* This list does not include all available options.

**See Also**

- “DENSITY Statement” on page 101 (SGPANEL procedure)
- “DENSITY Statement” on page 295 (SGPLOT procedure)

**About Histograms**

Histograms consist of a series of columns representing the frequency of a variable over a discrete interval or class.

The following examples show the height distribution for a class of students. Examples are provided for the SGPLOT and the SGPANEL procedures.
The SGPANEL example shows output that is paneled by gender. The UNISCALE=ROW option ensures that only the shared row axes are identical. The column axes vary based on the values of the height for the respective genders.

Options are available that enable you to customize the histogram and enhance its appearance. For example, you can do the following:

• control the visual attributes of the bins, such as fill color and outlines.
• specify the number of bins, their width, and the X coordinate of the first bin.
• specify legend labels and plot transparency.
• assign the response variable and the calculated values to the secondary axis (X2 or Y2). This option is available only for the SGPLOT procedure.

Note: This list does not include all available options.

See Also

• “HISTOGRAM Statement” on page 145 (SGPANEL procedure)
• “HISTOGRAM Statement” on page 343 (SGPLOT procedure)
Categorization Plots and Charts

About Categorization Plots and Charts

Categorization plots and charts produce a series of graph elements, one for each selected category of cases. For example, the relation between the age and the risk of a heart attack might differ between males and females. Categorization plots and charts can reveal patterns, complex interactions, exceptions, and anomalies.

You can use the SGPLOT and SGPANEL procedures to produce a variety of categorization plots and charts. The plot and chart statements include many options for controlling how the output is displayed. The options that are available depend on the plot type. The following sections describe each type and the options that are available.

The categorization plots are described in the following sections. If you run the examples, your output might differ somewhat depending on the size of your graphics. The examples here were specified to be a particular size using the following statement:

```
ods graphics on / width=4in;
```

About Bar Charts

Overview of Standard and Parameterized Bar Charts

Bar charts use bars to represent statistics based on the values of a category variable. Bar charts are useful for displaying magnitudes and emphasizing differences.

You can use the SGPLOT and SGPANEL procedures to create the following:

- horizontal and vertical bar charts that summarize the values of a category variable.
- parameterized horizontal and vertical bar charts that require a response variable in addition to the category variable. The response variable contains pre-summarized computed values such as a sum or a mean for each unique value of the category variable.

Options are available that enable you to customize both types of bar charts and enhance their appearance. For example, you can do the following:

- control the visual attributes of the bars, such as bar width, fill color, fill skin, and outlines.
- add data labels and specify font attributes for the labels.
- group the data by the values of a variable. A separate plot is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.
- control the display of grouped bars. For example, you can specify the width of each cluster.
- specify an amount to offset graph elements from the category midpoints or from the discrete axis tick marks.
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
• specify the value of an ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.

Note: This list does not include all available options.

**Bar Chart Examples**
The following examples show statistics for different categories of smokers. The examples use the SGPLOT procedure to create a horizontal and a vertical bar chart, respectively. By default, the charts show the frequency for each category. The examples specify an optional response variable to show the average age at death for each category rather than the frequency.

```sas
proc sgplot data=sashelp.heart;
  hbar smoking_status / response=ageatdeath stat=mean;
run;
```

```sas
proc sgplot data=sashelp.heart;
  vbar smoking_status / response=ageatdeath stat=mean;
run;
```

The following two examples use the SGPANEL procedure to create a horizontal and a vertical chart, respectively. The bar charts are paneled by gender.

```sas
proc sgpanel data=sashelp.heart;
  panelby sex;
  hbar smoking_status / response=ageatdeath stat=mean;
run;
```

```sas
proc sgpanel data=sashelp.heart;
  panelby sex;
  vbar smoking_status / response=ageatdeath stat=mean;
run;
```
Bar charts includes options that are not applicable to parameterized bar charts. For example, you can do the following:

- specify the response variable and the statistic to use for its axis
- specify the order in which the response values are arranged
- show limit lines, specify the statistic to use for the limit lines, and specify the confidence level
- for grouped data, you can specify whether the bars are stacked or clustered
- specify how many times observations are repeated for computational purposes

*Note:* This list does not include all available options.

**Parameterized Bar Chart Examples**

The following examples show height averages for a class of students. The averages are obtained using the following program.

```sas
proc means data=sashelp.class alpha=.05 clm mean std;
   class age sex;
   var height;
   output out=classMean uclm=uclm lclm=lclm mean=mean;
run;
```

The following two examples use the SGPLOT procedure to create a horizontal and a vertical chart, respectively. The response variable contains the computed mean values that were created with the MEANS procedure.

```sas
proc sgpanel data=sashelp.heart;
   panelby sex;
   vbar smoking_status / response=ageatdeath
      stat=mean;
run;
```
The following two examples use the SGPANEL procedure to create horizontal and vertical bar charts, respectively. The charts are paneled by gender.

You can also assign variables to the upper and lower limits of the bar chart. Parameterized bar charts enable you to pass in your own precomputed limits.
See Also

- “HBAR Statement” on page 111 (SGPANEL procedure)
- “VBAR Statement” on page 212 (SGPANEL procedure)
- “HBAR Statement” on page 309 (SGPLOT procedure)
- “VBAR Statement” on page 420 (SGPLOT procedure)
- “HBARPARM Statement” on page 120 (SGPANEL procedure)
- “VBARPARM Statement” on page 220 (SGPANEL procedure)
- “HBARPARM Statement” on page 317 (SGPLOT procedure)
- “VBARPARM Statement” on page 429 (SGPLOT procedure)

About Dot Plots

Dot plots summarize horizontally the values of a category variable. By default, each dot represents the frequency for each value of the category variable.

The following examples show the frequency of different weights of patients in a study. The examples use the SGPLOT and the SGPANEL procedures.

Options are available that enable you to customize the dot plot and enhance its appearance. For example, you can do the following:

- specify an optional response variable and show the mean, the sum, or the frequency for that variable. You can also specify the order in which the response values are arranged.
- show limits for the plot. You can also specify the statistic for the limit lines and visual attributes of the lines.
• specify the color, size, and symbol for the markers.
• add data labels and specify font attributes for the labels.
• control the display of grouped markers, lines, and bars. For example, you can specify whether the groups are overlaid or clustered, and the ordering of dots within a group.
• specify an amount to offset graph elements from the category midpoints or from the discrete axis tick marks.
• specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Note: This list does not include all available options.

See Also
• “DOT Statement” on page 104 (SGPANEL procedure)
• “DOT Statement” on page 299 (SGPLOT procedure)

About Line Charts

Line charts displays information as a series of data points connected by straight line segments. The SGPLOT and the SGPANEL procedures have separate statements for creating horizontal and vertical line charts.

The following examples show mean weight values for a class. Examples are provided for the SGPLOT and the SGPANEL procedures. The examples specify an optional response variable and use the mean statistic for that variable. The examples also add data point markers.

These two examples use the SGPLOT procedure to create a horizontal and a vertical chart, respectively.

```
proc sgplot data=sashelp.class;
   hline age /
      response=height
      stat=mean
      markers;
   run;
```

```
proc sgplot data=sashelp.class;
   vline age /
      response=height
      stat=mean
      markers;
   run;
```
The following two examples use the SGPANEL procedure to create panels of horizontal and vertical charts, respectively.

```
proc sgpanel data=sashelp.class;
panelby sex;
  hline age / response=height stat=mean markers;
run;
```

```
proc sgpanel data=sashelp.class;
panelby sex;
  vline age / response=height stat=mean markers;
run;
```

Options are available that enable you to customize the line chart and enhance its appearance. For example, you can do the following:

- specify an optional response variable and show the mean, the sum, or the frequency for that variable. You can also specify the order in which the response values are arranged.
- show limits for the chart. You can also specify the statistic for the limit lines and visual attributes of the lines.
- add data point markers and specify the color, size, and symbol for the markers.
- add curve and data labels and specify font attributes for the labels.
- control the display of grouped lines. For example, you can specify whether the groups are overlaid or clustered, the width of each cluster, and the ordering of lines within a group.
- specify an amount to offset graph elements from the category midpoints or from the discrete axis tick marks.
- specify legend labels, plot transparency, and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
- assign the category variable, the response variable, or both variables to the secondary axis (X2 or Y2). This option is available only for the SGPLOT procedure.
- specify the value of an ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.

*Note:* This list does not include all available options.
See Also

- “HLINE Statement” on page 148 (SGPANEL procedure)
- “VLINE Statement” on page 242 (SGPANEL procedure)
- “HLINE Statement” on page 346 (SGPLOT procedure)
- “VLINE Statement” on page 451 (SGPLOT procedure)

About Waterfall Charts (Preproduction)

Waterfall charts show how the value of a variable increases or decreases until it reaches a final value. In the chart, bars represent an initial value of Y and a series of intermediate values identified by X leading to a final value of Y. Waterfall charts are available only for the SGPLOT procedure.

The following example shows average failure counts for capacitors.

```plaintext
proc sgplot data=sashelp.failure;
    waterfall category=cause response=count / stat=mean;
run;
```

Options are available that enable you to customize the waterfall chart and enhance its appearance. For example, you can do the following:

- specify the statistic for the response variable.
- specify an initial bar for the chart. You can also specify the tick value that is used for the initial bar and visual attributes of the bar.
- control the appearance of the bars. For example, you can do the following:
  - show or hide the bar outline
  - show or hide the bar fill
  - use a special effect (data skin) for the fill
  - specify a variable to use for the bar colors
  - specify attributes separately for the final bar
- add data labels and specify font attributes for the labels.
- specify plot transparency and URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Note: This list does not include all available options.

See Also

“WATERFALL (Preproduction) Statement” on page 462 (SGPLOT procedure)
Chapter 4
SAS Statements That Are Used with ODS Graphics Procedures

Overview of SAS Statements That Are Used with ODS Graphics Procedures

Dictionary
- BY Statement
- FOOTNOTE Statement
- FORMAT Statement
- LABEL Statement
- ODS GRAPHICS Statement
- TITLE and FOOTNOTE Statements
- WHERE Statement

Overview of SAS Statements That Are Used with ODS Graphics Procedures

The SAS ODS Graphics procedures support these statements in addition to statements that are unique to each procedure:

BY
processes your data by using one or more classification variables, and produces a separate graph for each unique combination of values.

FORMAT
associates SAS formats or user-defined formats with variables.

FOOTNOTE
adds footnotes to your graphs.

LABEL
associates descriptive labels with variables.

ODS GRAPHICS
enables you manage the settings for your graphics output.

TITLE
adds titles to your graphs.

WHERE
selects observations from SAS data sets that meet a particular condition.

The ODS GRAPHICS, TITLE, and FOOTNOTE statements are global statements. That is, they can be specified anywhere in your program and they remain in effect until you explicitly cancel or change them. The BY, FORMAT, and LABEL statements are associated with a specific procedure step.
Dictionary

BY Statement

BY statement creates a separate graph for each BY group.

Required Argument

variable specifies the variable that the procedure uses to form BY groups. You can specify more than one variable. By default, observations in the data set must either be sorted in ascending order by all the variables that you specify, or be indexed appropriately.

Optional Arguments

DESCENDING specifies that the data set is sorted in descending order by the specified variable. This option affects only the variable that immediately follows it—you must specify the DESCENDING option before each variable that is sorted in descending order. For example, the following code specifies a BY group that uses two variables that are both sorted in descending order:

by descending variable1 descending variable2;

NOTSORTED specifies that the observations in the data set that have the same BY values are grouped together, but are not necessarily sorted in alphabetical or numeric order. For example, the observations might be sorted in chronological order using a date format such as DDMMYY.

The NOTSORTED option applies to all of the variables in the BY statement. You can specify the NOTSORTED option anywhere within the BY statement.

The requirement for ordering or indexing observations according to the values of BY variables is suspended when you use the NOTSORTED option. In fact, the procedure does not use an index if you specify the NOTSORTED option. For the NOTSORTED option, the procedure defines a BY group as a set of contiguous observations that have the same values for all BY variables. If observations that have the same value for the BY variables are not contiguous, then the procedure treats each new value that it encounters as the first observation in a new BY group. The procedure then creates a graph for that value.

Restriction: The NOTSORTED option is not supported by the SGPANEL procedure.
Preparing Data for BY-Group Processing

Unless you specify the NOTSORTED or DESCENDING options, observations in the input data set must be in ascending numeric or alphabetic order. To prepare the data set, sort it with the SORT procedure using the same BY statement that you plan to use in the target procedure. Alternatively, you can create an appropriate index on the BY variables. For more information about indexes, see “Understanding SAS Indexes” in Chapter 26 of SAS Language Reference: Concepts.

If the procedure encounters an observation that is out of order, an error message is generated.

If you need to group data in some other order, such as chronological order, you can still use BY-group processing. To do so, process the data so that observations are arranged in contiguous groups that have the same BY-variable values and specify the NOTSORTED option in the BY statement.

Controlling BY Lines

By default, the BY statement prints a BY line above each graph that contains the variable name followed by an equal sign and the variable value. For example, if you specify BY SITE in the procedure, the default heading when the value of SITE is London would be SITE=London.

To suppress the BY line, use the NOBYLINE option in an OPTION statement.

To display only the BY value, use the NOBYLINE option and then use the #BYVAL1 substitution in a TITLE statement.

Using the BY Statement with the SGPLOT Procedure

You can use the UNIFORM= option in the PROC SGPLOT statement to produce the same group markers, the same axis scaling, or both for all graphs in a BY group. By default, the group markers and axis scales might vary from graph to graph.

Using the BY Statement with the TITLE and FOOTNOTE Statements

The TITLE and FOOTNOTE statements can automatically include the BY variable name, BY variable values, or BY lines in the text that they produce. To insert BY variable information into the text strings used by these statements, use the #BYVAR, #BYVAL, and #BYLINE substitution options. For more information, see the description for the text-string argument in “TITLE and FOOTNOTE Statements” on page 58.

FOOTNOTE Statement

Writes up to 10 lines of text at the bottom of the graph.

Valid in: anywhere in your program

Used by: SGPLOT, SGPANEL, and SGSCATTER procedures

See: “TITLE and FOOTNOTE Statements” on page 58

Syntax

FOOTNOTE<1...10> <text-options> <"text-string-1"> ... <text-options> <"text-string-n"> ;
FORMAT Statement

Associates SAS formats or user-defined formats with variables.

**Used by:** SGDESIGN, SGPANEL, SG PLOT, SGRENDER, and SGSCATTER procedures

**Details**

All features of the FORMAT statement are supported. For more information, see “FORMAT Statement” in SAS Statements: Reference.

The following SAS formats are supported by the ODS Graphics procedures:

**Table 4.1 Character Formats Supported By Java**

<table>
<thead>
<tr>
<th></th>
<th>$ASCII</th>
<th>$BINARY</th>
<th>$CHAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF</td>
<td>$HEX</td>
<td>$OCTAL</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.2 Numeric Formats Supported By Java**

<table>
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<th>BINAR Y</th>
<th>COMMA</th>
<th>COMMAX</th>
<th>COMMAX</th>
</tr>
</thead>
<tbody>
<tr>
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<td>DOLLAR</td>
<td>DOLLARX</td>
<td>E</td>
<td>EURO</td>
</tr>
<tr>
<td>EUROX</td>
<td>F</td>
<td>HEX</td>
<td>LOGPROB</td>
<td>NEGPAREN</td>
</tr>
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<td>NLMNIAUD</td>
<td>NLMNIBGN</td>
</tr>
<tr>
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<td>NLMNIEEK</td>
<td>NLMNIEGP</td>
<td>NLMNIEUR</td>
<td>NLMNIGBP</td>
</tr>
<tr>
<td>NLMNIHKD</td>
<td>NLMNIHRK</td>
<td>NLMNIHUF</td>
<td>NLMNIIDR</td>
<td>NLMNIILS</td>
</tr>
<tr>
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<td>NLMNIJPY</td>
<td>NLMNIKRW</td>
<td>NLMNILTL</td>
<td>NLMNILVL</td>
</tr>
<tr>
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<td>NLMNIMXN</td>
<td>NLMNIMYR</td>
<td>NLMNINOK</td>
<td>NLMNINZD</td>
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<tr>
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<td>NLMNIRUB</td>
<td>NLMNIRUR</td>
<td>NLMNISEK</td>
</tr>
<tr>
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<td>NLMNISKK</td>
<td>NLMNITHB</td>
<td>NLMNITRY</td>
<td>NLMNITWD</td>
</tr>
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<td>NLMNIZAR</td>
<td>NLMNLAED</td>
<td>NLMNLAUD</td>
<td>NLMNLBGN</td>
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</tr>
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<td>NLMNLKRW</td>
<td>NLMNLLTL</td>
<td>NLMNLLVL</td>
</tr>
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<td>----------</td>
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<td>----------</td>
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<td>NLMNY</td>
<td>NLMNYI</td>
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<td>NLPCTI</td>
<td>NLPVALUE</td>
<td>NUMX</td>
</tr>
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<td>PERCENTN</td>
<td>PVALUE</td>
<td>ROMAN</td>
</tr>
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<td>RSTDOCYY</td>
<td>RSTDONYN</td>
<td>RSTDOPNY</td>
<td>RSTDOPYN</td>
</tr>
<tr>
<td>RSTDOPYY</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4.3**  Date and Time Formats Supported By Java

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<th>AFRDFDD</th>
<th>AFRDFDE</th>
<th>AFRDFN</th>
<th>AFRDFDT</th>
<th>AFRDFDWN</th>
</tr>
</thead>
<tbody>
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<td>AFRDFMY</td>
<td>AFRDFWX</td>
<td>AFRDFWKX</td>
<td>CATDFDD</td>
</tr>
<tr>
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<td>CATDFDN</td>
<td>CATDFDT</td>
<td>CATDFDW</td>
<td>CATDFMN</td>
</tr>
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<td>CATDFWX</td>
<td>CATDFKW</td>
<td>CRODFD</td>
<td>CRODFDE</td>
</tr>
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<td>CRODFWN</td>
<td>CRODFMN</td>
<td>CRODFMY</td>
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<td>CRODFWKX</td>
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<td>DANDFMY</td>
<td>DANDFWX</td>
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<td>DATETIME</td>
<td>DAY</td>
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<td>NORDFMM</td>
<td>NORDFMY</td>
<td>NORDFWDX</td>
</tr>
</tbody>
</table>
### LABEL Statement

Associates descriptive labels with variables.

**Used by:** SGDESIGN, SGPANEL, SGPLOT, SGRENDER, and SGSCATTER procedures

**Details**

All features of the LABEL statement are supported. For more information, see “LABEL Statement” in *SAS Statements: Reference*.

### ODS GRAPHICS Statement

Specifies the settings for your graphics output.

**Valid in:** anywhere in your program

**Used by:** SGDESIGN, SGPANEL, SGPLOT, SGRENDER, and SGSCATTER procedures
Details

For information about using the ODS GRAPHICS statement, see “Using the ODS GRAPHICS Statement” on page 651. For the complete statement syntax, see “ODS GRAPHICS Statement” in SAS Output Delivery System: User's Guide.

TITLE and FOOTNOTE Statements

The TITLE and FOOTNOTE statements control the content, appearance, and placement of title and footnote text.

Valid in: anywhere in your program

Used by: SGPLOT, SGPANEL, and SGSCATTER procedures

Syntax

TITLE<1...10> <text-options> <"text-string–1"> ... <text-options> <"text-string–n"> ;

FOOTNOTE<1...10> <text-options> <"text-string–1"> ... <text-options > <"text-string–n"> ;

Required Argument

text-string

is a text string that can contain up to 200 characters. You must enclose text strings in either single or double quotation marks. The text appears exactly as you type it in the statement, including uppercase and lowercase characters and spaces. Titles and footnotes automatically wrap to additional lines if necessary.

To use single quotation marks or apostrophes within the title, you can either:

• use a pair of single quotation marks together:

  footnote 'All''s well that ends well';

• enclose the text in double quotation marks:

  footnote "All's well that ends well";

Because the FOOTNOTE and TITLE statements concatenate all text strings, the strings must contain the correct spacing. With a series of strings, add spaces to the beginning of a text string rather than at the end, as in this example:

footnote color=red "Sales:" color=blue " 2000";

With fonts that support Unicode, you can produce specific characters by specifying a hexadecimal value. A trailing x identifies a string as a hexadecimal value. You must also enclose the character specification in a special ODS handler string, in the format (*ESC*){unicode 'hexadecimal-value'x}. For example:

title "Regression with Confidence Limits ((*ESC*){unicode '03B1'x}=.05 )";

This statement produces the title, "Regression with Confidence Limits (α =.05)" because '03B1'x is the hexadecimal value for the lowercase Greek letter alpha in all Unicode fonts.

In addition, if you are using a BY statement, then you can include special options. For more information, see “Substituting BY Line Values in a Text String” on page 62.

Note: The LISTING destination does not honor the (*ESC*) statement.
Optional Arguments

**BOLD**
specifies that the font weight is bold for the text string.

**Default:** For titles, the default font weight is specified by the FONTWEIGHT attribute of the GraphTitleText style element in the current style.

For footnotes, the default font weight is specified by the FONTWEIGHT attribute of the GraphFootnoteText style element in the current style.

**BCOLOR= color**
specifies the background color for a box that you created with the BOX= option. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

This option has no effect if you do not also specify the BOX= option. By default, the background color is the same color as the background of the graph.

**Alias:** BC=

**BOX= 1 | 2 | 3 | 4**
draws a box around one line of text. Specify a value between 1 and 4, where 1 specifies the thinnest line and 4 specifies the thickest line. Only the last BOX= option is used. The color of the box outline is determined by the GraphBorderLines element of the current style.

**Alias:** BO

**BSPACE= numeric-value<units>**
specifies the amount of space between the text and the border of a box that you create with the BOX= option.

You can also specify the unit of measure. See “Measurement Units for TITLE and FOOTNOTE Statement Options” on page 63 for a list of the units that are supported.

If you do not specify a unit, then the size of the space is approximately $12n$ points. For example, if you specify BSPACE=2, then the space is approximately 24 points.

**Alias:** BS=

**Default:** 0

**COLOR= color**
specifies the color for the text. The COLOR= option affects all of the text strings that follow it in your TITLE or FOOTNOTE statement. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

You can use multiple colors by specifying multiple COLOR= options. For example, the following code produces a title where the first word is red and the second word is blue:

```plaintext
title color=red "Red" color=blue " Blue";
```

**Alias:** C=

**Default:** For titles, the default text color is specified by the COLOR attribute of the GraphTitleText style element in the current style.

For footnotes, the default font color is specified by the COLOR attribute of the GraphFootnoteText style element in the current style.

**FONT= "system-font"**
specifies a system font for the text string.
Alias:  F=
Default: For titles, the default font is specified by the FONTFAMILY attribute of the GraphTitleText style element in the current style.
For footnotes, the default font is specified by the FONTFAMILY attribute of the GraphFootnoteText style element in the current style.
Note: SAS/GRAPH software fonts such as SWISS cannot be used with statistical graphics procedures.

**HEIGHT= numeric-value <units>**
specifies the size of the text. You can also specify the unit of measurement. The following table lists the measurement units that are supported:

If you do not specify a unit, then the size of the text is approximately 12n points. For example, if you specify HEIGHT=2, then the text size is approximately 24 points.

Alias:  H=
Default: For titles, the default font size is specified by the FONTSIZE attribute of the GraphTitleText style element in the current style.
For footnotes, the default font size is specified by the FONTSIZE attribute of the GraphFootnoteText style element in the current style.

ITALIC
specifies that the font style is italic for the text string.

Default: For titles, the default font style is specified by the FONTSTYLE attribute of the GraphTitleText style element in the current style.
For footnotes, the default font style is specified by the FONTSTYLE attribute of the GraphFootnoteText style element in the current style.

JUSTIFY= LEFT | CENTER | RIGHT
specifies the alignment of the text string. You can specify one of the following values:

LEFT | L
    aligns the text to the left.

CENTER | C
    aligns the text in the center.

RIGHT | R
    aligns the text to the right.

The JUSTIFY= option affects all of the text strings that follow it in your TITLE or FOOTNOTE statement. You can specify multiple alignments by using more than one JUSTIFY= option. For example, the following code creates a footnote where the first string is aligned to the left and the second string is aligned to the right:

```
footnote justify=left "Example 2" justify=right "Graph 3";
```

Alias:  J=

LSPACE= numeric-value <units>
specifies the amount of space above the title text and below the footnote text.

You can also specify the unit of measure. See “Measurement Units for TITLE and FOOTNOTE Statement Options” on page 63 for a list of the units that are supported.
If you do not specify a unit, then the size of the space is approximately $12n$ points. For example, if you specify LSPACE=2, then the space is approximately 24 points.

**Alias:** LS  
**Default:** 0  
**Interaction:** The LSPACE= option has no effect if you also specify the BOX= option.

### Details

**Summary of Text Options**

text-options can be one or more of the following:

- appearance options:
  - BOLD
  - COLOR=color
  - FONT="system-font"
  - HEIGHT=numeric-value <units>
  - ITALIC
- placement and spacing options:
  - JUSTIFY= LEFT | CENTER | RIGHT
  - LSPACE= numeric-value <units>
- boxing and drawing options:
  - BCOLOR=color
  - BOX=numeric-value
  - BSPACE=numeric-value <units>

The following options are not supported by statistical graphics procedures:

- ANGLE=
- BLANK=
- DRAW=
- LANGLE=
- LINK=
- MOVE=
- ROTATE=
- UNDERLIN=
- WRAP

### Using TITLE and FOOTNOTE Statements

You can define TITLE and FOOTNOTE statements anywhere in your SAS program. They are global and remain in effect until you cancel them or until you end your SAS session. All currently defined FOOTNOTE and TITLE statements are displayed automatically.

You can define up to ten TITLE statements and ten FOOTNOTE statements in your SAS session. A TITLE or FOOTNOTE statement without a number is equivalent to a
TITLE1 or FOOTNOTE1 statement. It is not necessary to use sequential statement numbers—skipping a number in the sequence leaves a blank line.

You can use an unlimited number of text strings and options. Ensure that each option is placed before the text strings that you want it to modify.

The most recently specified TITLE or FOOTNOTE statement of any number completely replaces any other TITLE or FOOTNOTE statement of that number. In addition, it cancels all TITLE or FOOTNOTE statements of a higher number. For example, if you define TITLE1, TITLE2, and TITLE3, then submitting a new TITLE2 statement cancels TITLE3.

The most recently specified TITLE or FOOTNOTE statement of any number completely replaces any other TITLE or FOOTNOTE statement of that number. In addition, it cancels all TITLE or FOOTNOTE statements of a higher number. For example, if you define TITLE1, TITLE2, and TITLE3, resubmitting the TITLE2 statement cancels TITLE3.

title4;

But remember that this cancels all other existing statements of a higher number.

To cancel all current TITLE or FOOTNOTE statements, use the TITLE1; or FOOTNOTE1; statement:

**Substituting BY Line Values in a Text String**

These options are available if a BY statement is in effect:

#BYLINE

substitutes the entire BY line without leading or trailing blanks for #BYLINE in the text string. The BY line uses the format `variable-name=value`.

#BYVALn | #BYVAL(BY-variable-name)

substitutes the current value of the specified BY variable for #BYVAL in the text string. Specify the variable with one of these:

- `n` specifies a variable by its position in the BY statement. For example, #BYVAL2 specifies the second variable in the BY statement.

- `BY-variable-name` specifies a variable from the BY statement by its name. For example, #BYVAL(YEAR) specifies the BY variable, YEAR. `variable-name` is not case sensitive.

#BYVARn | #BYVAR(BY-variable-name)

substitutes the name of the BY-variable or the label associated with the variable (whatever the BY line would normally display) for #BYVAR in the text string. Specify the variable with one of these:

- `n` specifies a variable by its position in the BY statement. For example, #BYVAR2 specifies the second variable in the BY statement.

- `BY-variable-name` specifies a variable from the BY statement by its name. For example, #BYVAR(SITES) specifies the BY variable, SITES. `Variable-name` is not case sensitive.

*Note:* A BY variable name displayed in a title or footnote is always in uppercase. If a label is used, then it appears as specified in the LABEL statement.
To use the #BYVAR and #BYVAL substitutions, insert the item in the text string at the position where you want the substitution text to appear. Both #BYVAR and #BYVAL specifications must be followed by a delimiting character. The character can be either a space or other non-alphanumeric character, such as a quotation mark. If no delimiting character is provided, then the specification is ignored and its text remains intact and is displayed with the rest of the string. To allow a #BYVAR or #BYVAL substitution to be followed immediately by other text, with no delimiter, use a trailing dot (as with macro variables). The trailing dot is not displayed in the resolved text. If you want a period to be displayed as the last character in the resolved text, use two dots after the #BYVAR or #BYVAL substitution.

The substitution for #BYVAR or #BYVAL does not occur in the following cases:

- if you use a #BYVAR or #BYVAL specification for a variable that is not named in the BY statement. For example, you might use #BYVAL2 when there is only one BY-variable or #BYVAL(ABC) when ABC is non-existent or is not a BY-variable.
- if there is no BY statement at all

For both cases, no error or warning message is issued. The option specification is displayed with the rest of the string. The graph continues to display a BY line at the top of the page unless you suppress it by using the NOBYLINE option in an OPTION statement.

**Measurement Units for TITLE and FOOTNOTE Statement Options**

Some of the options in the TITLE and FOOTNOTE statements give you the option to specify the unit of measurement. The following table lists the units that are supported:

**Table 4.4 Measurement Units**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM</td>
<td>centimeters</td>
</tr>
<tr>
<td>IN</td>
<td>inches</td>
</tr>
<tr>
<td>PCT or %</td>
<td>percentage</td>
</tr>
<tr>
<td>PT</td>
<td>point size, calculated at 100 dots per inch</td>
</tr>
</tbody>
</table>

WHERE Statement

Selects observations from SAS data sets that meet a particular condition.

**Used by:** SGDESIGN, SGPANEL, SGPLOT, SGRENDER, and SGSCATTER procedures

**Details**

All features of the WHERE statement are supported. For more information, see “WHERE Statement” in SAS Statements: Reference.

**Note:** When the WHERE statement is used with the SGDESIGN procedure, you must specify the data set. This is required even though a data set has already been defined for the ODS Graphics Designer (SGD) file that is rendered by the procedure.
Part 2

SAS ODS Graphics Procedures

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Chapter 5
SGDESIGN Procedure

Overview: SGDESIGN Procedure

The SGDESIGN procedure produces a graph from one or more input SAS data sets and a user-defined ODS Graphics Designer (SGD) file. The SGD file is created with the SAS ODS Graphics Designer application.
Here is example output:

**Display 5.1 Example PROC SGDESIGN Output**

In the example, the data columns and title text are provided dynamically with the DYNAMIC statement.

By default, the SGDESIGN procedure uses the data set or data sets that are currently defined in the SGD file. If the SGD file has been defined with dynamic variables, then you can substitute a different value for a variable by using the DYNAMIC statement. For more information, see “Dynamic Variable Concepts” on page 69.

**Note:** The procedure applies the style of the active destination rather than the style that is currently defined in the SGD file.


---

**Concepts: SGDESIGN Procedure**

**General Concepts**

Here are the general concepts for the SGDESIGN procedure:

- The SGDESIGN procedure requires an SGD file that was created with the ODS Graphics Designer application.

- By default, the SGDESIGN procedure uses the data set or sets that are currently referenced by the SGD file. You have the option to specify an alternate data set.

- You can produce a graph from a different data set as long as the new data set has variables of the same name and type. For an example, see “Example 2: Creating a Graph That Uses a Different Data Set” on page 74.
Note: If the SGD file was created using shared variables, then you can create a graph from a different data set regardless of the name of the variables. For more information, see “Dynamic Variable Concepts” on page 69.

- You can render the graph to any ODS destination by using standard ODS syntax. When the graph is rendered, the procedure applies the style of the active destination rather than the style that was used in the SGD file.
- As with the other ODS Graphics procedures, the ODS GRAPHICS statement is always ON. However, you can use the ODS GRAPHICS statement options to control many aspects of your graphics. For more information, see “Using the ODS GRAPHICS Statement” on page 651.
- The SGDESIGN procedure supports SAS statements such as FORMAT, LABEL, BY, and WHERE. These statements can be applied only if the DATA= option is used with the procedure.

For an example that uses the WHERE statement, see “Example 1: Creating a Graph and Subsetting the Data” on page 73.

**Dynamic Variable Concepts**

A dynamic variable is a variable that is defined in a template with the DYNAMIC statement and that can be initialized at template run time. If the SGD file has been defined with dynamic variables, then you can set or initialize these variables by using the DYNAMIC statement with the SGDESIGN procedure.

For more information about dynamic variables, see *SAS Graph Template Language: Reference*.

Dynamic variables can be created in ODS Graphics Designer in two ways:

- shared variables

  In ODS Graphics Designer, graphs can be defined to use shared variables. A shared variable is a feature of ODS Graphics Designer that enables users to reuse graphs and specify different variables from the same or from a different data set. The shared variable is a type of dynamic variable that can be assigned the name of a data column.

  In ODS Graphics Designer, shared variables are named V1, V2, V3, and so on. Each shared variable corresponds to a column in the data set.

  If the SGD file has been defined with a shared variable, you can substitute a different column for the shared variable when you run the SGDESIGN procedure. When you use the SGDESIGN procedure, the column that you substitute must be the same type as the column specified in the SGD file.

  For example, suppose that your SGD file is a shared-variable graph in which V1 is assigned MPG_City, which is a numeric data type. When you run the SGDESIGN procedure, you can substitute MPG_Highway because it is also a numeric data type.

  In the procedure, you would specify `DYNAMIC V1="MPG_Highway"`.

  The column that you substitute can reside in the same or in a different data set. (To use a different data set, you specify the data set by using the DATA= option.)

- dynamic content in text elements

  In ODS Graphics Designer, you can insert dynamic content into textual elements such as titles and footnotes. This dynamic content is specified by using the expression `dyn(DNAME)` where `DNAME` is a name that you want to associate with...
the text that is generated. You then substitute a character string or numeric constant when you run the graph using the SGDESIGN procedure.

For example, suppose the SGD file has the following title: Weight in dyn(DWEIGHT). When you run the graph with the SGDESIGN procedure, you can specify DYNAMIC DWEIGHT="Pounds". The entire string dyn(DWEIGHT) is replaced with the specified value. In the resulting graph, the title becomes Weight in Pounds.

**Note:**

- In ODS Graphics Designer, you can see the dynamic variables that have been defined for a graph when you view the graph’s template code (from the View menu).

- For every graph that you create in ODS Graphics Designer, the designer defines dynamic variables automatically for every role assignment in the graph. In the template code, the names of these automatic variables begin with an underscore (for example, dynamic _HEIGHT).

**CAUTION:**

Substituting columns for these automatic dynamic variables can be complex and prone to error, and is not a supported usage of the SGDESIGN procedure. When using the SGDESIGN procedure, it is strongly recommended that you limit your use of dynamic variables to the shared variables and dynamic content that are described in this topic.

In summary, you can use dynamic variables to generate the same graph with different data variables, a different data set, and different text elements.

For more information about shared variables and dynamic content that are defined in the ODS Graphics Designer, see Chapter 19, “Using Shared Variables in Graphs,” in *SAS ODS Graphics Designer: User's Guide.*

---

**Syntax: SGDESIGN Procedure**

```
PROC SGDESIGN SGD= "SGD-file-specification" < option(s)>;
    DYNAMIC dynamic-var–1="assigned-value–1" <dynamic-var–n="assigned-value–n">;
```

---

**PROC SGDESIGN Statement**

Renders a graph (SGD file) that was created by using ODS Graphics Designer. The statement also enables you to specify a data set and other options.

**Restrictions:**

- On z/OS systems, the SGDESIGN procedure does not render SGD files that were generated with the previous release of the ODS Graphics Designer. You must open the SGD file in the 9.3 version of the ODS Graphics Designer (on a Windows or UNIX system). Then save the file in the 9.3 format.

- On z/OS systems, SGD files must be transferred to the HFS file system of UNIX System Services in order to be rendered by the SGDESIGN procedure.
**Requirement:** An input SGD file specification is required. If the SGD file was created to use a temporary data set, such as a data set in the SAS Work library, then that data set must exist in the current SAS session in order for the graph to be rendered. The data set might need to be re-created in the current SAS session.

**Syntax**

```sql
PROC SGDESIGN SGD= "SGD-file-specification"
  <CONTENT>
  <DATA= input-data-set>
  <DESCRIPTION= "text-string">
  <LIBNAME= library-name>
  ;
```

**Summary of Optional Arguments**

- **CONTENT**
  outputs important information about the SGD file into the SAS log.
- **DATA= input-data-set**
  specifies the SAS data set that contains the variables to process.
- **DESCRIPTION= "text-string"**
  specifies a description for the output image.
- **LIBNAME= library-name**
  specifies an alternate library for all data sets that are associated with the SGD file.

**Required Argument**

- **SGD= "SGD-file-specification"**
  specifies the SGD file to use for the graph. Include the complete path and filename enclosed in single or double quotation marks.

  If you do not specify the full path, then the procedure looks for the file in the SAS current working directory. The SAS current directory is the same directory in which you start your SAS session. If you are running SAS with the Windowing environment in the Windows operating system, then the current directory is displayed in the status bar at the bottom of the main SAS window.


**Optional Arguments**

- **CONTENT**
  outputs important information about the SGD file into the SAS log. The information includes data set names, library names, variable names (including those for dynamic variables), and the ODS style.

  **Note:** When the CONTENT option is used, no graphics output is produced.

- **DATA= input-data-set**
  specifies the SAS data set that contains the variables to process.

  By default, the SGDESIGN procedure uses the data set or data sets that are currently defined in the SGD file. You have the option to specify an alternate data set. Only one data set can be specified here. If the SGD file uses columns from multiple data
sets, then the specified data set should contain all the columns that are required to render the graph.

Specify the full name of the SAS data set in the format `libref.data-set`. If you do not specify the library, then the procedure looks for the data set in the SAS Work library.

**DESCRIPTION=** `"text-string"`

specifies a description for the output image. The description identifies the image in the following locations:

- the Results window
- the alternate text for the image in HTML output
- the table of contents that is created by the CONTENTS option in an ODS statement

**Alias:** DES

**Default:** The default description is “The SGDesign Procedure”.

**LIBNAME=** `library-name`

specifies an alternate library for all data sets that are associated with the SGD file.

If no library is specified, then the procedure uses the library that is currently defined in the SGD file.

The data sets in the SGD file can come from multiple libraries. However, when you use the LIBNAME= option, you override all of those library names with the specified library.

---

**DYNAMIC Statement**

Assigns values to dynamic variables that have been defined in the SGD file. You can either specify variables in multiple DYNAMIC statements or specify all of your variables in a single DYNAMIC statement.

*See:* “Example 3: Using the DYNAMIC Statement to Specify a Column and a Character String” on page 74

### Syntax

```
DYNAMIC dynamic-var–1="assigned-value–1" <dynamic-var–n="assigned-value–n">;
```

### Required Argument

**dynamic-var= assigned-value**

specifies the values for one or more dynamic variables. For more information about dynamic variables, see “Dynamic Variable Concepts” on page 69.

**dynamic-var**

specifies the name of a dynamic variable.

The variable must be declared in a DYNAMIC statement within the SGD file's template. (In ODS Graphics Designer, you can see the dynamic variables that have been declared for a graph when you view the graph's template code from the **View** menu.)
assigned-value

specifies the value for the dynamic variable. If the value is a character string or a
column name, then it must be enclosed in single or double quotation marks. For
example: V1="year" and MYTITLE="Distribution of Patient Weight".

If the value is a numeric value, then you should supply a number. In this case, no
quotation marks are required. For example: BINS=5.

When the value refers to a column name, then the new column must be the same
type as the column that it replaces. For example, if V1 is a numeric type column,
then the column name that you specify must also be numeric.

When the value is a column name, the case of the string value does not matter.
For example, V1="Weight" is effectively the same as V1="WEIGHT". When the
value resolves to text that appears in the graph (for example, titles and axis
labels) the value entered is case-sensitive.

Details

When you use dynamic variables, be aware that some variables must be initialized,
whereas for others, initialization is optional. For example, suppose that the graph file
Histogram.sgd is defined with dynamic content in the title. In order to execute this SGD
file with the correct title, the dynamic variable used in the title must be initialized. (In
the example, the dynamic variable is named TITLE.)

```
proc sgdesign sgd = "Histogram.sgd";
  dynamic TITLE = "This is a Histogram";
run;
```

However, if the SGD file was created with a shared variable, then that shared variable
has already been assigned a column value in the SGD file. You do not need to specify a
value for the variable unless you want to change the column. For more information about
shared variables, see “Dynamic Variable Concepts” on page 69.

If you have multiple dynamic variables, you can either specify variables in multiple
DYNAMIC statements or specify all of your variables in a single DYNAMIC statement.
For example, the following statement specifies two variables.

```
dynamic V1="cholesterol" EXAMPLESV="Cholesterol";
```

As an alternative, you can specify the dynamic variables in multiple DYNAMIC
statements.

```
dynamic V1="cholesterol";
dynamic EXAMPLESV="Cholesterol";
```

Examples: SGDESIGN Procedure

Example 1: Creating a Graph and Subsetting the Data

**Features:** WHERE statement

This example uses a WHERE statement to subset the data. The example assumes the
existence of a graph named CarsLattice.sgd that was created based on the
SASHELP.CARS data set.
Although a data set has already been defined for the SGD file, you must specify the data set in the procedure when you use the WHERE statement.

```sas
proc sgdesign sgd="CarsLattice.sgd"
   data=sashelp.cars;
   where Origin="Asia";
run;
```

Specify the path and name that you used when you saved the SGD file. For example, the path might be "C:\SGDFiles\CarsLattice.sgd."

---

**Example 2: Creating a Graph That Uses a Different Data Set**

**Features:** subset data

You can produce a graph from a different data set as long as the new data set has variables of the same name and type. (If the SGD file was created using shared variables, then you can create a graph from a different data set regardless of the name of the variables. For more information, see “Dynamic Variable Concepts” on page 69.)

The following example creates a new data set from an existing data set. This example assumes the existence of a graph named CarsLattice.sgd that was created based on the SASHELP.CARS data set.

```sas
data sedans;
   set sashelp.cars;
   where type="Sedan";
run;
```

```sas
proc sgdesign sgd="CarsLattice.sgd" data=sedans;
run;
```

Specify the path and name that you used when you saved the SGD file. For example, the path might be "C:\SGDFiles\CarsLattice.sgd."

---

**Example 3: Using the DYNAMIC Statement to Specify a Column and a Character String**

**Features:** DYNAMIC statement

This example substitutes a column and also initializes the dynamic text for a title. The example assumes the following:

- the existence of a shared-variable graph named svExample.sgd that uses the SASHELP.CLASSFIT data set. To create this SGD file, follow the steps provided in “Example: Create a Shared-Variable Graph and Add a Dynamic Title” in Chapter 23 of *SAS ODS Graphics Designer: User's Guide*.

- in the SGD file, the shared variable V1 is set to WEIGHT.

- in ODS Graphics Designer, the title of the graph is *Distribution of dyn(EXAMPLESV)*.
Create the graph using the default data. You generate this graph only for comparison purposes.

```sas
proc sgdesign sgd="svExample.sgd"
   dynamic EXAMPLESV="Class Weight";
run;
```

1 Specify the path and name that you used when you saved the SGD file. For example, the path might be "C:\SGDFiles\svExample.sgd."

2 Though this example uses the default value for the shared variable V1 (WEIGHT), there is no default value for the dyn(EXAMPLESV) function that is used in the title. To execute this SGD file with a correct title, the dynamic expression used in the title must be initialized, as shown in the code. In the output, the title becomes Distribution of Class Weight. The “Distribution of” portion of the title was defined in the SGD file. The “Class Weight” portion is generated dynamically.

Create the graph using different data. You can create the graph using a different data set and substitute a different column for V1. You can also change the dynamic variable that is used in the title. In the output, the title is Distribution of Cholesterol.

```sas
proc sgdesign sgd="svExample.sgd"
   data=sashelp.heart;
   dynamic V1="cholesterol" EXAMPLESV="Cholesterol";
run;
```

1 Specify the path and name that you used when you saved the SGD file.

2 The CHOLESTEROL column is the same type as the WEIGHT column that was defined in the SGD file. The columns can be different as long as they are the same type (numeric in this case).
Overview: SGPANEL Procedure

The SGPANEL procedure creates a panel of graph cells for the values of one or more classification variables. For example, if a data set contains three variables (A, B and C) and you want to compare the scatter plots of B*C for each value of A, then you can use the SGPANEL to create this panel. The SGPANEL procedure creates a layout for you automatically and splits the panel into multiple graphs if necessary.

The SGPANEL procedure can create a wide variety of plot types, and overlay multiple plots together in each graph cell in the panel. It can also produce several types of layout. Here are some examples of panels that the SGPANEL procedure can create.

Table 6.1  Examples of Panels That Can Be Generated by the SGPANEL Procedure

The following code creates a panel of loess curves:

```sas
title1 "Cholesterol Levels for Age > 60";
proc sgpanel data=sashelp.heart(where=(AgeAtStart > 60)) ;
panelby sex / novarname;
loess x=weight y=cholesterol / clm;
run;
title1;
```

The following code creates a panel of vertical bar charts:

```sas
title1 "Product Sales";
proc sgpanel data=sashelp.prdsale;
panelby quarter;
rowaxis label="Sales";
vbar product / response=predict stat=mean transparency=0.3;
   barwidth=0.5 stat=mean transparency=0.3;
run;
title1;
```
The following code creates a panel of box plots in a lattice layout:

```sas
title1 "Distribution of Cholesterol Levels";
proc sgpanel data=sashelp.heart;
  panelby weight_status sex / layout=lattice novarname;
      hbox cholesterol;
run;
title1;
```

The following code creates a panel of cells with a histogram and a normal density curve:

```sas
Title1 "Weight Distribution in the Heart Study";
proc sgpanel data=sashelp.heart noautolegend;
  panelby sex / novarname;
      histogram weight;
      density weight;
run;
Title1;
```

---

Concepts: SGPANEL Procedure

### Panel Creation

The SGPANEL procedure has a required PANELBY statement that is used to define the classifier variables for the panel. This statement must be specified before any plot, axis, or legend statement or else an error occurs. You can use options in the PANELBY statement to control the attributes of the panel. For example, you can use the COLUMNS= option to specify the number of columns in the panel.

SGPANEL can use four different layouts, which are specified by the LAYOUT= option in the PANELBY statement. The layout determines how your classifier variables are used to create the panel, and also affects the number of classifier variables that you can specify.

The default layout is PANEL. With this layout, you can specify any number of classifier variables. The graph cells in the panel are arranged automatically, and the classifier values are displayed above each graph cell in the panel. When you specify multiple classifier variables, the order of the classifier variables determines how the graph cells are sorted.
Another layout is called LATTICE. This layout requires exactly two classifier variables. The values of the first variable are assigned as columns, and the values of the second variable are assigned as rows. The classifier values are displayed above the columns and to the right side of the rows.

Two additional layouts are available, which are called COLUMNLATTICE and ROWLATTICE. These layouts require exactly one classifier variable. The values of the classifier variable are assigned as cells in a single row or column.
If you have a large number of classifier variables, then the best method for creating a panel is to choose one or two classifiers for the PANELBY statement. Then specify the remaining variables in a BY statement. This method maximizes the space for the plots and generates results that are easier to interpret.

**Plot Type Compatibility**

Each graph cell in your panel contains one or more plots, and there are four basic types of plots that you can create with the SGPANEL procedure.

- **Basic plots**
  - scatter, series, step, band, bubble, high-low, needle plots, and vector plots

- **Fit and confidence plots**
  - loess, regression, and penalized B-spline curves

- **Distribution plots**
  - box plots, histograms, normal density curves, and kernel density estimates

- **Categorization plots**
  - dot plots, bar charts, and line plots

Not all of the plot types can be used together in the same PROC SGPANEL step. The following table shows which of the plot types can be used together:

<table>
<thead>
<tr>
<th></th>
<th>Basic</th>
<th>Fit and Confidence</th>
<th>Distribution</th>
<th>Categorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Fit and Confidence</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Basic</td>
<td>Fit and Confidence</td>
<td>Distribution</td>
<td>Categorization</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------------</td>
<td>--------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Categorization</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

Note: Box plots cannot be combined with any other plot types. Box plots can be overlaid with other box plots. However, overlaid box plots must have the same category variables.

If you submit a PROC SGPANEL step that combines two incompatible plot statements, then an error appears in the log.

The SGPANEL procedure draws the plots in your graph in the same order that you specify the plot statements. Because of this, it is important to consider the order of your plot statements so that your plots do not obscure one another. For example, if you specify a BAND statement after a SCATTER statement, then the band plot might obscure the markers in your scatter plot. You can also avoid obscuring your data by using the TRANSPARENCY= option to make your plots partially transparent.

**Plot Axes**

The SGPANEL procedure contains two statements that enable you to change the type and appearance for the axes of the graph cells in your panel: COLAXIS and ROWAXIS.

By default, the type of each axis is determined by the types of plots that use the axis and the data that is applied to the axis.

The SGPANEL procedure supports the following axis types:

- **Discrete**
  - The axis contains independent data values rather than a range of numeric values.
  - Each distinct value is represented by a tick mark. Discrete is the default axis type for character data.

- **Linear**
  - The axis contains a linear range of numeric values. Linear is the default axis type for numeric data.

- **Logarithmic**
  - The axis contains a logarithmic range of values. The logarithmic axis type is not used as a default.

- **Time**
  - The axis contains a range of time values. Time is the default axis type for data that uses a SAS time, date, or datetime format.

Some types of plot do not support all of the axis types. For example, needle plots cannot use a discrete vertical axis. See the documentation for each plot statement to determine whether any axis type restrictions apply.

**Panel Legends**

The SGPANEL procedure creates a legend automatically based on the plot statements and options that you specify. The automatic legend functionality determines which information is likely to be useful in the legend. You can override this behavior by
defining your own legend with the KEYLEGEND statement or by specifying the NOAUTOLEGEND option in the PROC SGPANEL statement.

You can specify the labels that represent your plots in the legend by using the LEGENDLABEL= option in the corresponding plot statements.

You can create customized legends by using one or more KEYLEGEND statements. You can specify which plot statements are assigned to the legend, and use options to control the title, location, and border of the legend. For more information, see “KEYLEGEND Statement” on page 157.

**Automatic Differentiation of Visual Attributes**

Depending on the plots and options that you specify, the SGPANEL procedure can automatically assign different style attributes to the plots in your graph. For example, if you specify two series plots, then each series plot automatically uses a different line pattern and line color by default. If different attributes are not assigned by default, you can force the procedure to assign different style attributes by using the CYCLEATTRS option in the PROC SGPANEL statement. You can also disable automatic attribute differentiation by using the NOCYCLEATTRS option in the PROC SGPANEL statement.

**Syntax: SGPANEL Procedure**

**Requirement:** The PANELBY statement and at least one plot statement are required.

**Global statements:**

- BY, FORMAT, LABEL, ODS GRAPHICS, TITLE and FOOTNOTE, WHERE
PROC SGPANEL < option(s)>;
   PANELBY variable(s) / option(s)>;
   BAND X= variable | Y= variable
       UPPER= numeric-value | numeric-variable LOWER= numeric-value | numeric-variable 
       / option(s)>;
   BUBBLE X= variable Y= variable SIZE= numeric-variable / option(s)>;
   DENSITY response-variable / option(s)>;
   DOT category-variable / option(s)>;
   HBAR category-variable / option(s)>;
   HBARPARM CATEGORY= category-variable RESPONSE= numeric-variable / option(s)>;
   HBOX analysis-variable / option(s)>;
   HIGHLOW X= variable | Y= variable
       HIGH= numeric-variable LOW= numeric-variable / option(s)>;
   HISTOGRAM response-variable / option(s)>;
   HLINE category-variable / option(s)>;
   KEYLEGEND <"name(s)" / option(s)>;
   LINEPARM X= numeric-value | numeric-variable
       Y= numeric-value | numeric-variable
       SLOPE= numeric-value | numeric-variable / option(s)>;
   LOESS X= numeric-variable Y= numeric-variable / option(s)>;
   NEEDLE X= variable Y= numeric-variable / option(s)>;
   PBSPLINE X= numeric-variable Y= numeric-variable / option(s)>;
   REFLINE value(s) / option(s)>;
   REG X= numeric-variable Y= numeric-variable / option(s)>;
   SCATTER X= variable Y= variable / option(s)>;
   SERIES X= variable Y= variable / option(s)>;
   STEP X= variable Y= variable / option(s)>;
   VBAR category-variable / option(s)>;
   VBARPARM CATEGORY= category-variable RESPONSE= numeric-variable / option(s)>;
   VBOX analysis-variable / option(s)>;
   VECTOR X= numeric-variable Y= numeric-variable / option(s)>;
   VLINE category-variable / option(s)>;
   COLAXIS <option(s)>;
   ROWAXIS <option(s)>;

PROC SGPANEL Statement

Identifies the data set that contains the plot variables. The statement also gives you the option to specify a
description, and control automatic legends and automatic attributes.

Requirement: An input data set is required.
Syntax

PROC SGPANEL <DATA= input-data-set>
     <CYCLEATTRS | NOCYCLEATTRS>
     < DATTRMAP= "attribute-map-data-set ” >
     < DESCRIPTION=“text-string” >
     <NOAUTOLEGEND>
     < PAD= dimension<units> | (pad-options)>
     < SGANNO= "annotation-data-set “ >
;

Summary of Optional Arguments

CYCLEATTRS | NOCYCLEATTRS
specifies whether plots are drawn with unique attributes in the graph.

DATA=input-data-set
specifies the SAS data set that contains the variables to process.

DATTRMAP= attribute-map-data-set
specifies the SG attribute map data set that you want to use with the
SGSCATTER procedure.

DESCRIPTION= “text-string”
specifies a description for the output image.

NOAUTOLEGEND
disables automatic legends from being generated.

PAD= dimension<units> | (pad-options)
specifies the amount of extra space that is reserved inside the border of an
annotated graph.

SGANNO= annotation-data-set
specifies the SG annotation data set that you want to use.

Optional Arguments

CYCLEATTRS | NOCYCLEATTRS
specifies whether plots are drawn with unique attributes in the graph. By default, the
SGPANEL procedure automatically assigns unique attributes in many situations,
depending on the types of plots that you specify. If the plots do not have unique
attributes by default, then the CYCLEATTRS option assigns unique attributes to
each plot in the graph. The NOCYCLEATTRS option prevents the procedure from
assigning unique attributes.

For example, if you specify the CYCLEATTRS option and you create a graph with a
SERIES statement and a SCATTER statement, then the two plots have different
colors.

If you specify the NOCYCLEATTRS option, then plots have the same attributes
unless you specify appearance options such as the LINEATTRS= option.

DATA=input-data-set
specifies the SAS data set that contains the variables to process. By default, the
procedure uses the most recently created SAS data set.

DATTRMAP= attribute-map-data-set
specifies the SG attribute map data set that you want to use with the SGSCATTER
procedure. You specify this option only if you are using an attribute map to control
visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**DESCRIPTION=“text-string”**

specifies a description for the output image. The description identifies the image in the following locations:

- the Results window
- the alternate text for the image in HTML output
- the table of contents that is created by the CONTENTS option in an ODS statement

The default description is “The SGPANEL Procedure”.

**Alias:** DES

**Note:** The name of the output image is specified by the IMAGENAME= option in the ODS GRAPHICS statement.

**Tip:** You can disable the alternate text in HTML output by specifying an empty string. That is, **DESCRIPTION=“”**.

**NOAUTOLEGEND**

disables automatic legends from being generated. By default, legends are created automatically for some plots, depending on their content. This option has no effect if you specify a KEYLEGEND statement.

**PAD= dimension<units> | (pad-options)**

specifies the amount of extra space that is reserved inside the border of an annotated graph.

You specify this option only if you are using the SG annotation feature to annotate your graph. For more information, see Chapter 10, “Annotating ODS Graphics,” on page 557.

This option creates margins around the graph for company logos, annotated notes, and so on. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Use pad options to create non-uniform padding. Edges that are not assigned padding are padded with the default amount.

**pad-options** can be one or more of the following:

- **LEFT= dimension<units>**
  
specifies the amount of extra space to add to the left edge.

- **RIGHT= dimension<units>**
  
specifies the amount of extra space to add to the right edge.

- **TOP= dimension<units>**
  
specifies the amount of extra space to add to the top edge.

- **BOTTOM= dimension<units>**
  
specifies the amount of extra space to add to the bottom edge.

**SGANNO= annotation-data-set**

specifies the SG annotation data set that you want to use. You specify this option only if you are using the SG annotation feature to annotate your graph. For more information, see Chapter 10, “Annotating ODS Graphics,” on page 557.
PANELBY Statement

Specifies one or more classification variables for the panel, the layout type, and other options for the panel.

Syntax

PANELBY variable(s) <option(s)>;

Summary of Optional Arguments

- **BORDER | NOBORDER**
  specifies whether borders are displayed around each cell in the panel.

- **COLHEADERPOS= TOP | BOTTOM | BOTH**
  specifies the location of the column headings in the panel.

- **COLUMNS= n**
  specifies the number of columns in the panel.

- **LAYOUT= LATTICE | PANEL | COLUMNLATTICE | ROWLATTICE**
  specifies the type of layout that is used for the panel.

- **MISSING**
  processes missing values as a valid classification value and creates cells for it.

- **NOVARNAME**
  removes the variable names from the cell headings of a panel layout, or from the row and column headings of a lattice layout.

- **ONEPANEL**
  places the entire panel in a single output image.

- **ROWHEADERPOS= LEFT | RIGHT | BOTH**
  specifies the location of the row headings in the panel.

- **ROWS= n**
  specifies the number of rows in the panel.

- **SPACING= n**
  specifies the number of pixels between the rows and columns in the panel.

- **SPARSE**
  enables the SGPANEL procedure to create empty cells for crossings of the classification variables that are not present in the input data set.

- **START= TOPLEFT | BOTTOMLEFT**
  specifies whether the first cell in the panel is placed at the upper left corner or the lower left corner.

- **UNISCALE= COLUMN | ROW | ALL**
  scales the shared axes in the panel to be identical.

Required Argument

**variable(s)**

specifies one or more classification variables for the panel.
Optional Arguments

BORDER | NOBORDER
specifies whether borders are displayed around each cell in the panel. BORDER adds
the borders. NOBORDER removes the borders. Depending on the current ODS style,
The borders might be present by default.

COLHEADERPOS= TOP | BOTTOM | BOTH
specifies the location of the column headings in the panel. Specify one of the
following values:

TOP
places column headings at the top of each column.

BOTTOM
places column headings at the bottom of each column.

BOTH
places column headings at the top and bottom of each column.

Default: TOP

Interaction: This option has no effect if the panel uses the PANEL layout.

COLUMNS= n
specifies the number of columns in the panel. By default, the number of columns is
determined automatically based on the number of classifier values and the layout
type.

Tip: The SGPANEL procedure automatically splits the panel into multiple graphs
(pages) as needed when your panel contains a large number of cells. You can
control the number of cells in each graph by using the COLUMNS= and the
ROWS= options.

LAYOUT= LATTICE | PANEL | COLUMNLATTICE | ROWLATTICE
specifies the type of layout that is used for the panel. Select one of the following
values:

LATTICE
when you specify two classification variables, arranges the cells so that the
values of the first variable are columns and the values of the second variable are
rows. You can use LATTICE only when you specify exactly two classification
variables.

PANEL
arranges the cells in rows and columns. The headings for each cell are placed at
the top of the cell.

COLUMNLATTICE
arranges the cells in a single row. You can use the COLUMNLATTICE layout
only with a single classification variable.

ROWLATTICE
arranges the cells in a single column. You can use the ROWLATTICE layout
only with a single classification variable.

Default: PANEL

MISSING
processes missing values as a valid classification value and creates cells for it. By
default, missing values are not processed as a classification value.

NOVARNAME
removes the variable names from the cell headings of a panel layout, or from the row
and column headings of a lattice layout. For example, a row heading might
“NorthEast” instead of “Region=NorthEast” when you specify the NOVARNAME option.

**ONEPANEL**
places the entire panel in a single output image. If you do not specify this option, then the panel is automatically split into multiple images as appropriate.

**Interactions:**
- When you use ONEPANEL with the PANEL layout, only one of the ROWS= and COLUMNS= options can be used. If you specify both options, then the value for COLUMNS= is used.
- When you use ONEPANEL with the LATTICE layout, the ROWS= and COLUMNS= options have no effect.

**Note:** This option is recommended only for panels with a small number of cells. If your panel is too large for the output image, then a blank image is created.

**ROWHEADERPOS= LEFT | RIGHT | BOTH**
specifies the location of the row headings in the panel. Specify one of the following values:

- **LEFT**
  places row headings at the left side of each row.

- **RIGHT**
  places row headings at the right side of each row.

- **BOTH**
  places row headings at the left side and the right side of each row.

**Default:** RIGHT

**Interaction:** This option has no effect if the panel uses the PANEL layout.

**ROWS= n**
specifies the number of rows in the panel. By default, the number of rows is determined automatically based on the number of classifier values and the layout type.

**Tip:** The SGPANEL procedure automatically splits the panel into multiple graphs (pages) as needed when your panel contains a large number of cells. You can control the number of cells in each graph by using the COLUMNS= and the ROWS= options.

**SPACING= n**
specifies the number of pixels between the rows and columns in the panel.

**Default:** 0

**SPARSE**
enables the SGPANEL procedure to create empty cells for crossings of the classification variables that are not present in the input data set. By default, empty cells are not created for the panel layout.

**Interaction:** This option has no effect if you specify LAYOUT=LATTICE.

**START= TOPLEFT | BOTTOMLEFT**
specifies whether the first cell in the panel is placed at the upper left corner or the lower left corner. Specify one of the following values:

- **TOPLEFT**
  places the cell for the first data crossing in the upper left corner.

  Cells are placed from left to right, starting in the top row. Each additional row is placed below the previous row.
The following figure shows the placement of nine cells in a panel where START= TOPLEFT:

```
   1 2 3
   4 5 6
   7 8 9
```

BOTTOMLEFT
places the cell for the first data crossing in the lower left corner. Cells are placed from left to right, starting in the bottom row. Each additional row is placed above the previous row.

The following figure shows the placement of nine cells in a panel where START=BOTTOMLEFT:

```
   7 8 9
   4 5 6
   1 2 3
```

**Default:** TOPLEFT

**UNISCALE= COLUMN | ROW | ALL**
scales the shared axes in the panel to be identical. Specify one of the following values:

- **COLUMN**
scales all of the column axes in the panel to be identical.

- **ROW**
scales all of the row axes in the panel to be identical.

- **ALL**
scales all of the column axes to be identical, and also scales all of the row axes to be identical.

**Default:** ALL

---

### BAND Statement

Creates a band that highlights part of the plot.

**Restriction:** The axis that the UPPER and LOWER values are placed on cannot be a discrete axis. For example, if you specify a variable for Y, the plot cannot use a discrete horizontal axis.

**Note:** The input data should be sorted by the X or Y variable. If the data is not sorted, the graph might produce unpredictable results.

**Example:** "About Band Plots" on page 20
Syntax

**BAND** X= variable | Y= variable
UPPER= numeric-value | numeric-variable
LOWER= numeric-value | numeric-variable
</option(s)>;

**Summary of Optional Arguments**

**Band options**

- **DISCRETEOFFSET= numeric-value**
  specifies an amount to offset all bands from discrete X or Y tick values.

- **FILL | NOFILL**
  specifies whether the area fill is visible.

- **FILLATTRS= style-element | (COLOR= color)**
  specifies the appearance of the area fill for the band.

- **LINEATTRS= style-element <(options)> | (options)**
  specifies the appearance of the lines in the plot.

- **MODELNAME= "plot-name"**
  specifies that the band should be interpolated in the same way as the specified plot.

- **NOEXTEND**
  when you specify numeric values for UPPER= and LOWER=, specifies that the band does not extend beyond the first and last data points in the plot.

- **NOMISSINGGROUP**
  specifies that missing values of the group variable are not included in the plot.

- **OUTLINE | NOOUTLINE**
  specifies whether the outlines of the band are visible.

- **TYPE= SERIES | STEP**
  specifies how the data points for the lower and upper band boundaries are connected.

**Label options**

- **CURVELABELATTRS= style-element <(options)> | (options)**
  specifies the appearance of the labels in the plot when you specify a curve label.

- **CURVELABELLOWER = "text-string"**
  adds a label to the lower edge of the band.

- **CURVELABELPOS= MIN | MAX | START | END**
  specifies the location of the curve label.

- **CURVELABELUPPER = "text-string"**
  adds a label to the upper edge of the band.

**Plot options**

- **ATTRID= variable**
  specifies the value of the ID variable in an attribute map data set.

- **GROUP= variable**
  specifies a variable that is used to group the data.

- **LEGENDLABEL= "text-string"**
  specifies a label that identifies the elements from the band plot in the legend.

- **NAME= "text-string"**
specifies a name for the plot.

\texttt{TRANSPARENCY=} \texttt{numeric-value}

specifies the degree of transparency for the area fill.

**Required Arguments**

\texttt{X=} \texttt{variable} | \texttt{Y=} \texttt{variable}

specifies a variable that is used to plot the band along the x or y axis.

\texttt{LOWER=} \texttt{numeric-value} | \texttt{numeric-variable}

specifies the lower value for the band. You can specify either a constant numeric value or a numeric variable.

\texttt{UPPER=} \texttt{numeric-value} | \texttt{numeric-variable}

specifies the upper value for the band. You can specify either a constant numeric value or a numeric variable.

**Optional Arguments**

\texttt{ATTRID=} \texttt{variable}

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

\texttt{CURVELABELATTRS=} \texttt{style-element <(options)> | (options)}

specifies the appearance of the labels in the plot when you specify a curve label. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

\texttt{CURVELABELATTRS=} \texttt{GraphTitleText}

\texttt{options} can be one or more of the following:

\texttt{COLOR=} \texttt{color}

specifies the color of the line label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of \textit{SAS/GRAPH: Reference}.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\texttt{n} style elements in the current style.

\texttt{FAMILY=} \texttt{"font-family"}

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of \textit{SAS Language Reference: Concepts}.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

\texttt{SIZE=} \texttt{n <units>}

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE=** ITALIC | NORMAL
specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT=** BOLD | NORMAL
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:

\[
\text{CURVELABELATTRS=}(\text{Color=Green Family=Arial Size=8 Style=Italic Weight=Bold})
\]

**Default:** The default style element is GraphValueText.

**Interaction:** This option has no effect unless CURVELABELLOWER or CURVELABELUPPER is also specified.

**CURVELABELLOWER = “text-string”**
adds a label to the lower edge of the band. Specify the label text.

**CURVELABELPOS=** MIN | MAX | START | END
specifies the location of the curve label. Specify one of the following values:

- **MIN** places the label at the part of the curve closest to the minimum X axis value.
- **MAX** places the label at the part of the curve closest to the maximum X axis value.
- **START** places the curve label at the first point on the curve.
- **END** places the curve label at the last point on the curve.

**Default:** END

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**CURVELABELUPPER = “text-string”**
adds a label to the upper edge of the band. Specify the label text.

**DISCRETEOFFSET=** numeric-value
specifies an amount to offset all bands from discrete X or Y tick values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**Requirement:** This option is applicable only when the X or Y axis is discrete.

**FILL | NOFILL**
specifies whether the area fill is visible. The FILL option shows the area fill. The NOFILL option hides the area fill.

**Default:** The default status of the area fill is specified by the DisplayOpts style attribute of the GraphBand style element in the current style.

**Interactions:**
- Specifying FILL also hides any visible outlines.
- If NOFILL and NOOUTLINE are both specified, then both options are ignored.
FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the area fill for the band. You can specify the color of the
fill by using a style element or by using the COLOR= suboption. You can specify
colors using the same color schemes that are supported by SAS/GRAPH software.
For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of
the GraphConfidence style element in the current style.

For grouped data, the default color is specified by the Color attribute of the
GraphData1 ... GraphData n style elements in the current style.

Interaction: This option has no effect if you specify the NOFILL option.

GROUP= variable
specifies a variable that is used to group the data. A separate band is created for each
unique value of the grouping variable.

LEGENDLABEL= "text-string"
specifies a label that identifies the elements from the band plot in the legend. By
default, the label “Band” is used for ungrouped data, and the group values are used
for grouped data.

Interaction: The LEGENDLABEL= option has no effect if you also specify the
GROUP= option in the same plot statement.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the lines in the plot. You can specify the appearance by
using a style element or by using suboptions. If you specify a style element, you can
also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute
of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphDataDefault style element in the current
style.

For grouped data, the default line thickness is specified by the LineThickness
attribute of the GraphData1 ... GraphData n style elements in the current style.
MODELNAME= "plot-name"
  specifies that the band should be interpolated in the same way as the specified plot. If you do not specify the MODELNAME option, then the band is interpolated in the same way as a series plot.

NAME= "text-string"
  specifies a name for the plot. You can use the name to refer to this plot in other statements.
  \textbf{Note}: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOEXTEND
  when you specify numeric values for UPPER= and LOWER=, specifies that the band does not extend beyond the first and last data points in the plot. By default, the band extends to the edges of the plot area.
  \textbf{Interaction}: This option has no effect if you do not specify numeric values for the UPPER= and LOWER= options.

NOMISSINGGROUP
  specifies that missing values of the group variable are not included in the plot.

OUTLINE | NOOUTLINE
  specifies whether the outlines of the band are visible. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.
  \textbf{Default}: The default status of the band outlines is specified by the DisplayOpts attribute of the GraphBand style element in the current style.
  \textbf{Interactions}: Specifying OUTLINE also hides the fill color.
  If NOOUTLINE and NOFILL are both specified, then both options are ignored.

TRANSPARENCY= numeric-value
  specifies the degree of transparency for the area fill. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
  \textbf{Default}: 0.0

TYPE= SERIES | STEP
  specifies how the data points for the lower and upper band boundaries are connected. You can specify one of the following:

  \begin{itemize}
    \item \texttt{SERIES}
      the data points are connected directly using line segments, as in a series plot.
    \item \texttt{STEP}
      the data points are connected using a step function, as in a step plot.
  \end{itemize}
  \textbf{Default}: \texttt{SERIES}

\section{Details}

The MODELNAME= option fits a band to another plot. This is particularly useful for plots that use a special interpolation such as step plots.

The following code fragment fits a band to a step plot:

\begin{verbatim}
  band x=t upper=ucl lower=lcl / modelname="myname" transparency=.5;
  step x=t y=survival / name="myname";
\end{verbatim}
**Figure 6.4** Fitted Band Plot Example

![Fitted Band Plot Example](image)

**BBUBBLE Statement**

Creates a bubble plot in which two variables determine the location of the bubble centers and a third variable controls the size of the bubble.

Example: “About Bubble Plots” on page 21

**Syntax**

```plaintext
BBUBBLE X= variable Y= variable SIZE= numeric-variable </option(s)>;
```

**Summary of Optional Arguments**

**Bubble options**

- **BRADIUSMAX= numeric-value**
  - Specifies the size of the radius of the largest bubble.
- **BRADIUSMIN= numeric-value**
  - Specifies the size of the radius of the smallest bubble.
- **FILL | NOFILL**
  - Specifies whether the bubbles are filled.
- **FILLATTRS= style-element | (COLOR= color)**
  - Specifies the appearance of the fill for the bubbles.
- **LINEATTRS= style-element <(options)> | (options)**
  - Specifies the appearance of the outlines for the bubbles.
- **OUTLINE | NOOUTLINE**
  - Specifies whether the outlines of the bubbles are visible.

**Group options**

- **NOMISSINGGROUP**
  - Specifies that missing values of the group variable are not included in the plot.

**Label options**

- **DATALABEL <= variable>**
displays a label for each data point.

**DATALABELATTRS=** \( \text{style-element} \langle \text{options} \rangle \mid \langle \text{options} \rangle \)

specifies the appearance of the labels in the plot when you use the **DATALABEL=** option.

**Plot options**

**ATTRID=** \textit{variable}

specifies the value of the ID variable in an attribute map data set.

**GROUP=** \textit{variable}

specifies a variable that is used to group the data.

**LEGENDLABEL=** \textit{“text-string”}

specifies the label that identifies the bubble plot in the legend.

**NAME=** \textit{“text-string”}

specifies a name for the plot.

**TRANSPARENCY=** \textit{numeric-value}

specifies the degree of transparency for the fill and outline of the bubbles.

**URL=** \textit{character-variable}

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Required Arguments**

**X=** \textit{variable}

specifies the variable for the X axis.

**Y=** \textit{variable}

specifies the variable for the Y axis.

**SIZE=** \textit{numeric-variable}

specifies the variable that controls the size of the bubbles. The minimum and maximum values automatically provide the range that is used to determine bubble sizes. You can control this range manually by using the **BRADIUSMAX** and **BRADIUSMIN** options.

**Optional Arguments**

**ATTRID=** \textit{variable}

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BRADIUSMAX=** \textit{numeric-value}

specifies the size of the radius of the largest bubble. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Restriction:** The **BRADIUSMAX=** value must be greater than the **BRADIUSMIN=** value if one is specified. If **BRADIUSMAX** is not greater, an error is generated and a message is written to the SAS log.

**Note:** If you specify the maximum size as a percentage, this is interpreted as a percentage of the graph's height.

**BRADIUSMIN=** \textit{numeric-value}

specifies the size of the radius of the smallest bubble. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
**Restriction:** The BRADIUSMIN= value must be smaller than the BRADIUSMAX= value if one is specified. If BRADIUSMIN is not smaller, an error is generated and a message is written to the SAS log.

**Note:** If you specify the minimum size as a percentage, this is interpreted as a percentage of the graph's height.

**DATALABEL <= variable>**

Displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

**DATALABELATTRS= style-element (options) | (options)**

Specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

**DATALABELATTRS=GraphLabelText**

*options* can be one or more of the following:

**COLOR= color**

Specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**FAMILY= “font-family”**

Specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**

Specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**

Specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**

Specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

**DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)**
Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

FILL | NOFILL
specifies whether the bubbles are filled. The FILL option shows the fill color. The NOFILL option hides the fill color.

Default: FILL

Interactions:
Specifying FILL also hides the outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the bubbles. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphDataN style elements in the current style.

Interaction: This option has no effect if you specify the NOFILL option.

GROUP= variable
specifies a variable that is used to group the data. The bubbles for each group value are automatically distinguished by different colors.

When this option is used, the bubble colors are taken from the GraphData1... GraphDataN style elements. If the bubbles are filled, then the COLOR attribute is used for bubble fill and GRAPHOUTLINES is used for the bubble outline. If the bubbles are not filled, then the CONTRASTCOLOR and PATTERN are used for the bubble outlines.

When this option is used and the value is a variable associated with an ATTRID= option, the attribute mapping defined by the associated attribute map is used.

LEGENDLABEL= “text-string”
specifies the label that identifies the bubble plot in the legend. By default, the label for the Y variable is used for ungrouped data, and the group values are used for grouped data.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the outlines for the bubbles. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: LINEATTRS=GraphData3

For more information about style elements, see “Style Elements for Use with ODS Graphics” on page 640.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

\textbf{PATTERN=} \texttt{line-pattern}

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

\textbf{THICKNESS=} \texttt{n <units>}

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

Here is an example expression:

\texttt{LINEATTRS=\{Color="light green" Pattern=MediumDash Thickness= 4\}}

Default: For ungrouped data, line attributes are derived from the GraphDataDefault style element. For grouped data, the ContrastColor attribute of the GraphData1 ... GraphData\textsubscript{n} style elements are used.

Interaction: This option has no effect if you also specify the NOOUTLINE option.

\textbf{NAME=} \texttt{"text-string"}

specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

\textbf{NOMISSINGGROUP}

specifies that missing values of the group variable are not included in the plot.

Interaction: This option has no effect unless GROUP= is also specified.

\textbf{OUTLINE | NOOUTLINE}

specifies whether the outlines of the bubbles are visible. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: OUTLINE

Interactions:

Specifying OUTLINE also hides the fill color.

If NOOUTLINE and NOFILL are both specified, then both options are ignored.

\textbf{TRANSPARENCY=} \texttt{numeric-value}

specifies the degree of transparency for the fill and outline of the bubbles. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

\textbf{URL=} \texttt{character-variable}

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
**DENSITY Statement**

Creates a density curve that shows the distribution of values in your data.

**Interaction:**
The DENSITY statement can be combined only with the DENSITY and HISTOGRAM statements in the SGPANEL procedure.

**Examples:**
“About Density Plots” on page 39
“Example 1: Creating a Panel of Graph Cells with Histograms and Density Plots” on page 267

**Syntax**

```plaintext
DENSITY response-variable < / option(s)>;
```

**Summary of Optional Arguments**

**DENSITY options**

- **LINEATTRS=** `style-element <(options)> | (options)`
  specifies the appearance of the density line.
- **SCALE=** `COUNT | DENSITY | PERCENT | PROPORTION`
  specifies the scaling that is used for the response axis.
- **TYPE =** `NORMAL < (normal-opts)> | KERNEL < (kernel-opts)>`
  specifies the type of distribution curve that is used for the density plot.

**Plot options**

- **FREQ=** `numeric-variable`
  specifies how many times observations are repeated for computational purposes.
- **LEGENDLABEL=** “text-string”
  specifies a label that identifies the density plot in the legend.
- **NAME=** “text-string”
  specifies a name for the plot.
- **TRANSPARENCY=** `numeric-value`
  specifies the degree of transparency for the density curve.

**Required Argument**

`response-variable`
specifies the variable for the x axis. The variable must be numeric.
Optional Arguments

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

LEGENDLABEL= “text-string”
specifies a label that identifies the density plot in the legend. By default, the label identifies the type of density curve. If you specify TYPE=NORMAL, then the default label is “Normal.” If you specify TYPE=KERNEL, then the default label is “Kernel.”

Note: User-specified parameters from the TYPE= option are included in the label by default.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the density line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphFit style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

SCALE= COUNT | DENSITY | PERCENT | PROPORTION
specifies the scaling that is used for the response axis. Specify one of the following values:

COUNT
the axis displays the frequency count.

DENSITY
the axis displays the density estimate values.

PERCENT
the axis displays values as a percentage of the total.
PROPORTION
the axis displays values in proportion to the total.

Default: PERCENT

TRANSPARENCY= numeric-value
specifies the degree of transparency for the density curve. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

TYPE = NORMAL < (normal-opts)> | KERNEL < (kernel-opts)>
specifies the type of distribution curve that is used for the density plot. Specify one of the following keywords:

NORMAL < (normal-opts)>
specifies a normal density estimate, with a mean and a standard deviation.

normal-opts can be one or more of the following values:

MU=numeric-value
specifies the mean value that is used in the density function equation. By default, the mean value is calculated from the data.

SIGMA=numeric-value
specifies the standard deviation value that is used in the density function equation. The value that you specify for the SIGMA= suboption must be a positive number. By default, the standard deviation value is calculated from the data.

KERNEL < (kernel-opts)>
specifies a nonparametric kernel density estimate.

kernel-opts can be:

C= numeric-value
specifies the standardized bandwidth for a number that is greater than 0 and less than or equal to 100.

The value that you specify for the C= suboption affects the value of \( \lambda \) as shown in the following equation:

\[
\lambda = cQn^{-\frac{1}{5}}
\]

In this equation \( c \) is the standardized bandwidth, \( Q \) is the interquartile range, and \( n \) is the sample size.

WEIGHT= NORMAL | QUADRATIC | TRIANGULAR
specifies the weight function. You can specify either normal, quadratic, or triangular weight function.

Default: NORMAL

Details

Normal Density Function
When the type of the density curve is NORMAL, the fitted density function equation is as follows.
\[ p(x) = \frac{100h}{\sigma\sqrt{2\pi}}\exp\left(-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right) \text{ for } -\infty < x < \infty \]

In the equation, \( \mu \) is the mean, and \( \sigma \) is the standard deviation. You can specify \( \mu \) by using the MU= suboption and \( \sigma \) by using the SIGMA= suboption.

**Kernel Density Function**

When the TYPE of the density curve is KERNEL, the general form of the kernel density estimator is as follows.

\[ \hat{f}_h(x) = \frac{100h}{n\lambda} \sum_{i=1}^{n} K_0\left(\frac{x-x_i}{\lambda}\right) \]

In the equation, \( K_0(\cdot) \) is the weight function, \( \lambda \) is the bandwidth, \( n \) is the sample size, and \( x_i \) is the \( i \)th observation. You can use the C= suboption to specify the bandwidth and the WEIGHT= suboption to specify the weight function \( K_0(\cdot) \).

**Kernel Density Weight Functions**

The formulas for the weight functions are as follows.

**NORMAL**

\[ K_0(t) = \frac{1}{\sqrt{2\pi}}\exp\left(-\frac{1}{2}t^2\right) \text{ for } -\infty < t < \infty \]

**QUADRATIC**

\[ K_0(t) = \frac{3}{4}(1 - t^2) \text{ for } |t| \leq 1 \]

**TRIANGULAR**

\[ K_0(t) = 1 - |t| \text{ for } -1 \leq t \leq 1 \]

---

**DOT Statement**

Creates a dot plot that summarizes the values of a category variable.

**Interaction:** The DOT statement can be combined only with other horizontal categorization plot statements in the SGPANEL procedure. See “Plot Type Compatibility” on page 81.

**Example:** “About Dot Plots” on page 46

**Syntax**

DOT category-variable <\( </ option(s)\)>;

**Summary of Optional Arguments**

**Dot options**

- `DISCRETEOFFSET= numeric-value`
  specifies an amount to offset all dots from discrete category values.

- `LIMITATTRS= style-element (options)`
  specifies the appearance of the limit lines in the plot.
LIMITS= UPPER | LOWER | BOTH
specifies which limit lines to display.

LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot.

MISSING
processes missing values as valid category value and creates a dot for it.

NOSTATLABEL
removes the statistic name from the axis and legend labels.

NUMSTD= n
specifies the number of standard units for the limit lines, when you specify
LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

RESPONSE= response-variable
specifies a numeric response variable for the plot.

STAT= FREQ | MEAN | SUM
specifies the statistic for the horizontal axis.

Group options

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.

GROUP= variable
specifies a classification variable to divide the values into groups.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped dots.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of dots within a group.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the
DATALABEL= option.

Plot options

ALPHA= numeric-value
specifies the confidence level for the confidence limits.

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

CATEGORYORDER= RESPASC | RESPDESC
specifies the order in which the response values are arranged.

FREQ= numeric-variable
specifies how many times observations are repeated for computational
purposes.

LEGENDLABEL= “text-string”
specifies the label that identifies the dot plot in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the plot.
URL= character-variable
 specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

WEIGHT= numeric-variable
 specifies how observations are weighted.

**Required Argument**

category-variable
 specifies the variable that classifies the observations into distinct subsets.

**Optional Arguments**

ALPHA= numeric-value
 specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

Interactions:
This option has no effect if you do not specify LIMITSTAT=CLM.
If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

ATTRID= variable
 specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

CATEGORYORDER= RESPASC | RESPDESC
 specifies the order in which the response values are arranged. Specify one of the following values:

RESPASC
 sorts the response values in ascending order.

RESPDESC
 sorts the response values in descending order.

Default: By default, the plot is sorted in ascending order based on the category values.

Restriction: This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.

Requirement: This option requires that you configure the panel to use either one column or one row, depending on the orientation of your charts. Use the ROWS= or the COLUMNS= option in the PANELBY statement. If you do not use this option and your graph contains multiple cells, the specified sort order is not correctly applied to all cells.

Interaction: If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

Note: If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

CLUSTERWIDTH= numeric-value
 specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).
**Default:** 0.8

**Interaction:** This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

**DATALABEL <= variable>**

Displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**

Specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

**DATALABELATTRS=GraphLabelText**

**options** can be one or more of the following:

**COLOR= color**

Specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDatan style elements in the current style.

**FAMILY= "font-family"**

Specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**

Specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**

Specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**

Specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

**DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)**

**Default:** The default style element is GraphDataText.
Interaction: This option has no effect unless the DATALABEL option is also specified.

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset all dots from discrete category values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the category axis is discrete.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

**GROUP= variable**
specifies a classification variable to divide the values into groups. A separate plot is created for each unique value of the classification variable.

Interaction: If you specify more than one categorization plot statement, then all of the plots must specify the same GROUP variable. If you do not specify the same GROUP= option for all of the categorization plots, then the GROUP= option has no effect.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped dots.

CLUSTER
  grouped items are drawn adjacent to each other.

OVERLAY
  grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1...GraphData\(n\) style elements in the current style.

Default: OVERLAY

Restriction: GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

Interaction: This option is ignored unless GROUP= is specified.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of dots within a group.

ASCENDING
  displays each group in ascending group value.

DESCENDING
  displays each group in descending group value.

DATA
  displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

**LEGENDLABEL= "text-string"**
specifies the label that identifies the dot plot in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, then the name of the response variable and the computed statistic (SUM or MEAN) is used. If the RESPONSE= option is not used, the legend label is “Frequency”.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

(options) can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

LIMITS= UPPER | LOWER | BOTH
specifies which limit lines to display. Limits are displayed as heavier line segments with a serif at the end extending horizontally from each dot. Upper limits extend to the right of the dot and lower limits extend to the left of the dot. By default, no limits are displayed unless you specify either the LIMITS= or LIMITSTAT= option. Specify one of the following values:

BOTH
adds lower and upper limit lines to the plot.

LOWER
adds lower limit lines to the plot.

UPPER
adds upper limit lines to the plot.

Interaction: Limit lines are displayed only when you specify STAT= MEAN.

LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines. Specify one of the following statistics:

CLM
confidence limits

STDDEV
standard deviation

STDERR
standard error

Default: CLM
**Interaction:** If you specify the LIMITSTAT= option only, then the default value for the LIMITS= option is BOTH. Limits lines are displayed only when you specify STAT=MEAN.

**MARKERATTRS=** `style-element <(options)> | (options)` specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

- **COLOR=** `color` specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
  
  **Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.
  
  For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData*n* style elements in the current style.

- **SIZE=** `n <units>` specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  
  **Default:** The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

- **SYMBOL=** `symbol-name` specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.
  
  **Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style.
  
  For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**MISSING** processes missing values as valid category value and creates a dot for it.

**NAME=** “*text-string*” specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NOSTATLABEL** removes the statistic name from the axis and legend labels.

**NUMSTD=** `n` specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive number, including decimals.

**Default:** 1

**RESPONSE=** `response-variable` specifies a numeric response variable for the plot. The summarized values of the response variable for each category value are displayed on the horizontal axis.
STAT= FREQ | MEAN | SUM
specifies the statistic for the horizontal axis. Specify one of the following statistics:

FREQ
the frequencies for the category variable. This is the default value when you do not specify the RESPONSE= option.

MEAN
the mean of the response variable.

SUM
the sum of the response variable. This is the default value when you specify the RESPONSE= option.

Interaction: If you do not specify the RESPONSE= option, then only the FREQ statistic can be used. If you specify the RESPONSE= option, then you can use either the SUM or MEAN statistics.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

HBAR Statement
Creates a bar chart that summarizes the values of a category variable.

Interaction: The HBAR statement can be combined only with other categorization plot statements in the SGPANEL procedure. See “Plot Type Compatibility” on page 81.

Examples: “About Bar Charts” on page 42
“Example 3: Creating a Panel of Bar Charts” on page 270

Syntax
HBAR category-variable </option(s)>;
Summary of Optional Arguments

Bar options

- **BARWIDTH= numeric-value**
  specifies the width of the bars as a ratio of the maximum possible width.

- **DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN**
  specifies a special effect to be used on all filled bars.

- **DISCRETEOFFSET= numeric-value**
  specifies an amount to offset all bars from the category midpoints.

- **FILL | NOFILL**
  specifies whether the bars are filled.

- **FILLATTRS= style-element | (COLOR= color)**
  specifies the appearance of the fill for the bars.

- **LIMITATTRS= style-element <(options)> | (options)**
  specifies the appearance of the limit lines in the plot.

- **LIMITS= BOTH | LOWER | UPPER**
  specifies which limit lines to display.

- **LIMITSTAT= CLM | STDDEV | STDERR**
  specifies the statistic for the limit lines.

- **MISSING**
  processes missing values as valid category value and creates a bar for it.

- **NOSTATLABEL**
  removes the statistic name from the axis and legend labels.

- **NUMSTD= n**
  specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

- **OUTLINE | NOOUTLINE**
  specifies whether the bars have outlines.

- **RESPONSE= response-variable**
  specifies a numeric response variable for the plot.

- **STAT= FREQ | MEAN | SUM**
  specifies the statistic for the horizontal axis.

Group options

- **CLUSTERWIDTH= numeric-value**
  specifies the cluster width as a ratio of the maximum width.

- **GROUP= variable**
  specifies a variable that is used to group the data.

- **GROUPDISPLAY= STACK | CLUSTER**
  specifies how to display grouped bars.

- **GROUPORDER= ASCENDING | DESCENDING | DATA**
  specifies the ordering of bars within a group.

Label options

- **DATALABEL <= variable>**
  displays a label for each data point.

- **DATALABELATTRS= style-element <(options)> | (options)**
  specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options
ALPHA= numeric-value
  specifies the confidence level for the confidence limits.

ATTRID= variable
  specifies the value of the ID variable in an attribute map data set.

CATEGORYORDER= RESPASC | RESPDESC
  specifies the order in which the response values are arranged.

FREQ= numeric-variable
  specifies how many times observations are repeated for computational purposes.

LEGENDLABEL= “text-string”
  specifies the label that identifies the bar chart in the legend.

NAME= “text-string”
  specifies a name for the plot.

TRANSPARENCY= numeric-value
  specifies the degree of transparency for the bars and limits, if displayed.

URL= character-variable
  specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

WEIGHT= numeric-variable
  specifies how observations are weighted.

Required Argument

category-variable
  specifies the variable that classifies the observations into distinct subsets.

Optional Arguments

ALPHA= numeric-value
  specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

  Default: .05

  Interactions:
  This option has no effect if you do not specify LIMITSTAT=CLM.

  If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

ATTRID= variable
  specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BARWIDTH= numeric-value
  specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

  For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

  Default: .8

  1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER
Interaction: When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

**CATEGORYORDER=** RESPASC | RESPDESC
specifies the order in which the response values are arranged. Specify one of the following values:

- **RESPASC**
  sorts the response values in ascending order.

- **RESPDESC**
  sorts the response values in descending order.

Default: By default, the plot is sorted in ascending order based on the category values.

Restriction: This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.

Requirement: This option requires that you configure the panel to use either one column or one row, depending on the orientation of your charts. Use the ROWS= or the COLUMNS= option in the PANELBY statement. If you do not use this option and your graph contains multiple cells, the specified sort order is not correctly applied to all cells.

Interaction: If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

Note: If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

**CLUSTERWIDTH=** numeric-value
specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

**DATALABEL <= variable>**
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS=** style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

```
DATALABELATTRS=GraphLabelText
```

**options** can be one or more of the following:
COLOR= *color*
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute
of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ...
GraphData style elements in the current style.

FAMILY= “*font-family*”
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

**Default:** The default font family is specified by the FontFamily attribute of the
GraphDataText style element in the current style.

SIZE= *n <units>*
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the
GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the
GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the
GraphDataText style element in the current style.

Here is an example expression:

```
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also
specified.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
specifies a special effect to be used on all filled bars. Specify one of the following
(the samples were generated using the HTMLBlue style):

```
<table>
<thead>
<tr>
<th>Dataskin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>CRISP</td>
<td></td>
</tr>
<tr>
<td>GLOSS</td>
<td></td>
</tr>
</tbody>
</table>
```

<table>
<thead>
<tr>
<th>Dataskin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>CRISP</td>
<td></td>
</tr>
<tr>
<td>GLOSS</td>
<td></td>
</tr>
</tbody>
</table>
MATTE

PRESSED

SHEEN

Default: NONE

Interactions:
This option has no effect if the applied style uses a fill pattern and FILL is
disabled for the style. If the style has both FILL and FILLPATTERN enabled,
data skins will work. For more information about fill patterns, see “Using Fill
Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about
viewing the contents of style templates, see “About Styles and Style Elements”
on page 620.

This option has no effect if you also specify NOFILL.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all bars from the category midpoints. Specify a value
from -0.5 (left offset) to +0.5 (right offset).
Default: 0.0 (no offset)

FILL | NOFILL
specifies whether the bars are filled. The FILL option shows the fill color for the
bars. The NOFILL option hides the fill color for the bars.
Default: FILL

Interactions:
Specifying FILL also hides the outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the bars. You can specify the color of the fill
by using a style element or by using the COLOR= suboption. You can specify colors
using the same color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.
Default: For ungrouped data, the default color is specified by the Color attribute of
the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the Color attribute of the
GraphData1 ... GraphData\n style elements in the current style.

Interaction: This option has no effect if you specify the NOFILL option.

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.
Each observation is repeated \( n \) times for computational purposes, where \( n \) is the
value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer.
If \( n \) is less than 1 or missing, then it is excluded from the analysis.
**Interaction:** If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

**GROUP=** `variable`

specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY=** `STACK | CLUSTER`

specifies how to display grouped bars.

- **STACK**
  
  groups are overlaid without any clustering. Each group is represented by unique visual attributes derived from the GraphData1... GraphData n style elements in the current style.

- **CLUSTER**
  
  displays group values as separate adjacent bars that replace the single category bar. Each set of group values is centered at the midpoint tick mark for the category.

**Default:** STACK

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER=** `ASCENDING | DESCENDING | DATA`

specifies the ordering of bars within a group.

- **ASCENDING**
  
  displays each group in ascending group value.

- **DESCENDING**
  
  displays each group in descending group value.

- **DATA**
  
  displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

**LEGENDLABEL=** "text-string"

specifies the label that identifies the bar chart in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, the name of the response variable and the computed statistic (SUM or MEAN) is used. If the RESPONSE= option is not used, the legend label is “Frequency”.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

**LIMITATTRS=** `style-element <(options)> | (options)`

specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

- **COLOR=** `color`
  
  specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

  **Default:** The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

- **PATTERN=** `line-pattern`
  
  specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
**Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Interaction:** This option has no effect unless you also specify either the LIMITS= or LIMITSTAT= option.

**LIMITS= BOTH | LOWER | UPPER**
specifies which limit lines to display. Limits are displayed as heavier line segments with a serif at the end extending from each bar. Upper limits extend to the right of the bar and lower limits extend to the left of the bar. By default, no limits are displayed unless you specify either the LIMITS= or LIMITSTAT= option. If you specify the LIMITSTAT= option only, then LIMITS=BOTH is the default. Specify one of the following values:

- **BOTH** adds lower and upper limit lines to the plot.
- **LOWER** adds lower limit lines to the plot.
- **UPPER** adds upper limit lines to the plot.

**Default:** By default, no limit lines are displayed. However, if you specify the LIMITSTAT= option, then the default is BOTH.

**Interactions:**
Limit lines are displayed only when you specify STAT=MEAN.
The LIMITS= option has no effect if you also specify the GROUP= option in the plot statement.

**LIMITSTAT= CLM | STDDEV | STDERR**
specifies the statistic for the limit lines. Specify one of the following statistics:

- **CLM** confidence limits
- **STDDEV** standard deviation
- **STDERR** standard error

**Default:** CLM

**Interactions:**
If you specify the LIMITSTAT= option only, then the default value for the LIMITS= option is BOTH.
Limits lines are displayed only when you specify STAT=MEAN.
The LIMITSTAT= option has no effect if you also specify the GROUP= option in the plot statement.

**MISSING**
processes missing values as valid category value and creates a bar for it.
NAME= “text-string”
  specifies a name for the plot. You can use the name to refer to this plot in other
  statements.
  Note: The name is case-sensitive. When you refer to the specified name in other
  statements, you must use the same exact capitalization.

NOSTATLABEL
  removes the statistic name from the axis and legend labels.

NUMSTD= n
  specifies the number of standard units for the limit lines, when you specify
  LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive
  number, including decimals.
  Default: 1

OUTLINE | NOOUTLINE
  specifies whether the bars have outlines. The OUTLINE option shows the outlines.
  The NOOUTLINE option hides the outlines.
  Default: OUTLINE
  Interactions:
  Specifying OUTLINE also hides the fill color.
  If NOOUTLINE and NOFILL are both specified, then both options are ignored.

RESPONSE= response-variable
  specifies a numeric response variable for the plot. The summarized values of the
  response variable are displayed on the horizontal axis.

STAT= FREQ | MEAN | SUM
  specifies the statistic for the horizontal axis. Specify one of the following statistics:
  FREQ
    the frequencies for the category variable. This is the default value when you do
    not specify the RESPONSE= option.
  MEAN
    the mean of the response variable.
  SUM
    the sum of the response variable. This is the default value when you specify the
    RESPONSE= option.
  Interaction: If you do not specify the RESPONSE= option, then only the FREQ
  statistic can be used. If you specify the RESPONSE= option, then you can use
  either the SUM or MEAN statistics.

TRANSPARENCY= numeric-value
  specifies the degree of transparency for the bars and limits, if displayed. Specify a
  value from 0.0 (completely opaque) to 1.0 (completely transparent).
  Default: 0.0

URL= character-variable
  specifies a character variable that contains URLs for Web pages to be displayed
  when parts of the plot are selected within an HTML page.
  Default: By default, no HTML links are created.
  Interactions:
  This option affects graphics output that is created through the ODS HTML
  destination only. For more information about ODS destinations, see “Specifying
  a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**WEIGHT= numeric-variable**

specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

### HBARPARM Statement

Creates a horizontal bar chart based on a pre-summarized response value for each unique value of the category variable. You can also assign variables to the upper and lower limits.

**Requirement:** The data must contain only one response value per unique category variable. If more than one value is found, a warning is written to the SAS log, and the graph might produce unpredictable results.

**Interactions:** The HBARPARM statement can be combined only with other basic plot statements in the SG PLOT procedure. See “Plot Type Compatibility” on page 277 . When used with particular styles, the HBARPARM statement produces fill patterns for grouped bars. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636.

**Note:** An important distinction between HBARPARM and HBAR is that the response variable is required for HBARPARM. In addition, the response variable should contain pre-summarized computed values such as a sum or a mean.

**Example:** “About Bar Charts” on page 42

### Syntax

```
HBARPARM CATEGORY= category-variable RESPONSE= numeric-variable </option(s)>;
```

### Summary of Optional Arguments

**Bar options**

- **BARWIDTH= numeric-value**
  
specifies the width of the bars as a ratio of the maximum possible width.

- **DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN**
  
specifies a special effect to be used on all filled bars.

- **DISCRETEOFFSET= numeric-value**
  
specifies an amount to offset all bars from the category midpoints.

- **FILL | NOFILL**
  
specifies whether the bars are filled.

- **FILLATTRS= style-element | (COLOR= color)**
  
specifies the appearance of the fill for the bars.

- **LIMITATTRS= style-element </options> | </options)**
  
specifies the appearance of the limit lines in the plot.

- **LIMITLOWER= numeric-variable**
specifies values for the lower endpoints on the limit lines.

LIMITUPPER= numeric-variable
specifies values for the upper endpoints on the limit lines.

MISSING
processes missing values as a valid category value and creates a bar for it.

OUTLINE | NOOUTLINE
specifies whether the bars have outlines.

Group options

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the maximum width.

GROUP= variable
specifies a variable that is used to group the data.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of bars within a group.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
specifies the label that identifies the bar chart in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Required Arguments

CATEGORY= category-variable
specifies the variable that categorizes the data. All values are treated as discrete values. The input data for this variable should contain unique values. When the category values are not unique, a warning is logged, and multiple bars are superimposed at the duplicated category values.

The CATEGORY axis is always discrete.

RESPONSE= numeric-variable
specifies a numeric response variable. The input data is expected to be pre-summarized computed values (sum, mean, and so on).
Optional Arguments

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

Default: .8

1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER

Interaction: When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.
FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

\[ \text{DATALABELATTRS}= \{ \text{Color=} \text{Green} \ \text{Family=} \text{Arial} \ \text{Size=} \text{8} \ \text{Style=} \text{Italic} \ \text{Weight=} \text{Bold} \} \]

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
specifies a special effect to be used on all filled bars. Specify one of the following (the samples were generated using the HTMLBlue style):

<table>
<thead>
<tr>
<th>Option</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>CRISP</td>
<td></td>
</tr>
<tr>
<td>GLOSS</td>
<td></td>
</tr>
<tr>
<td>MATTE</td>
<td></td>
</tr>
<tr>
<td>PRESSED</td>
<td></td>
</tr>
<tr>
<td>SHEEN</td>
<td></td>
</tr>
</tbody>
</table>
**Default:** NONE

**Interactions:**
This option has no effect if the applied style uses a fill pattern and FILL is disabled for the style. If the style has both FILL and FILLPATTERN enabled, data skins will work. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about viewing the contents of style templates, see “About Styles and Style Elements” on page 620.

This option has no effect if you also specify NOFILL.

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset all bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**FILL | NOFILL**
specifies whether the bars are filled. The FILL option shows the fill color for the bars. The NOFILL option hides the fill color for the bars.

**Default:** FILL

**Interactions:**
Specifying FILL also hides the outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.

**FILLATTRS= style-element | (COLOR= color)**
specifies the appearance of the fill for the bars. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphDataN style elements in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

**GROUP= variable**
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of bars within a group.

**ASCENDING**
displays each group in ascending group value.

**DESCENDING**
displays each group in descending group value.

**DATA**
displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.
LEGENDLABEL= "text-string"
specifies the label that identifies the bar chart in the legend. By default, the label of
the RESPONSE= variable is used. If there is no response variable label, the name of
the response variable is used.

Interaction: The LEGENDLABEL= option has no effect if you also specify the
GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance
by using a style element or by using suboptions. If you specify a style element, you
can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line.

You can specify colors using the same color schemes that are supported by
SAS/GRAPH software. For more information, see “Color-Naming Schemes” in
Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the
GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the
GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of
the GraphError style element in the current style.

LIMITLOWER= numeric-variable
specifies values for the lower endpoints on the limit lines. Limit lines are displayed
as line segments with a serif at the end.

Default: The lower segments of the limit lines are not displayed. (Limit lines are
displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

Interactions:
If LIMITUPPER= is also specified, then the plot displays the lower and upper
segments of the limit lines.
This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
The appearance of the limit lines can be controlled by the LIMITATTRS= option.

LIMITUPPER= numeric-variable
specifies values for the upper endpoints on the limit lines. Limit lines are displayed
as line segments with a serif at the end.

Default: The upper segments of the limit lines are not displayed. (Limit lines are
displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

Interactions:
If LIMITLOWER= is also specified, then the plot displays the lower and upper
segments of the limit lines.
This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
The appearance of the limit lines can be controlled by the LIMITATTRS= option.

MISSING
processes missing values as a valid category value and creates a bar for it.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

OUTLINE | NOOUTLINE
specifies whether the bars have outlines. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: OUTLINE

Interactions:
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

HBOX Statement
Creates a horizontal box plot that shows the distribution of your data.

Interaction: The HBOX statement cannot be used together with other plot statements in the SGPANEL procedure. Box plots can be overlaid with other box plots. However, overlaid box plots must have the same category variables.

Example: “About Box Plots” on page 37

Syntax
HBOX analysis-variable < / option(s)>;

Summary of Optional Arguments
Box options
BOXWIDTH= numeric-value  
specifies the width of the box.

CAPSHAPE= BRACKET | LINE | SERIF  
specifies the shape of the whisker cap lines.

CLUSTERWIDTH= numeric-value  
specifies the cluster width as a ratio of the midpoint spacing.

CONNECT= MEAN | MEDIAN | Q1 | Q3 | MIN | MAX  
specifies that a connect line joins a statistic from box to box.

CONNECTATTRS= style-element <(options)> | (options)  
specifies the appearance of the lines that connect multiple boxes.

DISCRETEOFFSET= numeric-value  
specifies an amount to offset all boxes from the discrete tick marks.

EXTREME  
specifies that the whiskers can extend to the maximum and minimum values 
for the analysis variable, and that outliers are not identified.

FILL | NOFILL  
specifies whether the boxes are filled with color.

FILLATTRS= style-element | (COLOR= color)  
specifies the appearance of the fill for the boxes.

LINEATTRS= style-element <(options)> | (options)  
specifies the appearance of the box outlines.

MEANATTRS= style-element <(options)> | (options)  
specifies the appearance of the marker that represents the mean in the box.

MEDIANATTRS= style-element <(options)> | (options)  
specifies the appearance of the line that represents the median.

NOCAPS  
hides the cap lines for the whiskers.

NOMEAN  
hides the mean marker.

NOMEDIAN  
hides the median line.

NOOUTLIERS  
hides the outliers from the plot.

NOTCHES  
specifies that the boxes be notched.

OUTLIERATTRS= style-element <(options)> | (options)  
specifies the appearance of the marker that represents the outliers.

WHISKERATTRS= style-element <(options)> | (options)  
specifies the appearance of the whisker and cap lines.

Group options

GROUP= variable  
specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY  
specifies how to display grouped boxes.

GROUPORDER= ASCENDING | DESCENDING | DATA  
specifies the ordering of boxes within a group.

Label options

DATALABEL <= variable>
adds data labels for the outlier markers.

\[ \text{DATALABELATTRS= style-element (options)} \]

specifies the appearance of the labels in the plot when you use the DATALABEL= option.

\[ \text{LABELFAR} \]

specifies that only the far outliers have data labels.

**Plot options**

\[ \text{ATTRID= variable} \]

specifies the value of the ID variable in an attribute map data set.

\[ \text{CATEGORY= category-variable} \]

specifies the category variable for the plot.

\[ \text{FREQ= numeric-variable} \]

specifies how many times observations are repeated for computational purposes.

\[ \text{LEGENDLABEL= “text-string”} \]

specifies a label that identifies the box plot in the legend.

\[ \text{MISSING} \]

processes missing values as a valid category value and creates a box for it.

\[ \text{NAME= “text-string”} \]

specifies a name for the plot.

\[ \text{PERCENTILE= 1 | 2 | 3 | 4 | 5} \]

specifies a method for computing the percentiles for the plot.

\[ \text{SPREAD} \]

relocates outlier points that have identical values to prevent overlapping.

\[ \text{TRANSPARENCY= numeric-value} \]

specifies the degree of transparency for the plot.

**Required Argument**

\[ \text{analysis-variable} \]

specifies the analysis variable for the plot. If you do not specify the CATEGORY= option, then one box is created for the analysis variable.

**Optional Arguments**

\[ \text{ATTRID= variable} \]

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

\[ \text{BOXWIDTH= numeric-value} \]

specifies the width of the box. Specify a value between 0.0 (0% of the available width) and 1.0 (100% of the available width).

**Default:** 0.4

When GROUP is specified, the default box width is 0.6.

\[ \text{CAPSHAPE= BRACKET | LINE | SERIF} \]

specifies the shape of the whisker cap lines. Specify one of the following values:

\[ \text{BRACKET} \]

displays a straight line with brackets.
LINE
displays a straight line.

SERIF
displays a short straight line.

CATEGORY= category-variable
specifies the category variable for the plot. A box plot is created for each distinct
value of the category variable.

If you explicitly set the category axis type to LINEAR and use a numeric category
variable, the box plot becomes an interval plot. Otherwise, the box plot is discrete.

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the midpoint spacing. Specify a value from
0.1 (narrowest) to 1.0 (widest).

Default: 0.7
Interaction: This option is applicable only when a GROUP is in effect and the
category axis is discrete.

CONNECT= MEAN | MEDIAN | Q1 | Q3 | MIN | MAX
specifies that a connect line joins a statistic from box to box.
Interaction: This option applies only when the CATEGORY option is used to
generate multiple boxes.
Tip: You can use the CONNECTATTRS option to specify attributes for the connect
line.

CONNECTATTRS= style-element <(options)> | (options)
specifies the appearance of the lines that connect multiple boxes. You can specify the
appearance by using a style element or by using suboptions. If you specify a style
element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: CONNECTATTRS=GraphData3

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphConnectLine style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of
the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphConnectLine style element in the current
style. For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphConnectLine style element in the current
style. For grouped data, the default line thickness is specified by the
LineThickness attribute of the GraphData1 ... GraphDataN style elements in
the current style.

Here is an example expression:

CONNECTATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)

Default: The default style element is GraphConnectLine.

Interactions:
This option takes effect only if the CONNECT= option is also specified.
This option is ignored if the GROUP= option is also specified.

DATALABEL <= variable>
adds data labels for the outlier markers. If you specified a variable, then the values
for that variable are used for the data labels. If you did not specify a variable, then
the values of the analysis variable are used.

Note: This option has no effect unless the plot contains outlier points.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL=
option. You can specify the appearance by using a style element or by using
suboptions. If you specify a style element, you can also specify suboptions to
override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ...
GraphDataN style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the
GraphDataText style element in the current style.
WEIGHT= BOLD | NORMAL
  specifies whether the label characters are bold (BOLD) or normal (NORMAL).
  **Default:** The default font weight is specified by the FontWeight attribute of the
  GraphDataText style element in the current style.

Here is an example expression:
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

  **Default:** The default style element is GraphDataText.
  **Interaction:** This option has no effect unless the DATALABEL option is also
  specified.

**DISCRETEOFFSET= numeric-value**
  specifies an amount to offset all boxes from the discrete tick marks.
  Specify a value from -0.5 (left offset) to +0.5 (right offset). If you specify a value
  outside of this range, an error message appears in the SAS log and the graph is not
  produced.
  **Default:** 0.0 (no offset)

**EXTREME**
  specifies that the whiskers can extend to the maximum and minimum values for the
  analysis variable, and that outliers are not identified. When you do not specify the
  EXTREME option, the whiskers cannot be longer than 1.5 times the length of the
  box.

**FILL | NOFILL**
  specifies whether the boxes are filled with color. The FILL option shows the fill
  color. The NOFILL option hides the fill color.
  **Default:** FILL

**FILLATTRS= style-element | (COLOR= color)**
  specifies the appearance of the fill for the boxes. You can specify the color of the fill
  by using a style element or by using the COLOR= suboption. You can specify colors
  using the same color schemes that are supported by SAS/GRAPH software. For more
  information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
  Reference.
  **Default:** For ungrouped data, the default color is specified by the Color attribute of
  the GraphDataDefault style element in the current style.
  For grouped data, the default color is specified by the ContrastColor attribute of
  the GraphData1 ... GraphData n style elements in the current style.
  **Interaction:** This option has no effect if you also specify the NOFILL option.

**FREQ= numeric-variable**
  specifies how many times observations are repeated for computational purposes.
  Each observation is repeated n times for computational purposes, where n is the
  value of the numeric variable. If n is not an integer, then it is truncated to an integer.
  If n is less than 1 or missing, then it is excluded from the analysis.
  **Interaction:** If your plot is overlaid with other categorization plots, then the first
  FREQ variable that you specified is used for all of the plots.

**GROUP= variable**
  specifies a variable that is used to group the data. The plot elements for each group
  value are automatically distinguished by different visual attributes.

**GROUPDISPLAY= CLUSTER | OVERLAY**
  specifies how to display grouped boxes.
CLUSTER
the boxes are drawn adjacent to each other.

OVERLAY
all the boxes for a given group value are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1... GraphData\textsubscript{n} style elements in the current style.

Default: CLUSTER for a discrete category axis
OVERLAY for a linear axis

Restriction: GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete.

Interaction: This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of boxes within a group.

ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LABELFAR
specifies that only the far outliers have data labels. Far outliers are points whose distance from the box is more than three times the length of the box.

Note: This option has no effect if you do not specify the DATALABEL option, or if there are no far outliers.

LEGENDLABEL= "text-string"
specifies a label that identifies the box plot in the legend. By default, the label of the analysis variable is used.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the box outlines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: LINEATTRS=GraphData3

For more information about style elements, see “Style Elements for Use with ODS Graphics” on page 640.

\textit{options} can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of \textit{SAS/GRAPH: Reference}.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

**THICKNESS=** \( n \text{ <units> } \)

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

Here is an example expression:

```
LINEATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)
```

**Default:** For ungrouped data, line attributes are derived from the GraphDataDefault style element. For grouped data, the ContrastColor attribute of the GraphData1... GraphData n style elements are used.

**Interactions:**

This option takes effect only if the CONNECT= option is also specified.

This option is ignored if the GROUP= option is also specified.

**MEANATTRS=** \( \text{style-element <(options)>(options)} \) | (options)

specifies the appearance of the marker that represents the mean in the box. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR=** \( \text{color} \)

specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxMean style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**SIZE=** \( n \text{ <units> } \)

specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphBoxMean style element in the current style.

**SYMBOL=** \( \text{symbol-name} \)

specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphBoxMean style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData n style elements in the current style.
WEIGHT= NORMAL | BOLD
  specifies the marker weight of the marker.

  Default: NORMAL

Default: GraphBoxMean is the default style element.

MEDIANATTRS= style-element <(options)> | (options)
specifies the appearance of the line that represents the median. You can specify the
appearance by using a style element or by using suboptions. If you specify a style
element, you can also specify suboptions to override specific appearance attributes.

  options can be one or more of the following:

  COLOR= color
  specifies the color of the line. You can specify colors using the same color
  schemes that are supported by SAS/GRAPH software. For more information, see
  “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

  Default: For ungrouped data, the default color is specified by the
  ContrastColor attribute of the GraphBoxMedian style element in the current style. For
  grouped data, the default color is specified by the ContrastColor attribute of
  the GraphData1 ... GraphDataN style elements in the current style.

  PATTERN= line-pattern
  specifies the line pattern for the line. You can reference SAS patterns by number
  or by name. For a list of line patterns, see “Line Patterns” on page 663.

  Default: For ungrouped data, the default line pattern is specified by the
  LineStyle attribute of the GraphBoxMedian style element in the current style. For
  grouped data, the default line pattern is specified by the LineStyle
  attribute of the GraphData1 ... GraphDataN style elements in the current style.

  THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
  “Units of Measurement” on page 659.

  Default: For ungrouped data, the default line thickness is specified by the
  LineThickness attribute of the GraphBoxMedian style element in the current style. For
  grouped data, the default line thickness is specified by the LineThickness attribute of
  the GraphData1 ... GraphDataN style elements in the current style.

  Default: GraphBoxMedian is the default style element.

Interaction: This option is ignored if the NOMEDIAN option is also specified.

MISSING
processes missing values as a valid category value and creates a box for it.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other
statements.

  Note: The name is case-sensitive. When you refer to the specified name in other
  statements, you must use the same exact capitalization.

NOCAPS
  hides the cap lines for the whiskers.

NOMEAN
  hides the mean marker.

NOMEDIAN
  hides the median line.
NOOUTLIERS
   hides the outliers from the plot.

NOTCHES
   specifies that the boxes be notched. The endpoints of the notches are at the following
   computed locations:

   \[ \text{median} \pm 1.58 \left( \frac{IQR}{\sqrt{N}} \right) \]

   For a visual description of the parts of a box plot, see “Details” on page 136.

OUTLIERATTRS= style-element <(options)> | (options)
   specifies the appearance of the marker that represents the outliers. You can specify
   the appearance by using a style element or by using suboptions. If you specify a style
   element, you can also specify suboptions to override specific appearance attributes.

   \textit{options} can be one or more of the following:

   \textbf{COLOR= color}
   specifies the color of the markers. You can specify colors using the same color
   schemes that are supported by SAS/GRAPH software. For more information, see
   “Color-Naming Schemes” in Chapter 14 of \textit{SAS/GRAPH: Reference}.

   \textbf{Default:} For ungrouped data, the default color is specified by the ContrastColor
   attribute of the GraphOutlier style element in the current style. For grouped
   data, the default color is specified by the ContrastColor attribute of the
   GraphData1 ... GraphData\textit{n} style elements in the current style.

   \textbf{SIZE= n <units>}
   specifies the size of the markers. You can also specify the unit of measurement.
   The default unit is pixels. For a list of measurement units that are supported, see
   “Units of Measurement” on page 659.

   \textbf{Default:} The default marker size is specified by the MarkerSize attribute of the
   GraphOutlier style element in the current style.

   \textbf{SYMBOL= symbol-name}
   specifies the symbol for the markers. For a list of valid marker symbols, see
   “Marker Symbols” on page 661.

   \textbf{Default:} For ungrouped data, the default marker symbol is specified by the
   MarkerSymbol attribute of the GraphOutlier style element in the current style. For grouped
   data, the default marker symbol is specified by the MarkerSymbol attribute of the
   GraphData1 ... GraphData\textit{n} style elements in the current style.

   \textbf{WEIGHT= NORMAL | BOLD}
   specifies the marker weight of the marker.

   \textbf{Default:} NORMAL

   \textbf{Default:} GraphOutlier is the default style element.

   \textbf{PERCENTILE= 1 | 2 | 3 | 4 | 5}
   specifies a method for computing the percentiles for the plot. For descriptions of
   each method, see “Calculating Percentiles” in the UNIVARIATE Procedure chapter
   of \textit{Base SAS Procedures Guide: Statistical Procedures}.

   \textbf{Default:} 5

   SPREAD
   relocates outlier points that have identical values to prevent overlapping.

   \textbf{Note:} This option has no effect if your data does not contain two or more outliers
   with identical values for the analysis variable.
TRANSPARENCY= numeric-value
   specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
   Default: 0.0

WHISKERATTRS= style-element <(options)> | (options)
   specifies the appearance of the whisker and cap lines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.
   options can be one or more of the following:

   COLOR= color
      specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
      Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData_n style elements in the current style.

   PATTERN= line-pattern
      specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
      Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData_n style elements in the current style.

   THICKNESS= n <units>
      specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
      Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData_n style elements in the current style.

   Default: GraphBoxWhisker is the default style element.
   Interaction: This option is ignored if the NOMEDIAN option is also specified.

Details

Horizontal and vertical box plots display the distribution of data by using a rectangular box and whiskers. Whiskers are lines that indicate a data range outside of the box.

Note: Though the following figure shows a vertical box plot, the basic concepts apply to horizontal box plots.
Figure 6.5  Parts of a Box Plot

Figure 6.5 on page 137 shows a diagram of a vertical box plot. The bottom and top edges of the box indicate the intra-quartile range (IQR). That is, the range of values between the first and third quartiles (the 25th and 75th percentiles). The marker inside the box indicates the mean value. The line inside the box indicates the median value.

The elements that are outside the box are dependent on your options. By default, the whiskers that extend from each box indicate the range of values that are outside of the intra-quartile range. However, the values are close enough not to be considered outliers (a distance less than or equal to 1.5*IQR). If you specify the EXTREME option, then the whiskers indicate the entire range of values, including outliers.

Any points that are a distance of more than 1.5*IQR from the box are considered to be outliers. By default, these points are indicated by markers. If you specify DATALABEL= option, then the outlier points have data labels. If you also specify the LABELFAR option, then only outliers that are 3*IQR from the box have data labels.

HIGHLOW Statement

Creates a display of floating vertical or horizontal lines or bars that represent high and low values. The statement also gives you the option to display open and close values as tick marks and to specify a variety of plot attributes.

Note: This plot does not summarize data. If multiple observations have the same X or Y value, the observations are all plotted separately based on their values.

Example: “About High-Low Charts” on page 22
Syntax
HIGHLOW X= variable | Y= variable
HIGH= numeric-variable LOW= numeric-variable
</option(s)>

Summary of Optional Arguments

Group options

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the maximum width.

GROUP= variable
specifies a variable that is used to group the data.

GROUPDISPLAY= OVERLAY | CLUSTER
specifies how to display grouped data.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of lines or bars within a group.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

HIGHLOW options

BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width.

CLOSE= numeric-variable
specifies the data for the CLOSE tick on the bar or line.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all lines or bars from the category midpoints.

FILL | NOFILL
specifies whether the area fill is visible for bars.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the area fill for the bar.

HIGHCAP= character-variable | option | NONE
specifies the type of arrowhead used at the high end of the bar or line.

HIGHLABEL= variable
specifies the label to be shown at the high end of the line or bar.

INTERVALBARWIDTH= numeric-value
specifies the thickness of the bar when the X (or Y) data is numeric.

LABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the HIGHLABEL= option, the LOWLABEL= option, or both options.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the outlines for the band.

LOWCAP= character-variable | option | NONE
specifies the type of arrowhead used at the low end of the bar or line.

LOWLABEL= variable
specifies the label to be shown at the low end of the line or bar.

OPEN= numeric-variable
specifies the data for the OPEN tick on the bar or line.
OUTLINE | NOOUTLINE
specifies whether the outlines of the bars are visible.

TYPE= BAR | LINE
specifies how the data is to be represented.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
specifies a label that identifies the elements from the band plot in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= value
specifies the degree of transparency for the plot.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Required Arguments

X= variable | Y= variable
specifies a variable that is used to plot the values along the N or Y axis.

Note: If you specify X=variable, then the statement creates vertical lines or bars on the X axis, with the HIGH and LOW values plotted along the Y axis. Conversely, if you specify Y=variable, then the statement creates horizontal lines or bars on the Y axis, with the HIGH and LOW values plotted along the X axis.

HIGH= numeric-variable
specifies the upper value for the floating lines or bars.

LOW= numeric-variable
specifies the lower value for the floating lines or bars.

Optional Arguments

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no distance between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

Default: 0.85

Requirement: This option is applicable only when the X or Y axis is discrete.

Interaction: This option has no effect unless TYPE= BAR.

CLOSE= numeric-variable
specifies the data for the CLOSE tick on the bar or line. For a vertical plot, the tick value is represented by an indicator on the side of the bar or line that has higher X
values. For a horizontal plot, the value is represented by an indicator on the side with higher Y values.

**CLUSTERWIDTH= numeric-value**  
specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).  
**Requirement:** This option is applicable only when the X or Y axis is discrete.  
**Interactions:**  
This option is applicable only when TYPE= BAR.  
This option is applicable only when the GROUP option is specified and GROUPDISPLAY= CLUSTER.

**DISCRETEOFFSET= numeric-value**  
specifies an amount to offset all lines or bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).  
**Default:** 0.0 (no offset from the category midpoints)  
**Requirement:** This option is applicable only when the X or Y axis is discrete.

**FILL | NOFILL**  
specifies whether the area fill is visible for bars. The FILL option shows the area fill. The NOFILL option hides the area fill.  
**Default:** The default status of the area fill is specified by the DisplayOpts attribute of the GraphBand style element in the current style.  
**Interactions:**  
This option has no effect unless TYPE= BAR.  
Specifying FILL also hides any visible outlines.  
If NOFILL and NOOUTLINE are both specified, then both options are ignored.

**FILLATTRS= style-element | (COLOR= color)**  
specifies the appearance of the area fill for the bar. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.  
**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataConfidence style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphData style elements in the current style.  
**Interactions:**  
This option is applicable only when TYPE= BAR.  
This option has no effect if you also specify the NOFILL option.

**GROUP= variable**  
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY= OVERLAY | CLUSTER**  
specifies how to display grouped data.  
**OVERLAY**  
groups are overlaid without any clustering. Each group is represented by unique visual attributes derived from the GraphData1... GraphData style elements in the current style.
CLUSTER
observations with different group values are displayed in adjacent clusters around
the category value. Each set of group values is centered at the midpoint tick mark
for the category.

Default: OVERLAY
Restriction: GROUPDISPLAY=CLUSTER has no effect unless the X or Y axis is
discrete.
Interactions:
GROUPDISPLAY=CLUSTER is applicable only when TYPE=BAR.
This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of lines or bars within a group.
ASCENDING
displays each group of lines or bars in ascending group value.
DESCENDING
displays each group of lines or bars in descending group value.
DATA
displays each group of lines or bars in data order of the group column.
Interactions:
This option is ignored unless GROUP= is specified.
This option is applicable only when GROUPDISPLAY=CLUSTER and
TYPE=BAR.

HIGHCAP= character-variable | option | NONE
specifies the type of arrowhead used at the high end of the bar or line. You can
specify one of the following options, or you can specify a character variable that
contains one of the following options:
SERIF
a small serif.  
The serif is supported for TYPE=LINE only.
BARBEDARROW
a solid triangle with an indent at the base.  
The barbed arrow is supported for TYPE=LINE only.
FILLEDARROW
a solid triangle.  
The filled arrow is supported for TYPE=BAR and TYPE=LINE.
OPENARROW
resembles the letter "V".  
The open arrow is supported for TYPE=LINE only.
CLOSEDARROW
an outline of a triangle.  
The closed arrow is supported for TYPE=BAR only.
Default: NONE
Restriction: Arrow heads are not displayed for very short bars. Bar height must be at least twice the size of the arrow heads in order for the arrow heads to appear.

**HIGHLABEL= variable**
specifies the label to be shown at the high end of the line or bar.

**INTERVALBARWIDTH= numeric-value**
specifies the thickness of the bar when the X (or Y) data is numeric.

**Default:** The default thickness of the bar is derived from the minimum interval between the data values along X or Y.

**Requirement:** This option is applicable only when the X or Y axis is a linear or a TIME axis.

**Interaction:** This option has no effect unless TYPE=BAR.

**LABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the HIGHLABEL= option, the LOWLABEL= option, or both options. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR= color**
specifies the color of the characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**FAMILY= “font-family”**
specifies the font family for the marker characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**
specifies the font size of the characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the elements from the band plot in the legend. By default, the label “band” is used for ungrouped data, and the group values are used for grouped data.
**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option.

**LINEATTRS= style-element <(options)> | (options)**

specifies the appearance of the outlines for the band. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

- **COLOR= color**
  specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

  **Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData*n* style elements in the current style.

- **PATTERN= line-pattern**
  specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

  **Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData*n* style elements in the current style.

- **THICKNESS= n <units>**
  specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

  **Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**Interaction:** This option has no effect unless you also specify the OUTLINES option.

**LOWCAP= character-variable | option | NONE**

specifies the type of arrowhead used at the low end of the bar or line. You can specify one of the following options, or you can specify a character variable that contains one of the following options:

- **SERIF**
  a small serif. ↓

  The serif is supported for TYPE=LINE only.

- **BARBEDARROW**
  a solid triangle with an indent at the base. ➙

  The barbed arrow is supported for TYPE=LINE only.

- **FILLEDARROW**
  a solid triangle. ➔

  The filled arrow is supported for TYPE=BAR and TYPE=LINE.
OPENARROW  
   resembles the letter "V".  
   The open arrow is supported for TYPE=LINE only.

CLOSEDARROW  
   an outline of a triangle.  
   The closed arrow is supported for TYPE=BAR only.

Default: NONE  
Restriction: Arrow heads are not displayed for very short bars. Bar height must be at least twice the size of the arrow heads in order for the arrow heads to appear.

LOWLABEL= variable  
specifies the label to be shown at the low end of the line or bar.

NOMISSINGGROUP  
specifies that missing values of the group variable are not included in the plot.  
Interaction: This option has no effect unless GROUP= is also specified.

NAME= "text-string"  
specifies a name for the plot. You can use the name to refer to this plot in other statements.  
Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

OPEN= numeric-variable  
specifies the data for the OPEN tick on the bar or line.  
For a vertical plot, the tick value is represented by an indicator on the side of the bar or line that has lower X values. For a horizontal plot, the value is represented by an indicator on the side with lower Y values.

OUTLINE | NOOUTLINE  
specifies whether the outlines of the bars are visible. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.  
Default: OUTLINE  
Interactions:  
   This option has no effect unless TYPE= BAR.  
   Specifying OUTLINE also hides the fill color.  
   If NOOUTLINE and NOFILL are both specified, then both options are ignored.

TRANSPARENCY= value  
specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).  
Default: 0.0

TYPE= BAR | LINE  
specifies how the data is to be represented. BAR uses fill and outline attributes. LINE uses line attributes.  
Default: LINE

URL= character-variable  
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.  
Default: By default, no HTML links are created.  
Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

HISTOGRAM Statement

Creates a histogram that displays the frequency distribution of a numeric value.

Interaction: The HISTOGRAM statement can be combined only with DENSITY statements in the SGPANEL procedure.

Note: The range of the response variable is automatically divided into an appropriate number of bins.

Examples: “About Histograms” on page 40
“Example 1: Creating a Panel of Graph Cells with Histograms and Density Plots” on page 267

Syntax

HISTOGRAM response-variable < / option(s)>;

Summary of Optional Arguments

Histogram options

BINSTART= numeric-value
specifies the X coordinate of the first bin.

BINWIDTH= numeric-value
specifies the bin width.

BOUNDARY= LOWER | UPPER
specifies how boundary values are assigned to bins.

FILL | NOFILL
specifies whether the area fill is visible.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the area fill.

NBINS= numeric-value
specifies the number of bins.

OUTLINE | NOOUTLINE
specifies whether outlines are displayed for the bars.

SCALE= COUNT | PERCENT | PROPORTION
specifies the scaling that is applied to the vertical axis.

Plot options

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.

LEGENDLABEL= “text-string”
specifies a label that identifies the histogram in the legend.
NAME=“text-string”
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the histogram.

Required Argument

response-variable
specifies a response variable for the histogram.

Optional Arguments

BINSTART= numeric-value
specifies the X coordinate of the first bin. Use this option in conjunction with the BINWIDTH= or NBINS= options to specify bins. If neither BINWIDTH= nor the NBINS= option is specified, the system determines the number of bins. If the BINSTART value results in excluding the entire range of data, it is ignored and the default BINSTART value is used.

Default: The default value is determined by the system.

BINWIDTH= numeric-value
specifies the bin width. The system determines the number of bins. The bins always span the range of the data.

Default: The default value is determined by the system.

Interaction: This option is ignored if the NBINS= option is also specified.

BOUNDARY= LOWER | UPPER
specifies how boundary values are assigned to bins.

LOWER
specifies that boundary values are assigned to the lower bin.

UPPER
specifies that boundary values are assigned to the upper bin.

Default: UPPER

FILL | NOFILL
specifies whether the area fill is visible. The FILL option shows the area fill. The NOFILL option hides the area fill.

Default: The default status of the area fill is specified by the DisplayOpts style attribute of the GraphHistogram style element in the current style.

Interactions:
Specifying FILL also hides any visible outlines.
If NOFILL and NOOUTLINE are both specified, then both options are ignored.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the area fill. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the Color attribute of the GraphData1 ... GraphDataN style elements in the current style.

Interaction: This option has no effect if you specify the NOFILL option.
FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

LEGENDLABEL= “text-string”
specifies a label that identifies the histogram in the legend. By default, the label of the response variable is used.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NBINS= numeric-value
specifies the number of bins. The system determines the BINWIDTH= value. The bins always span the range of the data.

The procedure attempts to produce tick values that are easily interpreted (for example, 5, 10, 15, 20). The procedure sometimes adjusts the location of the first bin and the bin width accordingly. As a result, the number of bins shown in the plot might not exactly match the number specified with the NBINS= option.

Default: The default number of bins is determined by the system.

OUTLINE | NOOUTLINE
specifies whether outlines are displayed for the bars. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: The default status of the bar outlines is specified by the DisplayOpts attribute of the GraphHistogram style element in the current style.

Interactions:
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

SCALE= COUNT | PERCENT | PROPORTION
specifies the scaling that is applied to the vertical axis. Specify one of the following values:

COUNT
the axis displays the frequency count.

PERCENT
the axis displays values as a percentage of the total.

PROPORTION
the axis displays values as proportions (0.0 to 1.0) of the total.

Default: PERCENT

TRANSPARENCY= numeric-value
specifies the degree of transparency for the histogram. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0
HLINE Statement

Creates a horizontal line chart (the line is vertical). You can use the HLINE statement with the HBAR statement to create a horizontal bar-line chart.

Interaction: The HLINE statement can be combined only with other categorization plot statements in the SGPANEL procedure. See “Plot Type Compatibility” on page 81.

Example: “About Line Charts” on page 47

Syntax

HLINE category-variable < / option(s)>;

Summary of Optional Arguments

Group options

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.

GROUP= variable
specifies a category variable to divide the values into groups.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped lines.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of lines within a group.

Label options

CURVELABEL <="text-string”>
adds a label for the line.

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option.

CURVELABELPOS= MIN | MAX | START | END
specifies the location of the curve label.

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Line options

BREAK
creates a break in the line for each missing value of the response variable.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all lines from the discrete category values.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot.

LIMITS= BOTH | LOWER | UPPER
adds limit lines to the plot.

LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines.

**LINEATTRS** = style-element <(options)> | (options)

specifies the appearance of the lines in the line plot.

**MARKERATTRS** = style-element <(options)> | (options)

specifies the appearance of the markers in the plot.

**MARKERS**

adds data point markers to the plot.

**MISSING**

processes missing values as a valid category value and creates a line for it.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**NUMSTD** = \( n \)

specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

**RESPONSE** = response-variable

specifies a numeric response variable for the plot.

**STAT** = FREQ | MEAN | SUM

specifies the statistic for the horizontal axis.

---

**Plot options**

**ALPHA** = numeric-value

specifies the confidence level for the confidence limits.

**ATTRID** = variable

specifies the value of the ID variable in an attribute map data set.

**CATEGORYORDER** = RESPASC | RESPDESC

specifies the order in which the response values are arranged.

**FREQ** = numeric-variable

specifies how many times observations are repeated for computational purposes.

**LEGENDLABEL** = “text-string”

specifies the label that identifies the line plot in the legend.

**NAME** = “text-string”

specifies a name for the plot.

**TRANSPARENCY** = numeric-value

specifies the degree of transparency for the lines and markers.

**URL** = character-variable

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**WEIGHT** = numeric-variable

specifies how observations are weighted.

---

**Required Argument**

category-variable

specifies the variable that classifies the observations into distinct subsets.

---

**Optional Arguments**

**ALPHA** = numeric-value

specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).
Default: 0.05

Interactions:
This option has no effect if you do not specify LIMITSTAT=CLM.
If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BREAK
creates a break in the line for each missing value of the response variable.

Notes:
The observation is excluded from the graph when there is a missing value for the category variable without the specification of the MISSING option. (No break occurs in the line.)
The observation is excluded from the graph when there is a missing value for the FREQ variable.

CATEGORYORDER= RESPASC | RESPDESC
specifies the order in which the response values are arranged. Specify one of the following values:

RESPASC
sorts the response values in ascending order.

RESPDESC
sorts the response values in descending order.

Default: By default, the plot is sorted in ascending order based on the category values.

Restriction: This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.

Requirement: This option requires that you configure the panel to use either one column or one row, depending on the orientation of your charts. Use the ROWS= or the COLUMNS= option in the PANELBY statement. If you do not use this option and your graph contains multiple cells, the specified sort order is not correctly applied to all cells.

Interaction: If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

Note: If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

CURVELABEL <"text-string" >
adds a label for the line. You can also specify the label text. If you do not specify a label, then the label from the response variable is used.
CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
CURVELABELATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
specifies the color of the line label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:
CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphValueText.

Interaction: This option has no effect unless the CURVELABEL option is also specified.

CURVELABELPOS= MIN | MAX | START | END
specifies the location of the curve label. Specify one of the following values:

MIN
places the label at the part of the curve closest to the minimum X axis value.
MAX
places the label at the part of the curve closest to the maximum X axis value.

START
places the curve label at the first point on the curve.

END
places the curve label at the last point on the curve.

**Default:** END

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**DATALABEL <= variable>**
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
```
DATALABELATTRS=GraphLabelText
```

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY= "font-family"**
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).
Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

DISCRETEOFFSET= numeric-value

specifies an amount to offset all lines from the discrete category values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the category axis is discrete.

FREQ= numeric-variable

specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

GROUP= variable

specifies a category variable to divide the values into groups. A separate plot is created for each unique value of the category variable.

Interaction: If you specify more than one categorization plot statement, then all of the plots must specify the same GROUP variable. If you do not specify the same GROUP= option for all of the categorization plots, then the GROUP= option has no effect.

GROUPDISPLAY= CLUSTER | OVERLAY

specifies how to display grouped lines.

CLUSTER

grouped items are drawn adjacent to each other.

OVERLAY

grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1...GraphDataN style elements in the current style.

Default: OVERLAY

Restriction: GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

Interaction: This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA

specifies the ordering of lines within a group.

ASCENDING

displays each group in ascending group value.

DESCENDING

displays each group in descending group value.

DATA

displays each group in data order of the group variable.
**Interaction:** This option is ignored unless GROUP= is specified.

**LEGENDLABEL= “text-string”**
specifies the label that identifies the line plot in the legend. By default, the label of the response variable is used. If there is no response variable label, then the name of the response variable and the computed statistic (SUM or MEAN) are used. If you do not specify a response variable, then the legend label is “Frequency”.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

**LIMITATTRS= style-element <(options)> | (options)**
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**LIMITS= BOTH | LOWER | UPPER**
adds limit lines to the plot. Specify one of the following values:

**BOTH**
adds lower and upper limit lines to the plot.

**LOWER**
adds lower limit lines to the plot.

**UPPER**
adds upper limit lines to the plot.

**Default:** By default, no limit lines are displayed. However, if you specify the LIMITSTAT= option, then the default is BOTH.

**Interaction:** Limit lines are displayed only when you specify STAT= MEAN.

**LIMITSTAT= CLM | STDDEV | STDERR**
specifies the statistic for the limit lines. Specify one of the following

**CLM**
confidence limits

**STDDEV**
standard deviation
STDERR
standard error

Default: CLM

Interaction: If you specify the LIMITSTAT= option, then the default value for the LIMITS= option is BOTH.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the lines in the line plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. This option has no effect unless you also specify the MARKERS option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.
SIZE= n <units >
   specifies the size of the markers. You can also specify the unit of measurement.
The default unit is pixels. For a list of measurement units that are supported, see
   “Units of Measurement” on page 659.
   Default: The default marker size is specified by the MarkerSize attribute of the
   GraphDataDefault style element in the current style.

SYMBOL= symbol-name
   specifies the symbol for the markers. For a list of valid marker symbols, see
   “Marker Symbols” on page 661.
   Default: For ungrouped data, the default marker symbol is specified by the
   MarkerSymbol attribute of the GraphDataDefault style element in the current
   style.
   For grouped data, the default marker symbol is specified by the
   MarkerSymbol attribute of the GraphData1 ... GraphDatan style elements in
   the current style.

MARKERS
   adds data point markers to the plot.

MISSING
   processes missing values as a valid category value and creates a line for it.

NAME= “text-string”
   specifies a name for the plot. You can use the name to refer to this plot in other
   statements.
   Note: The name is case-sensitive. When you refer to the specified name in other
   statements, you must use the same exact capitalization.

NOSTATLABEL
   removes the statistic name from the axis and legend labels.

NUMSTD= n
   specifies the number of standard units for the limit lines, when you specify
   LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive
   number, including decimals.
   Default: 1

RESPONSE= response-variable
   specifies a numeric response variable for the plot. The summarized values of the
   response variable are displayed on the horizontal axis.

STAT= FREQ | MEAN | SUM
   specifies the statistic for the horizontal axis. Specify one of the following:

   FREQ
      the frequencies for the category variable. This is the default value when you do
      not specify the RESPONSE= option.

   MEAN
      the mean of the response variable.

   SUM
      the sum of the response variable. This is the default value when you specify the
      RESPONSE= option.

   Interaction: If you do not specify the RESPONSE= option, then only the FREQ
      statistic can be used. If you specify the RESPONSE= option, then you can use
      either the SUM or MEAN statistics.
TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines and markers. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
Default: By default, no HTML links are created.
Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of $w$ for computational purposes, where $w$ is the value of the numeric variable. $w$ can be any numeric value. If $w$ is 0, negative or missing, then that observation is excluded from the analysis.
Interaction: If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

KEYLEGEND Statement
Adds a legend to the plot.

Syntax
KEYLEGEND <“name-1” ... “name-n”> <option(s)>;

Summary of Optional Arguments

ACROSS= $n$
specifies the number of columns in the legend.

BORDER | NOBORDER
specifies whether the border around the legend is visible.

DOWN= $n$
specifies the number of rows in the legend.

POSITION= position-value
specifies the position of the legend within the plot.

TITLE= “text-string”
adds a title to the legend.

TITLEATTRS= style-element <(options)> | (options)
specifies the appearance of the legend title.

VALUEATTRS= style-element <(options)> | (options)
specifies the appearance of the legend value labels.

“name-1” ... “name-n”
specifies the names of one or more plots that you want to include in legend.
Optional Arguments

“name-1” ... “name-n”
specifies the names of one or more plots that you want to include in legend. Each name that you specify must correspond to a value that you entered for the NAME= option in a plot statement.

Note: If you do not specify a name, then the legend contains references to all of the plots in the graph.

ACROSS= n
specifies the number of columns in the legend. By default, the number of columns is determined automatically.

Note: Depending on the number of legend entries and the number of columns and rows that you specify, the legend might not fit in your graph. If your legend does not appear, then you might need to specify a different value for the ACROSS= option.

BORDER | NOBORDER
specifies whether the border around the legend is visible. The BORDER option shows the border. The NOBORDER option hides the border.

Default: BORDER

DOWN= n
specifies the number of rows in the legend. By default, the number of rows is determined automatically.

Note: Depending on the number of legend entries and the number of columns and rows that you specify, the legend might not fit in your graph. If your legend does not appear, then you might need to specify a different value for the DOWN= option.

POSITION= position-value
specifies the position of the legend within the plot. The positions are as follows:

BOTTOM
places the legend at the bottom of the plot.

LEFT
places the legend at the left side of the plot.

RIGHT
places the legend at the right side of the plot.

TOP
places the legend at the top of the plot.

Default: BOTTOM

Note: By default, if you use more than one KEYLEGEND statement, then each legend is placed in a different position.

TITLE= “text-string”
adds a title to the legend.

TITLEATTRS= style-element <(options)> | (options)
specifies the appearance of the legend title. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
TITLEATTRS=GraphTitleText

options can be one or more of the following:
COLOR= color
specifies the color of the title characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphLabelText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the title characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphLabelText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the title characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphLabelText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the title characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the
GraphLabelText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the title characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphLabelText style element in the current style.

Here is an example expression:

TITLEATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default appearance of the title text is specified by the GraphLabelText
style element in the current style.

VALUEATTRS= style-element <(options)> | (options)
specifies the appearance of the legend value labels. You can specify the appearance
by using a style element or by using suboptions. If you specify a style element, you
can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphValueText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData n style elements in the current style.
FAMILY= “font-family”
 specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
 specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
 specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

### Example

```
proc sgpanel data=sashelp.class noautolegend;
  panelby sex;
  histogram height;
  density height /
    type=kernel
    name="kernel"
    lineattrs=(color = red);
```

![Graph Example](image-url)
LINEPARN Statement

Creates a straight line specified by a point and a slope. You can generate a single line by specifying a constant for each required argument. You can generate multiple lines by specifying a numeric variable for any or all required arguments.

**Requirement:** The statement must be used with another plot statement that is derived from data values that provide boundaries for the axis area. For example, the LINEPARN statement can be used with a scatter plot or a histogram.

**Example:** “About Parameterized Lines” on page 24

**Syntax**

```
LINEPARN X= numeric-value | numeric-variable
Y= numeric-value | numeric-variable
SLOPE= numeric-value | numeric-variable
```

**Summary of Optional Arguments**

**Group options**

- **NOMISSINGGROUP**
  - specifies that missing values of the group variable are not included in the plot.

**Label options**

- **CURVELABEL <="text-string"**
  - adds a label for the line.
- **CURVELABELATTRS= style-element <(options)> | (options)**
  - specifies the appearance of the labels in the plot when you use the CURVELABEL= option.
- **CURVELABELPOS= MAX | MIN**
  - specifies the location of the curve label.

**Line options**

- **CLIP**
  - specifies that the data for the line is ignored when determining the data ranges for the axes.
- **LINEATTRS= style-element <(options)> | (options)**
  - specifies the appearance of the line.
- **NOEXTEND**
  - prevents the line from being extended beyond the axis offset.

**Plot options**

- **ATTRID= variable**
specifies the value of the ID variable in an attribute map data set.

GROUP= variable
specifies a variable that is used to group the data.

LEGENDLABEL= "text-string"
specifies a label that identifies the plot in the legend.

NAME= "text-string"
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines.

Required Arguments

X= numeric-value | numeric-variable
specifies the X coordinate of a point.

Notes:
Values are in the units of the data.
If the value specified for the X= option is outside of the data range, then the data range is extended to include the specified point. This behavior can be changed with the CLIP= option.
If you specify a variable, and the variable contains any missing values, no line is drawn for the respective observation.

Y= numeric-value | numeric-variable
specifies the Y coordinate of a point.

Notes:
Values are in the units of the data.
If the value specified for the Y= option is outside of the data range, then the data range is extended to include the specified point. This behavior can be changed with the CLIP= option.
If you specify a variable, and the variable contains any missing values, no line is drawn for the respective observation.

SLOPE= numeric-value | numeric-variable
specifies the slope of the line. The slope can be positive or negative.

Tips:
SLOPE= 0 creates a horizontal line (parallel to the X axis).
SLOPE= . (missing value) creates a vertical line (parallel to the Y axis).

Optional Arguments

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

CLIP
specifies that the data for the line is ignored when determining the data ranges for the axes. Each axis scale is determined by the other plots in the overlay. This might result in the line not being displayed if its data range is not within the data ranges of the other plots.
CURVELABEL <=“text-string”>
adds a label for the line. You can also specify the label text. If you do not specify a label, then SLOPE=value is used. If you specify a GROUP variable, the group value is shown instead of the slope.

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
CURVELABELATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
specifies the color of the line label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:
CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphValueText.

Interaction: This option has no effect unless the CURVELABEL option is also specified.
CURVELABELPOS= MAX | MIN
specifies the location of the curve label. Specify one of the following values:

MIN
places the curve label at the minimum value for the X axis.

MAX
places the curve label at the maximum value for the X axis.

Default: MAX
Interaction: This option has no effect unless CURVELABEL is also specified.

GROUP= variable
specifies a variable that is used to group the data. A separate plot is created for each
unique value of the grouping variable. The plot elements for each group value are
automatically distinguished by different visual attributes.

LEGENDLABEL= “text-string”
specifies a label that identifies the plot in the legend. By default, the label
“LineParm” is used (if you specify a numeric value for Y) or the Y variable name is
used (if you specify a variable for Y).
Interaction: The LEGENDLABEL= option has no effect if you also specify the
GROUP= option in the same plot statement.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the line. You can specify the appearance by using a style
element or by using suboptions. If you specify a style element, you can also specify
suboptions to override specific appearance attributes.

Here is an example that specifies a style element: LINEATTRS=GraphData3
For more information about style elements, see “Style Elements for Use with ODS
Graphics” on page 640.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of
the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphDataDefault style element in the current
style. For grouped data, the default line thickness is specified by the

LineThickness attribute of the GraphData1 ... GraphData style elements in the current style.

Here is an example expression:

```
LINEATTRS=(Color= *light green* Pattern= MediumDash Thickness= 4)
```

**Default:** GraphDataDefault is the default style element.

**NAME= **“text-string”

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NOEXTEND**

prevents the line from being extended beyond the axis offset. When specified, there might be a gap between the line and the axis. The gap is controlled by the axis offset. If the offset is set to 0, then there is no gap.

**NOMISSINGGROUP**

specifies that missing values of the group variable are not included in the plot.

**Interaction:** This option has no effect unless GROUP= is also specified.

**TRANSPARENCY= numeric-value**

specifies the degree of transparency for the lines. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

---

**LOESS Statement**

Creates a fitted loess curve.

**Example:** “About Loess Plots” on page 34

**Syntax**

```
LOESS X= numeric-variable Y= numeric-variable <option(s)>;
```

**Summary of Optional Arguments**

**Label options**

```
CURVELABEL <=“text-string”>
```

adds a label for the curve.

```
CURVELABELPOS= MIN | MAX | START | END
```

specifies the location of the curve label.

```
DATALABEL <= variable>
```

displays a label for each data point.

**Limit options**

```
CLM <=“text-string”>
```

creates confidence limits.

```
CLMATTRS = style-element | (CLMAttributeOptions)
```

specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes.
CLMTRANSPARENCY= numeric-value
specifies the degree of transparency for the confidence limits.

LOESS options

DEGREE= 1 | 2
specifies the degree of the local polynomials to use for each local regression.

INTERPOLATION= CUBIC | LINEAR
specifies the degree of the interpolating polynomials that are used for blending local polynomial fits at the kd tree vertices.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the fit curve.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot.

MAXPOINTS= n
specifies the maximum number of predicted points for the loess fit and the corresponding limits.

NOLEGCLM
hides the legend entry for the mean value confidence limits.

NOLEGFIT
hides the legend entry for the fit line.

NOMARKERS
removes the scatter markers from the plot.

REWEIGHT= n
specifies the number of iterative reweighting steps to apply to the data.

SMOOTH= numeric-value
specifies a smoothing parameter value.

Plot options

ALPHA= numeric-value
specifies the confidence level for the confidence limits.

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

GROUP= variable
specifies a classification variable to divide the values into groups.

LEGENDLABEL= “text-string”
specifies a label that identifies the fit line in the legend.

NAME= “text-string”
specifies a name for the plot.

WEIGHT= numeric-variable
specifies how observations are weighted.

Required Arguments

X= numeric-variable
specifies the variable for the x axis.

Y= numeric-variable
specifies the variable for the y axis.
Optional Arguments

**ALPHA= numeric-value**
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

**Default**: .05

**Interaction**: This option has no effect unless you also specify the CLM option.

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**CLM <= “text-string”>**
creates confidence limits. The optional text string overrides the default legend label for the confidence limit.

**CLMATTRS = style-element | (CLMAttributeOptions)**
specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes. **CLMAttributeOptions** can be one or both of the following:

**CLMFILLATTRS=style-element | (COLOR= color)**
You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**CLMLINEATTRS= style-element <(options)> | (options)**
You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

The confidence limits have no outlines by default (for most styles). To make the outlines appear, you can change the DISPLAYOPTS in the GRAPHBAND style element. Then you can specify attributes for the outlines. The following code provides an example.

```sas
proc template;
   define style MyStyleDefault;
      parent=Styles.Default;
      style GraphBand from GraphBand / DisplayOpts = "Fill outline";
   end;
run;

ods listing style= MyStyleDefault;
proc sgplot data=sashelp.class;
   reg x=height y=weight / CLM
      CLMATTRS=(CLMLINEATTRS=
               (COLOR=Green PATTERN= ShortDash));
run;
```

The **CLMLINEATTRS= options** can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
Default: For ungrouped data, the default color is specified by the
ContrastColor attribute of the GraphConfidence style element in the
current style. For grouped data, the default color is specified by the
ContrastColor attribute of the GraphData1 ... GraphData$n
style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by
number or by name. For a list of line patterns, see “Line Patterns” on page
663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphConfidence style element in the current
style. For grouped data, the default line pattern is specified by the
LineStyle attribute of the GraphData1 ... GraphData$n
style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure.
The default unit is pixels. For a list of measurement units that are supported,
see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphConfidence style element in the
current style. For grouped data, the default line thickness is specified by
the LineThickness attribute of the GraphData1 ... GraphData$n
style elements in the current style.

Interaction: This suboption has no effect unless you change the display options
in the style element to display outlines. See the preceding code example.

Default: The default appearance of the confidence limits is specified by the
GraphConfidence style element in the current style.

Interaction: The CLMATTRS = option has no effect unless you also specify the
CLM option.

CLMTRANSPARENCY= numeric-value
specifies the degree of transparency for the confidence limits. Specify a value from
0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

Interaction: This option takes effect only if you also specify the CLM option.

CURVELABEL <text-string>
adds a label for the curve. You can also specify the label text. If you do not specify a
label, the label from the Y variable is used.

CURVELABELPOS= MIN | MAX | START | END
specifies the location of the curve label. Specify one of the following values:

MIN
places the label at the part of the curve closest to the minimum X axis value.

MAX
places the label at the part of the curve closest to the maximum X axis value.

START
places the curve label at the first point on the curve.

END
places the curve label at the last point on the curve.

Default: END
**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**DATALABEL <= variable>**
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

**Interaction:** This option has no effect if you also specify the NOMARKERS option.

**DEGREE= 1 | 2**
specifies the degree of the local polynomials to use for each local regression. 1 specifies a linear fit and 2 specifies a quadratic fit.

**Default:** 1

**GROUP= variable**
specifies a classification variable to divide the values into groups. A separate plot is created for each unique value of the classification variable.

**Interaction:** If you specify the GROUP= option in multiple fit plot statements, then the first GROUP= variable is used for all of the fit plots that specify GROUP=.

**INTERPOLATION= CUBIC | LINEAR**
specifies the degree of the interpolating polynomials that are used for blending local polynomial fits at the kd tree vertices.

**Default:** CUBIC

**LEGENDLABEL="text-string"**
specifies a label that identifies the fit line in the legend. By default, the label “Loess” is used, along with the value of the SMOOTH= option if specified.

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the fit curve. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style.
For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1...GraphData style elements in the current style.

**MARKERATTRS= style-element <(options)> | (options)**
specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR= color**
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

*Default:* For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1...GraphData style elements in the current style.

**SIZE= n <units>**
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

*Default:* The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

**SYMBOL= symbol-name**
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

*Default:* For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1...GraphData style elements in the current style.

**MAXPOINTS= n**
specifies the maximum number of predicted points for the loess fit and the corresponding limits.

*Default:* 201

**NAME= "text-string"**
specifies a name for the plot. You can use the name to refer to this plot in other statements.

*Note:* The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NOLEGCLM**
hides the legend entry for the mean value confidence limits.

**NOLEGFIT**
hides the legend entry for the fit line.

**NOMARKERS**
removes the scatter markers from the plot.

**REWEIGHT= n**
specifies the number of iterative reweighting steps to apply to the data.

*Default:* 0
Interaction: This option has no affect if you do not specify the WEIGHT option.

SMOOTH= numeric-value
specifies a smoothing parameter value. If you do not specify this option, a smoothing value is determined automatically.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

Details
For the SMOOTH= option, the smoothing parameter value must be greater than the minimum value that is determined by the following equation.

\[
minimum = \frac{\text{degree} + 1}{\text{number of observations}}
\]

NEEDLE Statement
Creates a plot with needles connecting each point to the baseline.

Restriction: The vertical axis that is used with the NEEDLE statement cannot be a discrete axis.

Example: “About Needle Plots” on page 26

Syntax
NEEDLE X= variable Y= numeric-variable </ option(s)>;

Summary of Optional Arguments

Group options

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.

GROUP= variable
specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped needles.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of needles within a group.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.
Needle options

**BASELINE= numeric-value**
specifies a value on the Y axis for the baseline.

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset all needle lines from discrete X values.

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the needle lines.

**MARKERATTRS= style-element <(options)> | (options)**
specifies the appearance of the markers in the plot.

**MARKERS**
adds markers to the tips of the needles.

Plot options

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the needle plot in the legend.

**NAME= “text-string”**
specifies a name for the plot.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the needle plot.

**URL= character-variable**
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Required Arguments**

**X= variable**
specifies the variable for the x axis.

**Y= numeric-variable**
specifies a numeric variable for the y axis.

**Optional Arguments**

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BASELINE= numeric-value**
specifies a value on the Y axis for the baseline.

**CLUSTERWIDTH= numeric-value**
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

**Default:** 0.8

**Interaction:** This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

**DATALABEL <= variable>**
displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.
DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL=
option. You can specify the appearance by using a style element or by using
suboptions. If you specify a style element, you can also specify suboptions to
override specific appearance attributes.

Here is an example that specifies a style element:

DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ...
GraphData n style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the
GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the
GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also
specified.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all needle lines from discrete X values. Specify a value
from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the X axis is discrete.
GROUP= **variable**
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

GROUPDISPLAY= **CLUSTER | OVERLAY**
specifies how to display grouped needles.

- **CLUSTER**
grouped items are drawn adjacent to each other.

- **OVERLAY**
grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1...GraphDataN style elements in the current style.

**Default:** OVERLAY

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

**Interaction:** This option is ignored unless GROUP= is specified.

GROUPORDER= **ASCENDING | DESCENDING | DATA**
specifies the ordering of needles within a group.

- **ASCENDING**
displays each group in ascending group value.

- **DESCENDING**
displays each group in descending group value.

- **DATA**
displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

LEGENDLABEL= **"text-string"**
specifies a label that identifies the needle plot in the legend. By default, the label of the Y variable or the group value for each marker is used.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LINEATTRS= **style-element <(options)> | (options)**
specifies the appearance of the needle lines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

- **COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

  **Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

  For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

- **PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData_n style elements in the current style.

\[ \text{THICKNESS=} n <\text{units}> \]

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData_n style elements in the current style.

**MARKERATTRS= style-element <(options)> | (options)**

specifies the appearance of the markers in the plot. This option has no effect unless you also specify the MARKERS option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR= color**

specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData_n style elements in the current style.

**SIZE= n <units>**

specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

**SYMBOL= symbol-name**

specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData_n style elements in the current style.

**MARKERS**

adds markers to the tips of the needles.

**NAME= “text-string”**

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.
NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Interaction: This option has no effect unless GROUP= is also specified.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the needle plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

PBSPLINE Statement
Creates a fitted penalized B-spline curve.

Example: “About Penalized B-Spline Plots” on page 35

Syntax
PBSPLINE x= numeric-variable y= numeric-variable <／options>;

Summary of Optional Arguments

Label options
CURVELABEL <=“text-string”>
adds a label for the curve.

CURVELABELPOS = MIN | MAX | START | END
specifies the location of the curve label.

DATALABEL <= variable>
displays a label for each data point.

Limit options
CLI <= “text-string”>
creates prediction limits for the individual predicted values.

CLIATTRS = style-element | (CLILINEATTRS = style-element <(options)> | (options))
specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines.

CLM <= “text-string”>
creates confidence limits.

CLMATTRS = style-element | (CLMAttributeOptions)
specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes.

**CLMTRANSPARENCY= numeric-value**
specifies the degree of transparency for the confidence limits.

**PBSPLINE options**

**DEGREE= n**
specifies the degree of the spline transformation.

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the fitted curve.

**MARKERATTRS= style-element <(options)> | (options)**
specifies the appearance of the markers in the plot.

**MAXPOINTS= n**
specifies the maximum number of predicted points for the spline curve and for any confidence limits.

**NKNOTS= n**
specifies the number of evenly spaced internal knots.

**NOLEGCLI**
hides the legend entry for the individual value prediction limits.

**NOLEGCLM**
hides the legend entry for the mean value confidence limits.

**NOLEGFIT**
hides the legend entry for the fit line.

**NOMARKERS**
removes the scatter markers from the plot.

**SMOOTH= numeric-value**
specifies a smoothing parameter value.

**Plot options**

**ALPHA= numeric-value**
specifies the confidence level for the confidence limits.

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes.

**GROUP= variable**
specifies a classification variable to divide the values into groups.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the B-spline curve in the legend.

**NAME= “text-string”**
specifies a name for the plot.

**WEIGHT= numeric-variable**
specifies how observations are weighted.

**Required Arguments**

**X= numeric-variable**
specifies the variable for the x axis.

**Y= numeric-variable**
specifies the variable for the y axis.
Optional Arguments

ALPHA= numeric-value
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

Interaction: This option has no effect unless you specify the CLI or CLM option (or both).

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

CLI <= “text-string”>
creates prediction limits for the individual predicted values. The optional text string overrides the default legend label for the prediction limits.

CLIATTRS = style-element | (CLILINEATTRS= style-element <(options)> ) (options)
specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines. The outline attributes can be the following:

CLILINEATTRS= style-element <(options)> ) (options)
You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line thickness is specified by
the LineThickness attribute of the GraphData1 ... GraphData\n style elements in the current style.

**Default:** The default style element is GraphPredictionLimits.

**Interaction:** The CLIATTRS = option has no effect unless you also specify the CLI option.

\[\text{CLM} <= \text{"text-string"}\]

creates confidence limits. The optional text string overrides the default legend label for the confidence limit.

**CLMATTRS = style-element | (CLMAttributeOptions)**

specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes. **CLMAttributeOptions** can be one or both of the following:

\[\text{CLMFILLATTRS}=\text{style-element | (COLOR=} \text{color}\]

You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

\[\text{CLMLINEATTRS}=\text{style-element | (COLOR=} \text{color}\]

You can specify the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphConfidence style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\n style elements in the current style.
**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by theLineStyle attribute of the GraphConfidence style element in the current style. For grouped data, the default line pattern is specified by theLineStyle attribute of the GraphData1 ... GraphData\n style elements in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by theLineThickness attribute of the GraphConfidence style element in the current style. For grouped data, the default line thickness is specified by theLineThickness attribute of the GraphData1 ... GraphData\n style elements in the current style.

**Interaction:** This suboption has no effect unless you change the display options in the style element to display outlines. See the preceding code example.

**Default:** The default appearance of the confidence limits is specified by theGraphConfidence style element in the current style.

**Interaction:** The CLMATTRS = option has no effect unless you also specify theCLM option.

**CLMTRANSPARENCY= numeric-value**
specifies the degree of transparency for the confidence limits. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**Interaction:** This option takes effect only if you also specify the CLM option.

**CURVELABEL <="text-string">**
adds a label for the curve. You can also specify the label text. If you do not specify a label, the label from the Y variable is used.

**CURVELABELPOS= MIN | MAX | START | END**
specifies the location of the curve label. Specify one of the following values:

- **MIN**
  places the label at the part of the curve closest to the minimum X axis value.

- **MAX**
  places the label at the part of the curve closest to the maximum X axis value.

- **START**
  places the curve label at the first point on the curve.

- **END**
  places the curve label at the last point on the curve.

**Default:** END

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.
DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that
variable are used for the data labels. If you do not specify a variable, then the values
of the Y variable are used for the data labels.

Interaction:  This option has no effect if you also specify the NOMARKERS option.

DEGREE= n
specifies the degree of the spline transformation.

Default:  3

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.
Each observation is repeated $n$ times for computational purposes, where $n$ is the
value of the numeric variable. If $n$ is not an integer, then it is truncated to an integer.
If $n$ is less than 1 or missing, then it is excluded from the analysis.

GROUP= variable
specifies a classification variable to divide the values into groups. A separate plot is
created for each unique value of the classification variable.

Interaction:  If you specify the GROUP= option in multiple fit plot statements, then
the first GROUP= variable is used for all of the fit plots that specify GROUP=.

LEGENDLABEL= "text-string"
specifies a label that identifies the B-spline curve in the legend. By default, the label
"Penalized B-Spline" is used with the SMOOTH= value if specified, or else the
group value for each B-spline is used.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the fitted curve. You can specify the appearance by using
a style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default:  For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphFit style element in the current style.
For grouped data, the default color is specified by the ContrastColor attribute
of the GraphData1 ... GraphData$n$ style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default:  For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphFit style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default:  For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphFit style element in the current style.
For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData style elements in the current style.

**MARKERATTRS=** *style-element* *(options)*

specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR=** *color*

specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.

**SIZE=** *n* *(units)*

specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

**SYMBOL=** *symbol-name*

specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData style elements in the current style.

**MAXPOINTS=** *n*

specifies the maximum number of predicted points for the spline curve and for any confidence limits.

**Default:** 201

**NAME=** “*text-string*

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NKNOTS=** *n*

specifies the number of evenly spaced internal knots.

**Default:** 100

**NOLEGCLI**

hides the legend entry for the individual value prediction limits.

**NOLEGCLM**

hides the legend entry for the mean value confidence limits.

**NOLEGFIT**

hides the legend entry for the fit line.
NOMARKERS
removes the scatter markers from the plot.

SMOOTH= numeric-value
specifies a smoothing parameter value. If you do not specify this option, a smoothing
value is determined automatically.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of
$w$ for computational purposes, where $w$ is the value of the numeric variable. $w$ can be
any numeric value. If $w$ is 0, negative or missing, then that observation is excluded
from the analysis.

Details
For the SMOOTH= option, the smoothing parameter value must be greater than the
minimum value that is determined by the following equation.

$$minimum = \frac{\text{degree} + 1}{\text{number of observations}}$$

REFLINE Statement
Creates a horizontal or vertical reference line.

Example: “About Reference Lines” on page 23

Syntax
REFLINE variable | value-1 <... value-n> </option(s)>;

Summary of Optional Arguments

Line options

AXIS= X | Y
specifies the axis that contains the reference line values.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all lines from discrete X or Y values.

LABEL <= (“text-string-1” ... “text-string-n”)>
creates labels for each reference line.

LABELPOS= MIN | MAX
specifies the position of the labels.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the reference line.

NOCLIP
extends the plot axes to contain the reference lines.

Plot options

LEGENDLABEL= “text-string”
specifies a label that identifies the markers from the plot in the legend.

NAME= “text-string”
specifies a name for the plot.
TRANSPARENCY = numeric-value
specifies the degree of transparency for the reference lines.

**Required Arguments**

*variable*
- draws a reference line for each value of the specified variable.

*value-1 < ... value-n>*
- draws one or more reference lines at the values that you specify.

**Optional Arguments**

**AXIS = X | Y**
- specifies the axis that contains the reference line values. For example, if you specify AXIS = X, vertical reference lines are drawn at points on the X axis.
- **Default:** Y

**DISCRETEOFFSET = numeric-value**
- specifies an amount to offset all lines from discrete X or Y values. Specify a value from -0.5 (left offset) to +0.5 (right offset).
- **Default:** 0.0 (no offset)
- **Requirement:** This option is applicable only when the X or Y axis is discrete.

**LABEL <= ("text-string-1" ... "text-string-n")>**
- creates labels for each reference line. If you do not specify a label for a line, the reference value for that line is used as the label.

**LABELPOS = MIN | MAX**
- specifies the position of the labels. MIN specifies the label is placed at the minimum value of the data axis. MAX specifies that the label is placed at the maximum value of the data axis.

**LEGENDLABEL = "text-string"**
- specifies a label that identifies the markers from the plot in the legend. By default, the label “Reference Line” is used.
- **Interaction:** This option has no effect unless you also specify the NAME= option.

**LINEATTRS = style-element <(options)> | (options)**
- specifies the appearance of the reference line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.
- **options** can be one or more of the following:
  - **COLOR = color**
    - specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
    - **Default:** The default color is specified by the ContrastColor attribute of the GraphReference style element in the current style.
  - **PATTERN = line-pattern**
    - specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
    - **Default:** The default line pattern is specified by the LinePattern attribute of the GraphReference style element in the current style.
THICKNESS= \( n \) \textless units\>

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphReference style element in the current style.

NAME= "text-string"

specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOCLIP

extends the plot axes to contain the reference lines. By default, if a reference line is created outside of the data range, then the reference line is not visible. This option has no effect if you do not create reference lines that are outside of the data range.

TRANSPARENCY= numeric-value

specifies the degree of transparency for the reference lines. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

REG Statement

Creates a fitted regression line or curve.

Interaction: A linear regression (DEGREE=1) cannot be used with logarithmic axes.

Examples: “About Regression Plots” on page 36
“Example 2: Creating a Panel of Regression Curves” on page 269

Syntax

REG \( X= \) numeric-variable \( Y= \) numeric-variable \(<\) option(s)\>;

Summary of Optional Arguments

Label options

CURVELABEL <=“text-string”>

adds a label for the curve.

CURVELABELPOS= MIN | MAX | START | END

specifies the location of the curve label.

DATALABEL <= variable>

displays a label for each data point.

Limit options

CLI <= “text-string”>

creates prediction limits for the individual predicted values.

CLIATTRS = style-element | (CLILINEATTRS= style-element <(options)> | (options))

specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines.
CLM <= "text-string"
creates confidence limits.

CLMATRORS = style-element | (CLMAttributeOptions)
specifies the appearance of the mean value confidence limits by using an
ODS style element or by specifying fill and line attributes.

CLMTRANSPARENCY= numeric-value
specifies the degree of transparency for the confidence limits.

Plot options

ALPHA= numeric-value
specifies the confidence level for the confidence limits.

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

FREQ= numeric-variable
specifies how many times observations are repeated for computational
purposes.

GROUP= variable
specifies a classification variable to divide the values into groups.

LEGENDLABEL= "text-string"
specifies a label that identifies the regression curve in the legend.

NAME= "text-string"
specifies a name for the plot.

WEIGHT= numeric-variable
specifies how observations are weighted.

REG options

DEGREE= n
specifies the degree of the polynomial fit.

LINEATTRS= style-element | (options)
specifies the appearance of the fit line.

MARKERATTRS= style-element | (options)
specifies the appearance of the markers in the plot.

MAXPOINTS= n
specifies the maximum number of predicted points for the regression curve
and for any confidence limits.

NOLEGCLI
hides the legend entry for the individual predicted value confidence limits.

NOLEGCLM
hides the legend entry for the mean value confidence limits.

NOLEGFIT
hides the legend entry for the fit line.

NOMARKERS
removes the scatter markers from the plot.

Required Arguments

X= numeric-variable
specifies the variable for the x axis.

Y= numeric-variable
specifies the variable for the y axis.
Optional Arguments

ALPHA= numeric-value
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

Interaction: This option has no effect unless you specify the CLI or CLM option (or both).

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

CLI <= “text-string”>
creates prediction limits for the individual predicted values. The optional text string overrides the default legend label for the prediction limits.

CLIATTRS = style-element | (CLILINEATTRS= style-element <(options)> | (options))
specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines. The outline attributes can be the following:

CLILINEATTRS= style-element <(options)> | (options)
You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by theLineStyle attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line pattern is specified by theLineStyle attribute of the GraphData1 ... GraphData\n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line thickness is specified by
the LineThickness attribute of the GraphData1 ... GraphData style elements in the current style.

**Default:** The default style element is GraphPredictionLimits.

**Interaction:** The CLIATTRS = option has no effect unless you also specify the CLI option.

**CLM <= “text-string”>**

creates confidence limits. The optional text string overrides the default legend label for the confidence limit.

**CLMATTRS = style-element | (CLMAttributeOptions)***

specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes. **CLMAttributeOptions** can be one or both of the following:

**CLMFILLATTRS=style-element | (COLOR= color)**

You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**CLMLINEATTRS= style-element <(options)> | (options)**

You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

The confidence limits have no outlines by default (for most styles). To make the outlines appear, you can change the DISPLAYOPTS in the GRAPHBAND style element. Then you can specify attributes for the outlines. The following code provides an example.

```sas
proc template;
  define style MyStyleDefault;
  parent=Styles.Default;
  style GraphBand from GraphBand /
    DisplayOpts = "Fill outline";
end;
run;
ods listing style= MyStyleDefault;
proc sgplot data=sashelp.class;
  reg x=height y=weight / CLM
  CLMATTRS=(CLMLINEATTRS=
    (COLOR=Green PATTERN= ShortDash));
run;
```

The CLMLINEATTRS= **options** can be one or more of the following:

**COLOR= color**

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphConfidence style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.
PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphConfidence style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphDatann style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphConfidence style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphDatann style elements in the current style.

**Interaction:** This suboption has no effect unless you change the display options in the style element to display outlines. See the preceding code example.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**Interaction:** The CLMATTRS = option has no effect unless you also specify the CLM option.

CLMTRANSPARENCY= numeric-value
specifies the degree of transparency for the confidence limits. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**Interaction:** This option takes effect only if you also specify the CLM option.

CURVELABEL <=“text-string”>
adds a label for the curve. You can also specify the label text. If you do not specify a label, the label from the Y variable is used.

CURVELABELPOS= MIN | MAX | START | END
specifies the location of the curve label. Specify one of the following values:

MIN
places the label at the part of the curve closest to the minimum X axis value.

MAX
places the label at the part of the curve closest to the maximum X axis value.

START
places the curve label at the first point on the curve.

END
places the curve label at the last point on the curve.

**Default:** END

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.
**DATALABEL <= variable >**

displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

**Interaction:** This option has no effect if you also specify the NOMARKERS option.

**DEGREE= n**

specifies the degree of the polynomial fit. For example, 1 specifies a linear fit, 2 specifies a quadratic fit, and 3 specifies a cubic fit.

Default: 1

**FREQ= numeric-variable**

specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

**GROUP= variable**

specifies a classification variable to divide the values into groups. A separate plot is created for each unique value of the classification variable.

**Interaction:** If you specify the GROUP= option in multiple fit plot statements, then the first GROUP= variable is used for all of the fit plots that specify GROUP=.

**LEGENDLABEL= "text-string"**

specifies a label that identifies the regression curve in the legend. By default, the label “Regression” is used.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

**LINEATTRS= style-element <(options)> | (options)**

specifies the appearance of the fit line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\( n \) style elements in the current style.

**PATTERN= line-pattern**

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData\( n \) style elements in the current style.

**THICKNESS= n <units>**

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
**MARKERATTRS=** `style-element <(options)> | (options)`
specifies the appearance of the markers in the plot. You can specify the appearance by using a `style-element` or by using `suboptions`. If you specify a `style-element`, you can also specify `suboptions` to override specific appearance attributes.

`options` can be one or more of the following:

- **COLOR=** `color`
  specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
  
  **Default:** For ungrouped data, the default color is specified by the `ContrastColor` attribute of the `GraphDataDefault` style element in the current style.

  For grouped data, the default color is specified by the `ContrastColor` attribute of the `GraphData1 ... GraphData` style elements in the current style.

- **SIZE=** `n <units>`
  specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  
  **Default:** The default marker size is specified by the `MarkerSize` attribute of the `GraphDataDefault` style element in the current style.

- **SYMBOL=** `symbol-name`
  specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.
  
  **Default:** For ungrouped data, the default marker symbol is specified by the `MarkerSymbol` attribute of the `GraphDataDefault` style element in the current style.

  For grouped data, the default marker symbol is specified by the `MarkerSymbol` attribute of the `GraphData1 ... GraphData` style elements in the current style.

- **MAXPOINTS=** `n`
  specifies the maximum number of predicted points for the regression curve and for any confidence limits.
  
  **Default:** 10

- **NAME=** “text-string”
  specifies a name for the plot. You can use the name to refer to this plot in other statements.
  
  **Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

- **NOLEGCL**
  hides the legend entry for the individual predicted value confidence limits.

- **NOLEGCLM**
  hides the legend entry for the mean value confidence limits.

- **NOLEGFIT**
  hides the legend entry for the fit line.
NOMARKERS
removes the scatter markers from the plot.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

SCATTER Statement
Creates a scatter plot.

Example: “About Scatter Plots” on page 27

Syntax

SCATTER X= variable Y= variable < / option(s)>;

Summary of Optional Arguments

Group options

CLUSTERWIDTH= numeric-value
    specifies the width of the group clusters as a fraction of the midpoint spacing.

GROUP= variable
    specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY
    specifies how to display grouped markers.

GROUPORDER= ASCENDING | DESCENDING | DATA
    specifies the ordering of markers within a group.

NOMISSINGGROUP
    specifies that missing values of the group variable are not included in the plot.

Label options

DATALABEL <= variable>
    displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
    specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options

ATTRID= variable
    specifies the value of the ID variable in an attribute map data set.

FREQ= numeric-variable
    specifies how many times observations are repeated for computational purposes.

LEGENDLABEL= “text-string”
    specifies a label that identifies the markers from the plot in the legend.

NAME= “text-string”
    specifies a name for the plot.
TRANSPARENCY= numeric-value
specifies the degree of transparency for the markers and error bars.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Scatter options**

DISCRETEOFFSET= numeric-value
specifies an amount to offset all markers from discrete X or Y values.

ERRORBARATTRS= style-element <(options)> | (options)
specifies the appearance of the error bars in the plot.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot.

MARKERCHAR= variable
specifies a variable whose values replace the marker symbols in the plot.

MARKERCHARATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot when you use the MARKERCHAR= option.

XERRORLOWER= numeric-variable
specifies a variable that contains the lower endpoints for the X error bars.

XERRORUPPER= numeric-variable
specifies a variable that contains the upper endpoints for the X error bars.

YERRORLOWER= numeric-variable
specifies a variable that contains the lower endpoints for the Y error bars.

YERRORUPPER= numeric-variable
specifies a variable that contains the upper endpoints for the Y error bars.

**Required Arguments**

**X= variable**
specifies the variable for the x axis.

**Y= variable**
specifies the variable for the y axis.

**Optional Arguments**

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**CLUSTERWIDTH= numeric-value**
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

**Default:** 0.8

**Interaction:** This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

**DATALABEL <= variable**
displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.
**DATALABELATTRS** = *style-element* <*(options)*> | *(options)*

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

\[ \text{DATALABELATTRS=} \text{GraphLabelText} \]

*options* can be one or more of the following:

- **COLOR** = *color*
  specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
  
  **Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData* n* style elements in the current style.

- **FAMILY** = *"font-family"*
  specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.
  
  **Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

- **SIZE** = *n* <*units*>  
  specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  
  **Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

- **STYLE** = ITALIC | NORMAL
  specifies whether the label characters are italic (ITALIC) or normal (NORMAL).
  
  **Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

- **WEIGHT** = BOLD | NORMAL
  specifies whether the label characters are bold (BOLD) or normal (NORMAL).
  
  **Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

\[ \text{DATALABELATTRS=} \{\text{Color=} \text{Green} \ \text{Family=} \text{Arial} \ \text{Size=} 8 \ \text{Style=} \text{Italic} \ \text{Weight=} \text{Bold} \} \]

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DISCRETEOFFSET** = *numeric-value*

specifies an amount to offset all markers from discrete X or Y values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**Requirement:** This option is applicable only when the X or Y axis is discrete.
ERRORBARATTRS= style-element <(options)> | (options)
specifies the appearance of the error bars in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes. Each observation is repeated n times for computational purposes, where n is the value of the numeric variable. If n is not an integer, then it is truncated to an integer. If n is less than 1 or missing, then it is excluded from the analysis.

GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped markers.

CLUSTER
grouped items are drawn adjacent to each other.

OVERLAY
grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1...GraphData_n style elements in the current style.

Default: OVERLAY

Restriction: GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

Interaction: This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of markers within a group.

ASCENDING
displays each group in ascending group value.
DESCENDING
   displays each group in descending group value.

DATA
   displays each group in data order of the group variable.

Interaction:  This option is ignored unless GROUP= is specified.

LEGENDLABEL= "text-string"
   specifies a label that identifies the markers from the plot in the legend. By default, the label of the Y variable or the group value for each marker is used.

Interaction:  The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

MARKERATTRS= style-element <(options)> | (options)
   specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
   specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default:  For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

   For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

SIZE= n <units >
   specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default:  The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
   specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default:  For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style.

   For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphDataN style elements in the current style.

MARKERCHAR= variable
   specifies a variable whose values replace the marker symbols in the plot. If a format is associated with the variable, then the formatted values are used as the marker symbols. If there is not a format associated with the variable and the variable contains numeric data, then the BEST6. format is used.

Interaction:  The MARKERCHAR= option overrides the DATALABEL= option and the SYMBOL= suboption of the MARKERATTRS= option.

MARKERCHARATTRS= style-element <(options)> | (options)
   specifies the appearance of the markers in the plot when you use the MARKERCHAR= option. You can specify the appearance by using a style element
or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

/options can be one or more of the following:

COLOR= color
  specifies the color of the marker characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see "Color-Naming Schemes" in Chapter 14 of SAS/GRAPH: Reference.
  
  Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataText style element in the current style.

  For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData{n} style elements in the current style.

FAMILY= "font-family"
  specifies the font family for the marker characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.
  
  Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n < units >
  specifies the font size of the marker characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  
  Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
  specifies whether the marker characters are italic (ITALIC) or normal (NORMAL).
  
  Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
  specifies whether the marker characters are bold (BOLD) or normal (NORMAL).
  
  Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

NAME= "text-string"
  specifies a name for the plot. You can use the name to refer to this plot in other statements.
  
  Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOMISSINGGROUP
  specifies that missing values of the group variable are not included in the plot.
  
  Interaction: This option has no effect unless GROUP= is also specified.

TRANSPARENCY= numeric-value
  specifies the degree of transparency for the markers and error bars. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
  
  Default: 0.0

URL= character-variable
  specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**XERRORLOWER= numeric-variable**
specifies a variable that contains the lower endpoints for the X error bars.

**XERRORUPPER= numeric-variable**
specifies a variable that contains the upper endpoints for the X error bars.

**YERRORLOWER= numeric-variable**
specifies a variable that contains the lower endpoints for the Y error bars.

**YERRORUPPER= numeric-variable**
specifies a variable that contains the upper endpoints for the Y error bars.

---

**SERIES Statement**

Creates a series plot.

**Example:** “About Series Plots” on page 29

---

**Syntax**

SERIES X=variable Y=variable < / option(s)>;

**Summary of Optional Arguments**

**Group options**

**CLUSTERWIDTH= numeric-value**
specifies the width of the group clusters as a fraction of the midpoint spacing.

**GROUP= variable**
specifies a variable that is used to group the data.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped lines.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of lines within a group.

**NOMISSINGGROUP**
specifies that missing values of the group variable are not included in the plot.

**Label options**

**CURVELABEL <="text-string">**
adds a label for the curve.

**CURVELABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the CURVELABEL= option.

**CURVELABELPOS= MIN | MAX | START | END**
specifies the location of the curve label.

**DATALABEL <= variable**

displays a label for each data point.

**DATALABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the **DATALABEL=** option.

**Marker options**

**MARKERATTRS= style-element <(options)> | (options)**

specifies the appearance of the markers in the plot.

**MARKERS**

adds data point markers to the series plot data points.

**Plot options**

**ATTRID= variable**

specifies the value of the ID variable in an attribute map data set.

**LEGENDLABEL= “text-string”**

specifies a label that identifies the series plot in the legend.

**NAME= “text-string”**

specifies a name for the plot.

**TRANSPARENCY= numeric-value**

specifies the degree of transparency for the lines and markers.

**URL= character-variable**

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Series options**

**BREAK**

creates a break in the line for each missing value for the Y variable.

**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all lines from discrete X or Y values.

**LINEATTRS= style-element <(options)> | (options)**

specifies the appearance of the series line.

**Required Arguments**

**X= variable**

specifies the variable for the x axis.

**Y= variable**

specifies the variable for the y axis.

**Optional Arguments**

**ATTRID= variable**

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BREAK**

creates a break in the line for each missing value for the Y variable.
CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

CURVELABEL <“text-string”>
adds a label for the curve. You can also specify the label text. If you do not specify a label, the label from the Y variable is used.

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
CURVELABELATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
specifies the color of the line label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:
CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

**Default:** The default style element is GraphValueText.

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**CURVELABELPOS= MIN | MAX | START | END**

specifies the location of the curve label. Specify one of the following values:

- **MIN**
  places the label at the part of the curve closest to the minimum X axis value.

- **MAX**
  places the label at the part of the curve closest to the maximum X axis value.

- **START**
  places the curve label at the first point on the curve.

- **END**
  places the curve label at the last point on the curve.

**Default:** END

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**DATALABEL <= variable>**

displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

```
DATALABELATTRS=GraphLabelText
```

**options** can be one or more of the following:

**COLOR= color**

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GROPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GROPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY= “font-family”**

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

```
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset all lines from discrete X or Y values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**Requirement:** This option is applicable only when the X or Y axis is discrete.

**GROUP= variable**
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped lines.

**CLUSTER**
grouped items are drawn adjacent to each other.

**OVERLAY**
grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1...GraphData style elements in the current style.

**Default:** OVERLAY

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of lines within a group.

**ASCENDING**
displays each group in ascending group value.

**DESCENDING**
displays each group in descending group value.

**DATA**
displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.
LEGENDLABEL= "text-string"
specifies a label that identifies the series plot in the legend. By default, the label of
the Y variable or the group value for each marker is used.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the series line. You can specify the appearance by using a
style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the ContrastColor attribute
of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line thickness is specified by the LineThickness
attribute of the GraphData1 ... GraphData n style elements in the current style.

NAME= "text-string"
specifies a name for the plot. You can use the name to refer to this plot in other
statements.

Note: The name is case-sensitive. When you refer to the specified name in other
statements, you must use the same exact capitalization.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. This option has no effect unless
you also specify the MARKERS option. You can specify the appearance by using a
style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.

SIZE= n <units >
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOLE= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData style elements in the current style.

MARKERS
adds data point markers to the series plot data points.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Interaction: This option has no effect unless GROUP= is also specified.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines and markers. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

STEP Statement
Creates a step plot.

Restriction: The vertical axis that is used with the STEP statement cannot be a discrete axis.

Example: “About Step Plots” on page 30

Syntax

STEP X= variable Y= numeric-variable < / option(s)>;
Summary of Optional Arguments

Group options

**CLUSTERWIDTH= numeric-value**
specifies the width of the group clusters as a fraction of the midpoint spacing.

**GROUP= variable**
specifies a variable that is used to group the data.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped step lines.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of step lines within a group.

**NOMISSINGGROUP**
specifies that missing values of the group variable are not included in the plot.

Label options

**CURVELABEL <=“text-string”>**
adds a label for the curve.

**CURVELABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the CURVELABEL= option.

**CURVELABELPOS= MIN | MAX | START | END**
specifies the location of the curve label.

**DATALABEL <= variable>>**
displays a label for each data point.

**DATALABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Marker options

**MARKERATTRS= style-element <(options)> | (options)**
specifies the appearance of the markers in the plot.

**MARKERS**
adds markers to the step plot data points.

Plot options

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the step plot in the legend.

**NAME= “text-string”**
specifies a name for the plot.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the lines.

**URL= character-variable**
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Step options

**BREAK**
creates a break in the line for each missing value.
DISCRETEOFFSET= numeric-value
specifies an amount to offset all step lines from discrete X values.

ERRORBARATTRS= style-element <(options)> | (options)
specifies the appearance of the error bars in the plot.

JUSTIFY= LEFT | CENTER | RIGHT
specifies the location of each step relative to its data point.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the step line.

YERRORLOWER= numeric-variable
specifies a variable that contains the lower endpoints for the Y error bars.

YERRORUPPER= numeric-variable
specifies a variable that contains the upper endpoints for the Y error bars.

Required Arguments

X= variable
specifies the variable for the x axis.

Y= numeric-variable
specifies the variable for the y axis.

Optional Arguments

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BREAK
creates a break in the line for each missing value.

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

CURVELABEL <=“text-string”>
adds a label for the curve. You can also specify the label text. If you do not specify a label, the label from the Y variable is used.

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
CURVELABELATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
specifies the color of the line label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY=** “font-family”

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE=** $n <units>$

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE=** ITALIC | NORMAL

specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT=** BOLD | NORMAL

specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:

CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

**Default:** The default style element is GraphValueText.

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**CURVELABELPOS=** MIN | MAX | START | END

specifies the location of the curve label. Specify one of the following values:

**MIN**

places the label at the part of the curve closest to the minimum X axis value.

**MAX**

places the label at the part of the curve closest to the maximum X axis value.

**START**

places the curve label at the first point on the curve.

**END**

places the curve label at the last point on the curve.

**Default:** END

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.
DATALABEL <= variable>
  displays a label for each data point. If you specify a variable, the values of that
variable are used for the data labels. If you do not specify a variable, then the values
of the Y variable are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL=
option. You can specify the appearance by using a style element or by using
suboptions. If you specify a style element, you can also specify suboptions to
override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
  specifies the color of the label characters. You can specify colors using the same
  color schemes that are supported by SAS/GRAPH software. For more
  information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
  Reference.

  Default: For ungrouped data, the default color is specified by the Color attribute
  of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ...
  GraphData n style elements in the current style.

FAMILY= “font-family”
  specifies the font family for the label characters. The SAS ODS styles use
  TrueType system fonts. For more information, see “TrueType Fonts Supplied by

  Default: The default font family is specified by the FontFamily attribute of the
  GraphDataText style element in the current style.

SIZE= n <units>
  specifies the font size of the label characters. You can also specify the unit of
  measurement. The default unit is pixels. For a list of measurement units that are
  supported, see “Units of Measurement” on page 659.

  Default: The default font size is specified by the FontSize attribute of the
  GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
  specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

  Default: The default font style is specified by the FontStyle attribute of the
  GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
  specifies whether the label characters are bold (BOLD) or normal (NORMAL).

  Default: The default font weight is specified by the FontWeight attribute of the
  GraphDataText style element in the current style.

Here is an example expression:
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also
specified.
**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all step lines from discrete X values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**Requirement:** This option is applicable only when the X axis is discrete.

**ERRORBARATTRS= style-element (options) | (options)**

specifies the appearance of the error bars in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

- **COLOR= color**
  
  specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

  **Default:** The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

- **PATTERN= line-pattern**
  
  specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

  **Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

- **THICKNESS= n <units>**
  
  specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

  **Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

- **GROUP= variable**
  
  specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

- **GROUPDISPLAY= CLUSTER | OVERLAY**
  
  specifies how to display grouped step lines.

  **CLUSTER**
  
  grouped items are drawn adjacent to each other.

  **OVERLAY**
  
  grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1...GraphDataN style elements in the current style.

  **Default:** OVERLAY

  **Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

  **Interaction:** This option is ignored unless GROUP= is specified.

- **GROUPORDER= ASCENDING | DESCENDING | DATA**
  
  specifies the ordering of step lines within a group.

  **ASCENDING**
  
  displays each group in ascending group value.
DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

JUSTIFY= LEFT | CENTER | RIGHT
specifies the location of each step relative to its data point. Figure 6.6 on page 210 shows the effect of each option:

Figure 6.6 Values for JUSTIFY=

LEGENDLABEL= “text-string”
specifies a label that identifies the step plot in the legend. By default, the label of the
Y variable or the group value for each marker is used.

LINEATTRS=
<options>
specifies the appearance of the step line. You can specify the appearance by using a
style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR=
color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute
of the GraphData1 ... GraphData n style elements in the current style.

PATTERN=
<line-pattern>
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS=
<n <units> specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line thickness is specified by the LineThickness
attribute of the GraphData1 ... GraphData n style elements in the current style.
MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. This option has no effect unless
you also specify the MARKERS option. You can specify the appearance by using a
style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the ContrastColor attribute
of the GraphData1 ... GraphDataN style elements in the current style.

SIZE= n <units >
specifies the size of the markers. You can also specify the unit of measurement.
The default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the
GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see
“Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the
MarkerSymbol attribute of the GraphDataDefault style element in the current
style.
For grouped data, the default marker symbol is specified by the
MarkerSymbol attribute of the GraphData1 ... GraphDataN style elements in
the current style.

MARKERS
adds markers to the step plot data points.

NAME= "text-string"
specifies a name for the plot. You can use the name to refer to this plot in other
statements.

Note: The name is case-sensitive. When you refer to the specified name in other
statements, you must use the same exact capitalization.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.
Interaction: This option has no effect unless GROUP= is also specified.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines. Specify a value from 0.0
(completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed
when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

\[
\text{YERRORLOWER} = \text{numeric-variable}
\]

specifies a variable that contains the lower endpoints for the Y error bars.

\[
\text{YERRORUPPER} = \text{numeric-variable}
\]

specifies a variable that contains the upper endpoints for the Y error bars.

---

**VBAR Statement**

Creates a vertical bar chart that summarizes the values of a category variable.

**Interaction:** The VBAR statement can be combined only with other vertical categorization plot statements in the SGPANEL procedure. See “Plot Type Compatibility” on page 81.

**Example:** “About Bar Charts” on page 42

---

**Syntax**

VBAR category-variable < / option(s)>;

---

**Summary of Optional Arguments**

**Bar options**

\[
\text{BARWIDTH} = \text{numeric-value}
\]

specifies the width of the bars as a ratio of the maximum possible width.

\[
\text{DATASKIN} = \text{NONE} | \text{CRISP} | \text{GLOSS} | \text{MATTE} | \text{PRESSED} | \text{SHEEN}
\]

specifies a special effect to be used on all filled bars.

\[
\text{DISCRETEOFFSET} = \text{numeric-value}
\]

specifies an amount to offset all bars from the category midpoints.

\[
\text{FILL} | \text{NOFILL}
\]

specifies whether the bars are filled.

\[
\text{FILLATTRS} = \text{style-element} | (\text{COLOR} = \text{color})
\]

specifies the appearance of the fill for the bars.

\[
\text{LIMITATTRS} = \text{style-element} <(\text{options})> | (\text{options})
\]

specifies the appearance of the limit lines in the plot.

\[
\text{LIMITS} = \text{BOTH} | \text{LOWER} | \text{UPPER}
\]

specifies which limit lines to display.

\[
\text{LIMITSTAT} = \text{CLM} | \text{STDDEV} | \text{STDERR}
\]

specifies the statistic for the limit lines.

\[
\text{MISSING}
\]

processes missing values as a valid category value and creates a bar for it.

\[
\text{NOSTATLABEL}
\]

removes the statistic name from the axis and legend labels.

\[
\text{NUMSTD} = n
\]

specifies the number of standard units for the limit lines, when you specify \text{LIMITSTAT} = \text{STDDEV} or \text{LIMITSTAT} = \text{STDERR}.
OUTLINE | NOOUTLINE
    specifies whether the bars have outlines.

RESPONSE= response-variable
    specifies a numeric response variable for the plot.

STAT= FREQ | MEAN | SUM
    specifies the statistic for the vertical axis.

Group options

CLUSTERWIDTH= numeric-value
    specifies the cluster width as a ratio of the maximum width.

GROUP= variable
    specifies a variable that is used to group the data.

GROUPDISPLAY= STACK | CLUSTER
    specifies how to display grouped bars.

GROUPORDER= ASCENDING | DESCENDING | DATA
    specifies the ordering of bars within a group.

Label options

DATALABEL <= variable>
    displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
    specifies the appearance of the labels in the plot when you use the
    DATALABEL= option.

Plot options

ALPHA= numeric-value
    specifies the confidence level for the confidence limits.

ATTRID= variable
    specifies the value of the ID variable in an attribute map data set.

CATEGORYORDER= RESPASC | RESPDESC
    specifies the order in which the response values are arranged.

FREQ= numeric-variable
    specifies how many times observations are repeated for computational
    purposes.

LEGENDLABEL= “text-string”
    specifies the label that identifies the bar chart in the legend.

NAME= “text-string”
    specifies a name for the plot.

TRANSPARENCY= numeric-value
    specifies the degree of transparency for the bars and limits, if displayed.

URL= character-variable
    specifies a character variable that contains URLs for Web pages to be
    displayed when parts of the plot are selected within an HTML page.

WEIGHT= numeric-variable
    specifies how observations are weighted.

Required Argument

category-variable
    specifies the variable that classifies the observations into distinct subsets.
**Optional Arguments**

**ALPHA= numeric-value**

specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

**Default:** .05

**Interactions:**

This option has no effect if you do not specify LIMITSTAT=CLM.

If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

**ATTRID= variable**

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.

For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BARWIDTH= numeric-value**

specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of 0.5, then the width of the bars is equal to the space between the bars.

**Default:** .8

1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER

**Interaction:** When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

**CATEGORYORDER= RESPASC | RESPDESC**

specifies the order in which the response values are arranged. Specify one of the following values:

- **RESPASC** sorts the response values in ascending order.
- **RESPDESC** sorts the response values in descending order.

**Default:** By default, the plot is sorted in ascending order based on the category values.

**Restriction:** This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.

**Requirement:** This option requires that you configure the panel to use either one column or one row, depending on the orientation of your charts. Use the ROWS= or the COLUMNS= option in the PANELBY statement. If you do not use this option and your graph contains multiple cells, the specified sort order is not correctly applied to all cells.

**Interaction:** If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

**Note:** If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.
CLUSTERWIDTH= numeric-value
speifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see "Color-Naming Schemes" in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).
**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

\[
\text{DATALABELATTRS= (Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)}
\]

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN**

specifies a special effect to be used on all filled bars. Specify one of the following (the samples were generated using the HTMLBlue style):

- **NONE**
- **CRISP**
- **GLOSS**
- **MATTE**
- **PRESSED**
- **SHEEN**

**Default:** NONE

**Interactions:**

This option has no effect if the applied style uses a fill pattern and FILL is disabled for the style. If the style has both FILL and FILLPATTERN enabled, data skins will work. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about viewing the contents of style templates, see “About Styles and Style Elements” on page 620.

This option has no effect if you also specify NOFILL.

**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)
FILL | NOFILL
specifies whether the bars are filled. The FILL option shows the fill color for the
bars. The NOFILL option hides the fill color for the bars.

Default: FILL

Interactions:
Specifying FILL also hides the outlines.
If NOFILL and NOOUTLINE are both specified, then both options are ignored.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the bars. You can specify the color of the fill
by using a style element or by using the COLOR= suboption. You can specify colors
using the same color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of
the GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the Color attribute of the
GraphData1... GraphData n style elements in the current style.

Interaction: This option has no effect if you specify the NOFILL option.

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.
Each observation is repeated n times for computational purposes, where n is the
value of the numeric variable. If n is not an integer, then it is truncated to an integer.
If n is less than 1 or missing, then it is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first
FREQ variable that you specified is used for all of the plots.

GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group
value are automatically distinguished by different visual attributes.

GROUPDISPLAY= STACK | CLUSTER
specifies how to display grouped bars.

STACK
groups are overlaid without any clustering. Each group is represented by unique
visual attributes derived from the GraphData1... GraphData n style elements in
the current style.

CLUSTER
displays group values as separate adjacent bars that replace the single category
bar. Each set of group values is centered at the midpoint tick mark for the
category.

Default: STACK

Interaction: This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of bars within a group.

ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.
**Interaction:** This option is ignored unless GROUP= is specified.

**LEGENDLABEL=** “text-string”
specifies the label that identifies the bar chart in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, the name of the response variable and the computed statistic (SUM or MEAN) is used. If the RESPONSE= option is not used, the legend label is “Frequency”.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

**LIMITATTRS= style-element <(options)> | (options)**
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

- **COLOR=** color
  specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
  
  **Default:** The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

- **PATTERN=** line-pattern
  specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
  
  **Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

- **THICKNESS=** n <units>
  specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  
  **Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**LIMITS= BOTH | LOWER | UPPER**
specifies which limit lines to display. Limits are displayed as heavier line segments with a serif at the end extending from each bar. Upper limits extend to the right of the bar and lower limits extend to the left of the bar. By default, no limits are displayed unless you specify either the LIMITS= or LIMITSTAT= option. If you specify the LIMITSTAT= option only, then LIMITS=BOTH is the default. Specify one of the following values:

- **BOTH**
  adds lower and upper limit lines to the plot.

- **LOWER**
  adds lower limit lines to the plot.

- **UPPER**
  adds upper limit lines to the plot.

**Default:** By default, no limit lines are displayed. However, if you specify the LIMITSTAT= option, then the default is BOTH.

**Interactions:**
Limit lines are displayed only when you specify STAT= MEAN.

The LIMITS= option has no effect if you also specify the GROUP= option in the plot statement.
LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines. Specify one of the following statistics:

CLM
  confidence limits

STDDEV
  standard deviation

STDERR
  standard error

Default: CLM

Interactions:
If you specify the LIMITSTAT= option only, then the default value for the
LIMITS= option is BOTH.

Limits lines are displayed only when you specify STAT=MEAN.
The LIMITSTAT= option has no effect if you also specify the GROUP= option
in the plot statement.

MISSING
processes missing values as a valid category value and creates a bar for it.

NAME= "text-string"
specifies a name for the plot. You can use the name to refer to this plot in other
statements.

Note: The name is case-sensitive. When you refer to the specified name in other
statements, you must use the same exact capitalization.

NOSTATLABEL
removes the statistic name from the axis and legend labels.

NUMSTD= n
specifies the number of standard units for the limit lines, when you specify
LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive
number, including decimals.

Default: 1

OUTLINE | NOOUTLINE
specifies whether the bars have outlines. The OUTLINE option shows the outlines.
The NOOUTLINE option hides the outlines.

Default: OUTLINE

Interactions:
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

RESPONSE= response-variable
specifies a numeric response variable for the plot. The summarized values of the
response variable are displayed on the vertical axis.

STAT= FREQ | MEAN | SUM
specifies the statistic for the vertical axis. Specify one of the following statistics:

FREQ
  the frequencies for the category variable. This is the default value when you do
  not specify the RESPONSE= option.

MEAN
  the mean of the response variable.
SUM  
the sum of the response variable. This is the default value when you specify the RESPONSE= option.

Interaction: If you do not specify the RESPONSE= option, then only the FREQ statistic can be used. If you specify the RESPONSE= option, then you can use either the SUM or MEAN statistics.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

---

**VBARPARM Statement**

Creates a vertical bar chart based on a pre-summarized response value for each unique value of the category variable. You can also assign variables to the upper and lower limits.

**Requirement:** The data must contain only one response value per unique category variable. If more than one value is found, a warning is written to the SAS log, and the graph might produce unpredictable results.

**Interactions:** The VBARPARM statement can be combined only with other basic plot statements in the SGPLOT procedure. See “Plot Type Compatibility” on page 277.

When used with particular styles, the VBARPARM statement produces fill patterns for grouped bars. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636.

**Note:** An important distinction between VBARPARM and VBAR is that the response variable is required for VBARPARM. In addition, the response variable should contain pre-summarized computed values such as a sum or a mean.

**Example:** “About Bar Charts” on page 42
Syntax

VBARPARM CATEGORY= category-variable RESPONSE= numeric-variable <\ option(s)>;

Summary of Optional Arguments

Bar options

BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
specifies a special effect to be used on all filled bars.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all bars from the category midpoints.

FILL | NOFILL
specifies whether the bars are filled.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the bars.

LIMITATTRS= style-element <\(options)\> | \(options\)
specifies the appearance of the limit lines in the plot.

LIMITLOWER= numeric-variable
specifies values for the lower endpoints on the limit lines.

LIMITUPPER= numeric-variable
specifies values for the upper endpoints on the limit lines.

MISSING
processes missing values as a valid category value and creates a bar for it.

OUTLINE | NOOUTLINE
specifies whether the bars have outlines.

Group options

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the maximum width.

GROUP= variable
specifies a variable that is used to group the data.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of bars within a group.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <\(options)\> | \(options\)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
specifies the label that identifies the bar chart in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed.

`URL= character-variable`

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Required Arguments**

`CATEGORY= category-variable`

specifies the variable that categorizes the data. All values are treated as discrete values. The input data for this variable should contain unique values. When the category values are not unique, a warning is logged, and multiple bars are superimposed at the duplicated category values.

The `CATEGORY` axis is always discrete.

`RESPONSE= numeric-variable`

specifies a numeric response variable. The input data is expected to be pre-summarized computed values (sum, mean, and so on).

**Optional Arguments**

`ATTRID= variable`

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

`BARWIDTH= numeric-value`

specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of 0.5, then the width of the bars is equal to the space between the bars.

**Default:** 0.8

1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER

**Interaction:** When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

`CLUSTERWIDTH= numeric-value`

specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.

**Default:** 0.8

**Interaction:** This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

`DATALABEL <= variable>`

displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.
DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:
DATALABELATTRS={(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)}

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
specifies a special effect to be used on all filled bars. Specify one of the following (the samples were generated using the HTMLBlue style):
 Default: NONE

 Interactions:
 This option has no effect if the applied style uses a fill pattern and FILL is disabled for the style. If the style has both FILL and FILLPATTERN enabled, data skins will work. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about viewing the contents of style templates, see “About Styles and Style Elements” on page 620.

 This option has no effect if you also specify NOFILL.

 DISCRETEOFFSET= numeric-value
 specifies an amount to offset all bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).
 Default: 0.0 (no offset)

 FILL | NOFILL
 specifies whether the bars are filled. The FILL option shows the fill color for the bars. The NOFILL option hides the fill color for the bars.
 Default: FILL

 Interactions:
 Specifying FILL also hides the outlines.
 If NOFILL and NOOUTLINE are both specified, then both options are ignored.

 FILLATRGS= style-element | (COLOR= color)
 specifies the appearance of the fill for the bars. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphDataN style elements in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of bars within a group.

ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

LEGENDLABEL= “text-string”
specifies the label that identifies the bar chart in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, the name of the response variable is used.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**LIMITLOWER= numeric-variable**
specifies values for the lower endpoints on the limit lines. Limit lines are displayed as line segments with a serif at the end.
Default: The lower segments of the limit lines are not displayed. (Limit lines are displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

Interactions:
If LIMITUPPER= is also specified, then the plot displays the lower and upper segments of the limit lines.
This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
The appearance of the limit lines can be controlled by the LIMITATTRS= option.

LIMITUPPER= numeric-variable
specifies values for the upper endpoints on the limit lines. Limit lines are displayed as line segments with a serif at the end.
Default: The upper segments of the limit lines are not displayed. (Limit lines are displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

Interactions:
If LIMITLOWER= is also specified, then the plot displays the lower and upper segments of the limit lines.
This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
The appearance of the limit lines can be controlled by the LIMITATTRS= option.

MISSING
processes missing values as a valid category value and creates a bar for it.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

OUTLINE | NOOUTLINE
specifies whether the bars have outlines. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.
Default: OUTLINE

Interactions:
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.
VBOX Statement

Creates a vertical box plot that shows the distribution of your data.

**Interaction:** The VBOX statement cannot be used together with other plot statements in the SGPANEL procedure. Box plots can be overlaid with other box plots. However, overlaid box plots must have the same category variables.

**Example:** “About Box Plots” on page 37

**Syntax**

VBOX analysis-variable < / option(s)>;

**Summary of Optional Arguments**

**Box options**

- **BOXWIDTH= numeric-value**
  specifies the width of the box.
- **CAPSHAPE= BRACKET | LINE | SERIF**
  specifies the shape of the whisker cap lines.
- **CONNECT= MEAN | MEDIAN | Q1 | Q3 | MIN | MAX**
  specifies that a connect line joins a statistic from box to box.
- **CONNECTATTRS= style-element <(options)> | (options)**
  specifies the appearance of the lines that connect multiple boxes.
- **DISCRETEOFFSET= numeric-value**
  specifies an amount to offset all boxes from the discrete tick marks.
- **EXTREME**
  specifies that the whiskers can extend to the maximum and minimum values for the analysis variable, and that outliers are not identified.
- **FILL | NOFILL**
  specifies whether the boxes are filled with color.
- **FILLATTRS= style-element | (COLOR= color)**
  specifies the appearance of the fill for the boxes.
- **LINEATTRS= style-element <(options)> | (options)**
  specifies the appearance of the box outlines.
- **MEANATTRS= style-element <(options)> | (options)**
  specifies the appearance of the marker that represents the mean in the box.
- **MEDIANATTRS= style-element <(options)> | (options)**
  specifies the appearance of the line that represents the median.
- **NOCAPS**
  hides the cap lines for the whiskers.
- **NOMEAN**
  hides the mean marker.
- **NOMEDIAN**
  hides the median line.
- **NOOUTLIERS**
  hides the outliers from the plot.
- **NOTCHES**
specifies that the boxes be notched.

OUTLIERATTRS= style-element <(options)> | (options)
specifies the appearance of the marker that represents the outliers.

WHISKERATTRS= style-element <(options)> | (options)
specifies the appearance of the whisker and cap lines.

Group options

CLUSTERWIDTH= numeric-value
    specifies the cluster width as a ratio of the midpoint spacing.

GROUP= variable
    specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY
    specifies how to display grouped boxes.

GROUPORDER= ASCENDING | DESCENDING | DATA
    specifies the ordering of boxes within a group.

Label options

DATALABEL <= variable>
    adds data labels for the outlier markers.

DATALABELATTRS= style-element <(options)> | (options)
    specifies the appearance of the labels in the plot when you use the
    DATALABEL= option.

LABELFAR
    specifies that only the far outliers have data labels.

Plot options

ATTRID= variable
    specifies the value of the ID variable in an attribute map data set.

CATEGORY= category-variable
    specifies the category variable for the plot.

FREQ= numeric-variable
    specifies how many times observations are repeated for computational
    purposes.

LEGENDLABEL= “text-string”
    specifies a label that identifies the box plot in the legend.

MISSING
    processes missing values as a valid category value and creates a box for it.

NAME= “text-string”
    specifies a name for the plot.

PERCENTILE= 1 | 2 | 3 | 4 | 5
    specifies a method for computing the percentiles for the plot.

SPREAD
    relocates outlier points that have identical values to prevent overlapping.

TRANSPARENCY= numeric-value
    specifies the degree of transparency for the plot.

Required Argument

analysis-variable
    specifies the analysis variable for the plot. If you do not specify the CATEGORY=
    option, then one box is created for the analysis variable.
Optional Arguments

**ATTRID=** *variable*

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BOXWIDTH=** *numeric-value*

specifies the width of the box. Specify a value between 0.0 (0% of the available width) and 1.0 (100% of the available width).

**Default:** 0.4

When GROUP is specified, the default box width is 0.6.

**CAPSHAPE=** *BRACKET | LINE | SERIF*

specifies the shape of the whisker cap lines. Specify one of the following values:

- **BRACKET**
  displays a straight line with brackets.

- **LINE**
  displays a straight line.

- **SERIF**
  displays a short straight line.

**CATEGORY=** *category-variable*

specifies the category variable for the plot. A box plot is created for each distinct value of the category variable.

If you explicitly set the category axis type to LINEAR and use a numeric category variable, the box plot becomes an interval plot. Otherwise, the box plot is discrete.

**CLUSTERWIDTH=** *numeric-value*

specifies the cluster width as a ratio of the midpoint spacing. Specify a value from 0.1 (narrowest) to 1.0 (widest).

**Default:** 0.7

**Interaction:** This option is applicable only when a GROUP is in effect and the category axis is discrete.

**CONNECT=** *MEAN | MEDIAN | Q1 | Q3 | MIN | MAX*

specifies that a connect line joins a statistic from box to box.

**Interaction:** This option applies only when the CATEGORY option is used to generate multiple boxes.

**Tip:** You can use the CONNECTATTRS option to specify attributes for the connect line.

**CONNECTATTRS=** *style-element <(options)> | (options)*

specifies the appearance of the lines that connect multiple boxes. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: **CONNECTATTRS=GraphData3**

**options** can be one or more of the following:

**COLOR=** *color*

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphConnectLine style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.

**PATTERN=** `line-pattern`  
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphConnectLine style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.

**THICKNESS=** `n <units>`  
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphConnectLine style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.

Here is an example expression:

```plaintext
CONNECTATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)
```

**Default:** The default style element is GraphConnectLine.

**Interactions:**
- This option takes effect only if the CONNECT= option is also specified.
- This option is ignored if the GROUP= option is also specified.

**DATALABEL <= variable>**  
adds data labels for the outlier markers. If you specified a variable, then the values for that variable are used for the data labels. If you did not specify a variable, then the values of the analysis variable are used.

**Note:** This option has no effect unless the plot contains outlier points.

**DATALABELATTRS=** `style-element <(options)>` | `(options)`  
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

```plaintext
DATALABELATTRS=GraphLabelText
```

**options** can be one or more of the following:

**COLOR=** `color`  
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.
FAMILY="font-family"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by
**Default:** The default font family is specified by the FontFamily attribute of the
GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.
**Default:** The default font size is specified by the FontSize attribute of the
GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).
**Default:** The default font style is specified by the FontStyle attribute of the
GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).
**Default:** The default font weight is specified by the FontWeight attribute of the
GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also
specified.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all boxes from the discrete tick marks.

Specify a value from -0.5 (left offset) to +0.5 (right offset). If you specify a value
outside of this range, an error message appears in the SAS log and the graph is not
produced.

**Default:** 0.0 (no offset)

EXTREME
specifies that the whiskers can extend to the maximum and minimum values for the
analysis variable, and that outliers are not identified. When you do not specify the
EXTREME option, the whiskers cannot be longer than 1.5 times the length of the
box.

FILL | NOFILL
specifies whether the boxes are filled with color. The FILL option shows the fill
color. The NOFILL option hides the fill color.

**Default:** FILL

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the boxes. You can specify the color of the fill
by using a style element or by using the COLOR= suboption. You can specify colors
using the same color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the
GraphDataDefault style element in the current style.
For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\text{n} style elements in the current style.

**Interaction:** This option has no effect if you also specify the NOFILL option.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

**GROUP= variable**
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped boxes.

- **CLUSTER**
  the boxes are drawn adjacent to each other.

- **OVERLAY**
  all the boxes for a given group value are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1... GraphData\text{n} style elements in the current style.

**Default:** CLUSTER for a discrete category axis

**OVERLAY** for a linear axis

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete.

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of boxes within a group.

- **ASCENDING**
  displays each group in ascending group value.

- **DESCENDING**
  displays each group in descending group value.

- **DATA**
  displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

**LABELFAR**
specifies that only the far outliers have data labels. Far outliers are points whose distance from the box is more than three times the length of the box.

**Note:** This option has no effect if you do not specify the DATALABEL option, or if there are no far outliers.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the box plot in the legend. By default, the label of the analysis variable is used.

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the box outlines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.
Here is an example that specifies a style element: \texttt{LINEATTRS=GraphData3}

For more information about style elements, see “Style Elements for Use with ODS Graphics” on page 640.

\textit{options} can be one or more of the following:

\textbf{COLOR=} \textit{color}

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of \textit{SAS/GRAPH: Reference}.

\textbf{Default:} For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

\textbf{PATTERN=} \textit{line-pattern}

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

\textbf{Default:} For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

\textbf{THICKNESS=} \textit{n \textless units\textgreater}

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

\textbf{Default:} For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

Here is an example expression:

\texttt{LINEATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)}

\textbf{Default:} For ungrouped data, line attributes are derived from the GraphDataDefault style element. For grouped data, the ContrastColor attribute of the GraphData1... GraphData\textsubscript{n} style elements are used.

\textbf{Interactions:}

- This option takes effect only if the CONNECT= option is also specified.
- This option is ignored if the GROUP= option is also specified.

\textbf{MEANATTRS=} \textit{style-element <(options)> | (options)}

specifies the appearance of the marker that represents the mean in the box. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

\textit{options} can be one or more of the following:

\textbf{COLOR=} \textit{color}

specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of \textit{SAS/GRAPH: Reference}.

\textbf{Default:} For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxMean style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**SIZE=** n <units>
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphBoxMean style element in the current style.

**SYMBOL=** symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphBoxMean style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphDataN style elements in the current style.

**WEIGHT=** NORMAL | BOLD
specifies the marker weight of the marker.

**Default:** NORMAL

**MEDIANATTRS=** style-element <(options)> | (options)
specifies the appearance of the line that represents the median. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR=** color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxMedian style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**PATTERN=** line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphBoxMedian style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphDataN style elements in the current style.

**THICKNESS=** n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphBoxMedian style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphDataN style elements in the current style.
**GraphBoxMedian** is the default style element.

**Interaction:** This option is ignored if the NOMEDIAN option is also specified.

**MISSING**
processes missing values as a valid category value and creates a box for it.

**NAME= “text-string”**
specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NOCAPS**
hides the cap lines for the whiskers.

**NOMEAN**
hides the mean marker.

**NOMEDIAN**
hides the median line.

**NOOUTLIERS**
hides the outliers from the plot.

**NOTCHES**
specifies that the boxes be notched. The endpoints of the notches are at the following computed locations:

\[
median \pm 1.58 \left( \frac{IQR}{\sqrt{N}} \right)
\]

For a visual description of the parts of a box plot, see “Details” on page 237.

**OUTLIERATTRS= style-element <(options)> | (options)**
specifies the appearance of the marker that represents the outliers. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphOutlier style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**SIZE= n <units>**
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphOutlier style element in the current style.

**SYMBOL= symbol-name**
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphOutlier style element in the current style. For grouped data, the default marker symbol is specified by the
MarkerSymbol attribute of the GraphData1 ... GraphData attribute of the style elements in the current style.

**WEIGHT** = NORMAL | BOLD
specifies the marker weight of the marker.

**Default**: NORMAL

**Default**: GraphOutlier is the default style element.

**PERCENTILE** = 1 | 2 | 3 | 4 | 5
specifies a method for computing the percentiles for the plot. For descriptions of each method, see “Calculating Percentiles” in the UNIVARIATE Procedure chapter of *Base SAS Procedures Guide: Statistical Procedures*.

**Default**: 5

**SPREAD**
 relocates outlier points that have identical values to prevent overlapping.

**Note**: This option has no effect if your data does not contain two or more outliers with identical values for the analysis variable.

**TRANSPARENCY** = numeric-value
specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default**: 0.0

**WHISKERATTRS** = style-element <(options)> | (options)
specifies the appearance of the whisker and cap lines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR** = color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default**: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData attribute of the style elements in the current style.

**PATTERN** = line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default**: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData attribute of the style elements in the current style.

**THICKNESS** = n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default**: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData attribute of the style elements in the current style.

**Default**: GraphBoxWhisker is the default style element.
Interaction: This option is ignored if the NOMEDIAN option is also specified.

Details

Horizontal and vertical box plots display the distribution of data by using a rectangular box and whiskers. Whiskers are lines that indicate a data range outside of the box.

**Figure 6.7 Parts of a Box Plot**

Figure 6.7 on page 237 shows a diagram of a vertical box plot. The bottom and top edges of the box indicate the intra-quartile range (IQR). That is, the range of values between the first and third quartiles (the 25th and 75th percentiles). The marker inside the box indicates the mean value. The line inside the box indicates the median value.

The elements that are outside the box are dependent on your options. By default, the whiskers that extend from each box indicate the range of values that are outside of the intra-quartile range. However, the values are close enough not to be considered outliers (a distance less than or equal to 1.5*IQR). If you specify the EXTREME option, then the whiskers indicate the entire range of values, including outliers.

Any points that are a distance of more than 1.5*IQR from the box are considered to be outliers. By default, these points are indicated by markers. If you specify DATALABEL= option, then the outlier points have data labels. If you also specify the LABELFAR option, then only outliers that are 3*IQR from the box have data labels.
VECTOR Statement

Creates a vector plot that draws arrows from a point of origin to each data point.

**Example:** “About Vector Plots” on page 31

**Syntax**

**VECTOR** \( X = \text{numeric-variable} \) \( Y = \text{numeric-variable} < / \text{option(s)}> ;

**Summary of Optional Arguments**

**Label options**

- **DATALABEL <= \text{variable}>**
  - displays a label for each data point.

- **DATALABELATTRS= \text{style-element <(options)> | (options)>**
  - specifies the appearance of the labels in the plot when you use the DATALABEL= option.

**Plot options**

- **ATTRID= \text{variable}**
  - specifies the value of the ID variable in an attribute map data set.

- **GROUP= \text{variable}**
  - specifies a variable that is used to group the data.

- **LEGENDLABEL= “text-string”**
  - specifies a label that identifies the vector plot in the legend.

- **NAME= “text-string”**
  - specifies a name for the plot.

- **TRANSPARENCY= \text{numeric-value}**
  - specifies the degree of transparency for the lines.

**Vector options**

- **ARROWDIRECTION= IN | OUT | BOTH**
  - specifies the location of the arrowheads for the vectors.

- **ARROWHEADSHAPE= \text{shape}**
  - specifies the shape of the arrowheads for the vectors.

- **LINEATTRS= \text{style-element <(options)> | (options)}**
  - specifies the appearance of the vector line.

- **NOARROWHEADS**
  - removes the arrowheads from the vectors.

- **NOMISSINGGROUP**
  - specifies that missing values of the group variable are not included in the plot.

- **XORIGIN= \text{numeric-value | numeric-variable}**
  - specifies the X coordinate of the origin for the vectors.

- **YORIGIN= \text{numeric-value | numeric-variable}**
  - specifies the Y coordinate of the origin for the vectors.
**Required Arguments**

X= numeric-variable
  specifies a numeric variable for the x axis.

Y= numeric-variable
  specifies numeric variable for the y axis.

**Optional Arguments**

ARROWDIRECTION= IN | OUT | BOTH
  specifies the location of the arrowheads for the vectors. Specify one of the following:

  IN
  places the arrowheads at the origin of the vector.

  OUT
  places the arrowheads at the ending point of the vector.

  BOTH
  places arrowheads at both the origin and the ending point of the vector.

  Default: OUT

ARROWHEADSHAPE= shape
  specifies the shape of the arrowheads for the vectors. Specify one of the following:

  OPEN
  resembles the letter "V".

  CLOSED
  an outline of a triangle.

  FILLED
  a solid triangle.

  BARBED
  a solid triangle with an indent at the base.

  Default: OPEN

ATTRID= variable
  specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

DATALABEL <= variable>
  displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
  specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:
COLOR= *color*
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ...
GraphData2 style elements in the current style.

FAMILY= "*font-family*"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphDataText style element in the current style.

SIZE= *n* *<units>*
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the
GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the
GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also
specified.

GROUP= *variable*
specifies a variable that is used to group the data. A separate plot is created for each
unique value of the grouping variable. The plot elements for each group value are
automatically distinguished by different visual attributes.

LEGENDLABEL= "*text-string*"
specifies a label that identifies the vector plot in the legend. By default, the label of
the Y variable or the group value for each plot element is used.

Interaction: The LEGENDLABEL= option has no effect if you also specify the
GROUP= option in the same plot statement.

LINEATTRS= *style-element *(options)* | *(options)*
specifies the appearance of the vector line. You can specify the appearance by using
a style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:
COLOR= *color*

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= *line-pattern*

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= *n <units>*

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

NAME= “*text-string*”

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOARROWHEADS

removes the arrowheads from the vectors.

NOMISSINGGROUP

specifies that missing values of the group variable are not included in the plot.

TRANSPARENCY= *numeric-value*

specifies the degree of transparency for the lines. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

XORIGIN= *numeric-value | numeric-variable*

specifies the X coordinate of the origin for the vectors. You can specify either a numeric value or a numeric variable.

**Default:** 0

YORIGIN= *numeric-value | numeric-variable*

specifies the Y coordinate of the origin for the vectors. You can specify either a numeric value or a numeric variable.

**Default:** 0
VLINE Statement

Creates a vertical line chart (the line is horizontal). You can use the VLINE statement with the VBAR statement to create a bar-line chart.

**Interaction:** The VLINE statement can be combined only with other categorization plot statements in the SGPANEL procedure. See “Plot Type Compatibility” on page 81.

**See:**

**Examples:** “About Line Charts” on page 47
“Example 4: Creating a Panel of Line Charts” on page 272

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**Syntax**

```
VLINE category-variable < / option(s)>
```

**Summary of Optional Arguments**

**Group options**

- `CLUSTERWIDTH= numeric-value`
  - specifies the width of the group clusters as a fraction of the midpoint spacing.
- `GROUP= variable`
  - specifies a category variable to divide the values into groups.
- `GROUPDISPLAY= CLUSTER | OVERLAY`
  - specifies how to display grouped lines.
- `GROUPORDER= ASCENDING | DESCENDING | DATA`
  - specifies the ordering of lines within a group.

**Label options**

- `CURVELABEL <="text-string">`
  - adds a label for the line plot.
- `CURVELABELATTRS= style-element <(options)> | (options)`
  - specifies the appearance of the labels in the plot when you use the CURVELABEL= option.
- `CURVELABELPOS= MIN | MAX | START | END`
  - specifies the location of the curve label.
- `DATALABEL <= variable>`
  - displays a label for each data point.
- `DATALABELATTRS= style-element <(options)> | (options)`
  - specifies the appearance of the labels in the plot when you use the DATALABEL= option.

**Line options**

- `BREAK`
  - creates a break in the line for each missing value of the response variable.
- `DISCRETEOFFSET= numeric-value`
  - specifies an amount to offset all lines from discrete category values.
- `LIMITATTRS= style-element <(options)> | (options)`
  - specifies the appearance of the limit lines in the plot.
LIMITS= BOTH | LOWER | UPPER
    adds limit lines to the plot.
LIMITSTAT= CLM | STDDEV | STDERR
    specifies the statistic for the limit lines.
LINEATTRS= style-element <(options)> | (options)
    specifies the appearance of the lines in the line plot.
MARKERATTRS= style-element <(options)> | (options)
    specifies the appearance of the markers in the plot.
MARKERS
    adds data point markers to the plot.
MISSING
    processes missing values as a valid category value and creates a line for it.
NOSTATLABEL
    removes the statistic name from the axis and legend labels.
NUMSTD= n
    specifies the number of standard units for the limit lines, when you specify
    LIMITSTAT= STDDEV or LIMITSTAT= STDERR.
RESPONSE= response-variable
    specifies a numeric response variable for the plot.
STAT= FREQ | MEAN | SUM
    specifies the statistic for the vertical axis.

Plot options

ALPHA= numeric-value
    specifies the confidence level for the confidence limits.
ATTRID= variable
    specifies the value of the ID variable in an attribute map data set.
CATEGORYORDER= RESPASC | RESPDESC
    specifies the order in which the response values are arranged.
FREQ= numeric-variable
    specifies how many times observations are repeated for computational purposes.
LEGENDLABEL= “text-string”
    specifies the label that identifies the line plot in the legend.
NAME= “text-string”
    specifies a name for the plot.
TRANSPARENCY= numeric-value
    specifies the degree of transparency for the lines and markers.
URL= character-variable
    specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
WEIGHT= numeric-variable
    specifies how observations are weighted.

Required Argument

category-variable
    specifies the variable that classifies the observations into distinct subsets.
**Optional Arguments**

**ALPHA= numeric-value**  
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).  
**Default:** .05  
**Interactions:**  
This option has no effect if you do not specify LIMITSTAT=CLM.  
If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

**ATTRID= variable**  
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.  
For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BREAK**  
creates a break in the line for each missing value of the response variable.  
**Notes:**  
The observation is excluded from the graph when there is a missing value for the category variable without the specification of the MISSING option. (No break occurs in the line.)  
The observation is excluded from the graph when there is a missing value for the FREQ variable.

**CATEGORYORDER= RESPASC | RESPDESC**  
specifies the order in which the response values are arranged. Specify one of the following values:  

- **RESPASC**  
  sorts the response values in ascending order.  
- **RESPDESC**  
  sorts the response values in descending order.  

**Default:** By default, the plot is sorted in ascending order based on the category values.  
**Restriction:** This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.  
**Requirement:** This option requires that you configure the panel to use either one column or one row, depending on the orientation of your charts. Use the ROWS= or the COLUMNS= option in the PANELBY statement. If you do not use this option and your graph contains multiple cells, the specified sort order is not correctly applied to all cells.  
**Interaction:** If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)  
**Note:** If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

**CLUSTERWIDTH= numeric-value**  
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).  
**Default:** 0.8
Interaction: This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

CURVELABEL "<text-string>"
adds a label for the line plot. You can also specify the label text. If you do not specify a label, the label from the response variable is used.

CURVELABELATTRS= style-element (options) | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
CURVELABELATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
specifies the color of the line label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:
CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphValueText.

Interaction: This option has no effect unless the CURVELABEL option is also specified.
CURVELABELPOS= MIN | MAX | START | END
specifies the location of the curve label. Specify one of the following values:

MIN
places the label at the part of the curve closest to the minimum X axis value.

MAX
places the label at the part of the curve closest to the maximum X axis value.

START
places the curve label at the first point on the curve.

END
places the curve label at the last point on the curve.

Default: END
Interaction: This option has no effect unless the CURVELABEL option is also specified.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDatan style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).
**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset all lines from discrete category values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**Requirement:** This option is applicable only when the category axis is discrete.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

**GROUP= variable**
specifies a category variable to divide the values into groups. A separate plot is created for each unique value of the category variable.

**Interaction:** If you specify more than one categorization plot statement, then all of the plots must specify the same GROUP variable. If you do not specify the same GROUP= option for all of the categorization plots, then the GROUP= option has no effect.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped lines.

**CLUSTER**
grouped items are drawn adjacent to each other.

**OVERLAY**
grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1...GraphDataN style elements in the current style.

**Default:** OVERLAY

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of lines within a group.

**ASCENDING**
displays each group in ascending group value.
DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LEGENDLABEL= "text-string"
specifies the label that identifies the line plot in the legend. By default, the label of
the response variable is used. If there is no response variable label, then the name of
the response variable and the computed statistic (SUM or MEAN) are used. If you do
not specify a response variable, then the legend label is “Frequency”.

Interaction: The LEGENDLABEL= option has no effect if you also specify the
GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance
by using a style element or by using suboptions. If you specify a style element, you
can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: The default color is specified by the ContrastColor attribute of the
GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the
GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of
the GraphError style element in the current style.

LIMITS= BOTH | LOWER | UPPER
adds limit lines to the plot. Specify one of the following values:

BOTH
adds lower and upper limit lines to the plot.

LOWER
adds lower limit lines to the plot.

UPPER
adds upper limit lines to the plot.

Default: By default, no limit lines are displayed. However, if you specify the
LIMITSTAT= option, then the default is BOTH.

Interaction: Limit lines are displayed only when you specify STAT= MEAN.

LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines. Specify one of the following statistics:
CLM
confidence limits

STDDEV
standard deviation

STDERR
standard error

Default: CLM

Interaction: If you specify the LIMITSTAT= option, then the default value for the LIMITS= option is BOTH.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the lines in the line plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData$n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData$n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style.

For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData$n style elements in the current style.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. This option has no effect unless you also specify the MARKERS option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.

SIZE= <units >
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData style elements in the current style.

MARKERS
adds data point markers to the plot.

MISSING
processes missing values as a valid category value and creates a line for it.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOSTATLABEL
removes the statistic name from the axis and legend labels.

NUMSTD= n
specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive number, including decimals.

Default: 1

RESPONSE= response-variable
specifies a numeric response variable for the plot. The summarized values of the response variable are displayed on the vertical axis.

STAT= FREQ | MEAN | SUM
specifies the statistic for the vertical axis. Specify one of the following statistics:

FREQ
the frequencies for the category variable. This is the default value when you do not specify the RESPONSE= option.

MEAN
the mean of the response variable.

SUM
the sum of the response variable. This is the default value when you specify the RESPONSE= option.
**Interaction:** If you do not specify the `RESPONSE=` option, then only the FREQ statistic can be used. If you specify the `RESPONSE=` option, then you can use either the SUM or MEAN statistics.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the lines and markers. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**URL= character-variable**
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Default:** By default, no HTML links are created.

**Interactions:**
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**WEIGHT= numeric-variable**
specifies how observations are weighted. Each observation is weighted by a factor of $w$ for computational purposes, where $w$ is the value of the numeric variable. $w$ can be any numeric value. If $w$ is 0, negative or missing, then that observation is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

---

**COLAXIS Statement**

Specifies the axis options for each X axis in the panel. You can control the features of the axis (for example, the axis label, grid lines, and minor tick marks). You can also control the structure of the axis (for example, the data range, data type, and tick mark values).

**Syntax**

```
COLAXIS option(s);
```

**Summary of Optional Arguments**

- **ALTERNATE**
  adds reference ticks to each side of the panel and alternates the tick values for each row or column between the two sides.

- **DISCRETEORDER= DATA | FORMATTED | UNFORMATTED**
  specifies the order in which discrete tick values are placed on the axis.

- **DISPLAY= ALL | NONE | (options)**
  specifies which features of the axis are displayed.

- **FITPOLICY= policy-value**
  specifies the method that is used to fit tick mark values on a horizontal axis when there is not enough room to draw them normally.

- **GRID**
creates grid lines at each tick on the axis.

**INTEGER**
specifies that only integers are used for tick mark values.

**INTERVAL=** *interval-value*
specifies the tick interval for a time axis.

**LABEL=** "*text-string"
specifies a label for the axis.

**LABELATTRS=** *style-element* *(options)* | *(options)*
specifies the appearance of the axis labels.

**LOGBASE=** 2 | 10 | e
specifies the base value for the logarithmic scale.

**LOGSTYLE=** LINEAR | LOGEXPAND | LOGEXPONENT
specifies how to scale and format the values for the major tick marks for logarithmic axes.

**MAX=** *numeric-value*
specifies the maximum value for the axis.

**MIN=** *numeric-value*
specifies the minimum value for the axis.

**MINOR**
adds minor tick marks to a log or time axis.

**NOTIMESPLIT**
prevents a time axis from splitting the time, date, or datetime values into two rows.

**OFFSETMAX=** *numeric-value*
specifies an offset that follows the highest data value on the axis.

**OFFSETMIN=** *numeric-value*
specifies an offset that precedes the lowest data value on the axis.

**REFTICKS <=** *(options)*
adds tick marks to the side of the panel that is opposite from the specified axis.

**REVERSE**
specifies that the tick values are displayed in reverse (descending) order.

**THRESHOLDMAX=** *numeric-value*
Specifies a threshold for displaying one more tick mark at the high end of the axis.

**THRESHOLDMIN=** *numeric-value*
Specifies a threshold for displaying one more tick mark at the low end of the axis.

**TICKVALUEFORMAT=** DATA | *SAS-format*
specifies the format for the axis tick values.

**TYPE=** DISCRETE | LINEAR | LOG | TIME
specifies the type of axis.

**VALUEATTRS=** *style-element* *(options)* | *(options)*
specifies the appearance of the axis tick value labels.

**VALUES=** *(values-list)*
specifies the values for the ticks on the axis.

**VALUESHINT**
specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option.
**Optional Arguments**

**ALTERNATE**
adds reference ticks to each side of the panel and alternates the tick values for each row or column between the two sides.

**DISCRETEORDER= DATA | FORMATTED | UNFORMATTED**
specifies the order in which discrete tick values are placed on the axis. Specify one of the following values:

- **DATA**
  places the values in the order in which they appear in the data.

- **FORMATTED**
  sorts the formatted values in ascending character order.

- **UNFORMATTED**
  sorts the unformatted values in ascending character order.

**Default:** UNFORMATTED  
**Restriction:** This option affects only box plots, dot plots, bar charts, and line plots, or for any axis where TYPE=DISCRETE.

**DISPLAY= ALL | NONE | (options)**
specifies which features of the axis are displayed. ALL displays all of the features of the axis. NONE specifies that none of the features of the axis are displayed.

You can also hide specific features by specifying options. *Options* can be any of the following:

- **NOLABEL**
  hides the axis label

- **NOLINE**
  hides the axis line

- **NOTICKS**
  hides the tick marks on the axis

- **NOVALUES**
  hides the tick mark values on the axis

**Default:** ALL  
**Interaction:** If the ALTERNATE option is also specified, the DISPLAY option affects both the primary and the alternate axis.

**FITPOLICY= policy-value**
specifies the method that is used to fit tick mark values on a horizontal axis when there is not enough room to draw them normally. Select one of the following values:

- **ROTATE**
  rotates the value text 45 degrees. This is the default for discrete axes.

- **ROTATETHIN**
  attempts to use ROTATE, and then THIN to fit the values.

- **STAGGER**
  shifts the values up and down.

- **STAGGERROTATE**
  attempts to use STAGGER, and then ROTATE to fit the values.

- **STAGGERTHIN**
  attempts to use STAGGER, and then THIN to fit the values.
THIN
removes some of the values from the axis. This is the default for linear and time axes.

Restriction: This option does not affect logarithmic axes.

Note: This option has no effect if used with the vertical (row) axes; only the THIN fit policy is used for vertical axes.

GRID
creates grid lines at each tick on the axis.

INTEGER
specifies that only integers are used for tick mark values. This option affects only linear axes.

INTERVAL= *interval-value*
specifies the tick interval for a time axis. Specify one of the following values:

AUTO
determines the tick interval automatically based on the data.

SECOND
places ticks one second apart. The default tick value format is TIME8.

MINUTE
places ticks one minute apart. The default tick value format is TIME8.

HOUR
places ticks one hour apart. The default tick value format is TIME8.

DAY
places ticks one day apart. The default tick value format is DATE9.

WEEK
places ticks one week apart. The default tick value format is DATE9.

TENDAY
places ticks ten days apart. The default tick value format is DATE9.

SEMIMONTH
places ticks at the first and sixteenth day of each month. The default tick value format is DATE9.

MONTH
places ticks one month apart. The default tick value format is MONYY7.

QUARTER
places ticks three months apart. The default tick value format is YYQC6.

SEMIYEAR
places ticks six months apart. The default tick value format is MONYY7.

YEAR
places ticks one year apart. The default tick value format is YEAR4.

Default: AUTO

LABEL= "*text-string"
specifies a label for the axis.

LABELATTRS= *style-element* (<options>) | (<options>)
specifies the appearance of the axis labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:
COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute
of the GraphLabelText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

**Default:** The default font family is specified by the FontFamily attribute of the
GraphLabelText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the
GraphLabelText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the
GraphLabelText style element in the current style.

**Interaction:** This option has no effect unless CURVELABEL is also specified.

LOGBASE= 2 | 10 | e
specifies the base value for the logarithmic scale.

**Default:** 10

**Interaction:** This option has no effect unless you also specify TYPE=LOG.

LOGSTYLE= LINEAR | LOGEXPAND | LOGEXponent
specifies how to scale and format the values for the major tick marks for logarithmic
axes. Specify one of the following values:

LOGEXPAND
places the tick marks at integer powers of the base. For example, if you specified
LOGBASE=2, the tick marks might be at 1, 2, 4, 8, 16. See Figure 6.8 on page
256.
LOGEXPONENT
places the tick marks at integer powers of the base, but identifies the values by the exponent. For example, if you specified \texttt{LOGBASE=10}, the tick marks might be at 1, 10, 100, 1000, but the tick values would read 0, 1, 2, 3. See Figure 6.9 on page 256.

**Figure 6.9** An Axis with LOGEXPONENT

LINEAR
places the tick marks at uniform linear intervals, but spaces them logarithmically. In some cases an intermediate tick mark is placed between the first and second marks.

For example, if the data on this axis range from 14 to 1154, and you specify \texttt{LOGBASE=10}, then the tick marks might be at 10, 40, 200, 400, 600, 800, 1000, 1200. See Figure 6.10 on page 256.

**Figure 6.10** An Axis with LINEAR

Default: LOGEXPAND
Interaction: This option has no effect unless you also specify TYPE=LOG.

\texttt{MAX= numeric-value}
specifies the maximum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the \texttt{VALUES=} option and you do not also specify the \texttt{VALUESHINT} option.

\texttt{MIN= numeric-value}
specifies the minimum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the \texttt{VALUES=} option and you do not also specify the \texttt{VALUESHINT} option.

MINOR
adds minor tick marks to a log or time axis.
Restriction: This option has no effect on discrete or linear axes.
Interaction: This option has no effect if you specify the \texttt{VALUES=} option.

\texttt{NOTIMESPLIT}
prevents a time axis from splitting the time, date, or datetime values into two rows.
Restriction: This option applies to time axes only.
OFFSETMAX= numeric-value
specifies an offset that follows the highest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset follows the highest data value or highest tick value, whichever is greater. For a discrete axis, the offset is applied to the end of the axis farther from the origin.

Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

OFFSETMIN= numeric-value
specifies an offset that precedes the lowest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset precedes the lowest data value or lowest tick value, whichever is less. For a discrete axis, the offset is applied to the end of the axis nearer to the origin.

Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

REFTICKS <= (options)>
adds tick marks to the side of the panel that is opposite from the specified axis. You can also specify options:

LABEL
in addition to the tick marks, displays the axis label.

VALUES
in addition to the tick marks, displays the values that are represented by the tick marks.

REVERSE
specifies that the tick values are displayed in reverse (descending) order.

THRESHOLDMAX= numeric-value
specifies a threshold for displaying one more tick mark at the high end of the axis.

THRESHOLDMIN= numeric-value
specifies a threshold for displaying one more tick mark at the low end of the axis.

TICKVALUEFORMAT= DATA | SAS-format
specifies the format for the axis tick values. You can either specify a SAS format or specify DATA, which indicates that the format from axis variable is used.

TYPE= DISCRETE | LINEAR | LOG | TIME
specifies the type of axis. Specify one of the following values:

DISCRETE
specifies an axis with discrete values. If a character variable is assigned to an axis, then that the default type for that axis is discrete. In addition, all categorization plots use a discrete axis for the category variable.

LINEAR
specifies a linear scale for the axis. This is the default axis type for numeric variables, except when the data is discrete or when the numeric variable has a date or time format.

LOG
specifies a logarithmic scale for the axis. This axis type is never a default.
**Interaction:** A logarithmic scale cannot be used with linear regression plots (REG statement where DEGREE=1).

**TIME**

specifies a time scale for the axis. If the variable assigned to an axis has a time, date, or datetime format associated with it, then time is the default axis type.

**VALUEATTRS=** *style-element <options>* | *(options)*

specifies the appearance of the axis tick value labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR=** *color*

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY=** “*font-family”*

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE=** *n <units>*

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE=** ITALIC | NORMAL

specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT=** BOLD | NORMAL

specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

**VALUES=** ( *values-list* )

specifies the values for the ticks on the axis.

For values on a linear axis, the values list can be one of the following:

**value <...value-n>**

creates ticks for specific values. For example, **VALUES= ( 0 50 100 )** places tick marks at 0, 50, and 100.
creates ticks for a range of values. The start of the value range is specified by `value-1` and the end of the range is specified by `value-2`. The `increment-value` specifies the interval between the ticks. For example, `VALUES= (0 to 100 by 50)` creates tick marks at 0, 50, and 100.

<value ... value-n> value-1 TO value-2 BY increment-value <value ... value-n>

creates ticks for specific values, and also creates ticks for a range of values. The start of the value range is specified by `value-1` and the end of the range is specified by `value-2`. The `increment-value` specifies the interval between the ticks.

For example, `VALUES= (-5 10 to 50 by 20 75)` creates tick marks at -5, 10, 30, 50, and 75.

For values on a time axis, the values list can be one of the following:

`value <...value-n>`

creates ticks for specific values. For example, `VALUES= ("25MAY08"d "04JUL08"d "23AUG08"d)` places tick marks at 25MAY08, 04JUL08, and 23AUG08.

`value-1 TO value-2 BY increment-value`

creates ticks for a range of values. The start of the value range is specified by `value-1` and the end of the range is specified by `value-2`. The `increment-value` specifies the interval between the ticks. For example, `VALUES= ("01JAN08"d to "01MAY08"d by month)` creates tick marks at 01JAN08, 01FEB08, 01MAR08, 01APR08, and 01MAY08.

For a list of the interval values that you can specify, see the `INTERVAL=` option.

**Restrictions:**

This option has no effect on discrete and logarithmic axes.

If your `VALUES=` option creates more than 1000 values, then the option has no effect.

**Interaction:** If a custom format is applied to the value, the raw value is plotted first and then formatted.

`VALUESHINT`

specifies that the minimum and maximum axis values are determined independently of the values that you specify in the `VALUES=` option. The values from the `VALUES=` option are displayed only if they are located between the minimum and maximum values.

**Interaction:** This option has no effect unless you also specify the `VALUES=` option.

---

**ROWAXIS Statement**

Specifies the axis options for each Y axis in the panel. You can control the features of the axis (for example, the axis label, grid lines, and minor tick marks). You can also control the structure of the axis (for example, the data range, data type, and tick mark values).

**Syntax**

```
ROWAXIS option(s);
```
Summary of Optional Arguments

**ALTERNATE**
adds reference ticks to each side of the panel and alternates the tick values for each row or column between the two sides.

**DISCRETEORDER= DATA | FORMATTED | UNFORMATTED**
specifies the order in which discrete tick values are placed on the axis.

**DISPLAY= ALL | NONE | (options)**
specifies which features of the axis are displayed.

**GRID**
creates grid lines at each tick on the axis.

**INTEGER**
specifies that only integers are used for tick mark values.

**INTERVAL= interval-value**
specifies the tick interval for a time axis.

**LABEL= "text-string"**
specifies a label for the axis.

**LABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the axis labels.

**LOGBASE= 2 | 10 | e**
specifies the base value for the logarithmic scale.

**LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT**
specifies how to scale and format the values for the major tick marks for logarithmic axes.

**MAX= numeric-value**
specifies the maximum value for the axis.

**MIN= numeric-value**
specifies the minimum value for the axis.

**MINOR**
adds minor tick marks to a log or time axis.

**NOTIMESPLIT**
prevents a time axis from splitting the time, date, or datetime values into two rows.

**OFFSETMAX= numeric-value**
specifies an offset that follows the highest data value on the axis.

**OFFSETMIN= numeric-value**
specifies an offset that precedes the lowest data value on the axis.

**REFTICKS <= (options)>**
adds tick marks to the side of the panel that is opposite from the specified axis.

**REVERSE**
specifies that the tick values are displayed in reverse (descending) order.

**THRESHOLDMAX= numeric-value**
Specifies a threshold for displaying one more tick mark at the high end of the axis.

**THRESHOLDMIN= numeric-value**
Specifies a threshold for displaying one more tick mark at the low end of the axis.

**TICKVALUEFORMAT= DATA | SAS-format**
specifies the format for the axis tick values.

**TYPE= DISCRETE | LINEAR | LOG | TIME**
specifies the type of axis.

**VALUEATTRS= style-element *(options)* | *(options)*

specifies the appearance of the axis tick value labels.

**VALUES= *(values-list)*

specifies the values for the ticks on the axis.

**VALUESHINT**

specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option.

**Optional Arguments**

**ALTERNATE**

adds reference ticks to each side of the panel and alternates the tick values for each row or column between the two sides.

**DISCRETEORDER= DATA | FORMATTED | UNFORMATTED**

specifies the order in which discrete tick values are placed on the axis. Specify one of the following values:

**DATA**

places the values in the order in which they appear in the data.

**FORMATTED**

sorts the formatted values in ascending character order.

**UNFORMATTED**

sorts the unformatted values in ascending character order.

**Default:** UNFORMATTED

**Restriction:** This option affects only box plots, dot plots, bar charts, and line plots, or for any axis where TYPE=DISCRETE.

**DISPLAY= ALL | NONE | *(options)*

specifies which features of the axis are displayed. ALL displays all of the features of the axis. NONE specifies that none of the features of the axis are displayed.

You can also hide specific features by specifying options. *Options* can be any of the following:

**NOLABEL**

hides the axis label

**NOLINE**

hides the axis line

**NOTICKS**

hides the tick marks on the axis

**NOVALUES**

hides the tick mark values on the axis

**Default:** ALL

**Interaction:** If the ALTERNATE option is also specified, the DISPLAY option affects both the primary and the alternate axis.

**GRID**

creates grid lines at each tick on the axis.

**INTEGER**

specifies that only integers are used for tick mark values. This option affects only linear axes.
INTERVAL= *interval-value*

specifies the tick interval for a time axis. Specify one of the following values:

AUTO
determines the tick interval automatically based on the data.

SECOND
places ticks one second apart. The default tick value format is TIME8.

MINUTE
places ticks one minute apart. The default tick value format is TIME8.

HOUR
places ticks one hour apart. The default tick value format is TIME8.

DAY
places ticks one day apart. The default tick value format is DATE9.

WEEK
places ticks one week apart. The default tick value format is DATE9.

TENDAY
places ticks ten days apart. The default tick value format is DATE9.

SEMIMONTH
places ticks at the first and sixteenth day of each month. The default tick value format is DATE9.

MONTH
places ticks one month apart. The default tick value format is MONYY7.

QUARTER
places ticks three months apart. The default tick value format is YYQC6.

SEMIYEAR
places ticks six months apart. The default tick value format is MONYY7.

YEAR
places ticks one year apart. The default tick value format is YEAR4.

Default: AUTO

LABEL= "*text-string*

specifies a label for the axis.

LABELATTRS= *style-element <(options)> | (options)*

specifies the appearance of the axis labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

COLOR= color

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference.*

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphLabelText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData* n* style elements in the current style.
FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphLabelText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the
GraphLabelText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphLabelText style element in the current style.

Interaction: This option has no effect unless CURVELABEL is also specified.

LOGBASE= 2 | 10 | e
specifies the base value for the logarithmic scale.

Default: 10

Interaction: This option has no effect unless you also specify TYPE=LOG.

LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT
specifies how to scale and format the values for the major tick marks for logarithmic
axes. Specify one of the following values:

LOGEXPAND
places the tick marks at integer powers of the base. For example, if you specified
LOGBASE=2, the tick marks might be at 1, 2, 4, 8, 16. See Figure 6.8 on page
256.

Figure 6.11  Graph Axes with LOGEXPAND

LOGEXPONENT
places the tick marks at integer powers of the base, but identifies the values by
the exponent. For example, if you specified LOGBASE=10, the tick marks might
be at 1, 10, 100, 1000, but the tick values would read 0, 1, 2, 3. See Figure 6.9 on
page 256.
Figure 6.12  An Axis with LOGEXPONENT

LINEAR
places the tick marks at uniform linear intervals, but spaces them logarithmically. In some cases an intermediate tick mark is placed between the first and second marks.

For example, if the data on this axis range from 14 to 1154, and you specify LOGBASE=10, then the tick marks might be at 10, 40, 200, 400, 600, 800, 1000, 1200. See Figure 6.10 on page 256.

Figure 6.13  An Axis with LINEAR

Default: LOGEXPAND
Interaction: This option has no effect unless you also specify TYPE=LOG.

MAX= numeric-value
specifies the maximum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MIN= numeric-value
specifies the minimum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MINOR
adds minor tick marks to a log or time axis.
Restriction: This option has no effect on discrete or linear axes.
Interaction: This option has no effect if you specify the VALUES= option.

NOTIMESPLIT
prevents a time axis from splitting the time, date, or datetime values into two rows.
Restriction: This option applies to time axes only.

OFFSETMAX= numeric-value
specifies an offset that follows the highest data value on the axis. Specify a value between 0 and 1.
The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset follows the highest data value or highest tick value, whichever is greater. For a discrete axis, the offset is applied to the end of the axis farther from the origin.
Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.
Interaction: For HBOX, HBAR, HLINE, and DOT plot statements, the Y axis is reversed by default, so the axis origin is at the top. For these plots, OFFSETMAX= creates an offset at the end of the Y axis nearer to the origin.
OFFSETMIN= numeric-value
specifies an offset that precedes the lowest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset precedes the lowest data value or lowest tick value, whichever is less. For a discrete axis, the offset is applied to the end of the axis nearer to the origin.

Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

Interaction: For HBOX, HBAR, HLINE, and DOT plot statements, the Y axis is reversed by default, so the axis origin is at the top. For these plots, OFFSETMIN= creates an offset at the end of the Y axis farther from the origin.

REFTICKS <= (options)>
adds tick marks to the side of the panel that is opposite from the specified axis. You can also specify options:

LABEL
in addition to the tick marks, displays the axis label.

VALUES
in addition to the tick marks, displays the values that are represented by the tick marks.

REVERSE
specifies that the tick values are displayed in reverse (descending) order.

THRESHOLDMAX= numeric-value
Specifies a threshold for displaying one more tick mark at the high end of the axis.

THRESHOLDMIN= numeric-value
Specifies a threshold for displaying one more tick mark at the low end of the axis.

TICKVALUEFORMAT= DATA | SAS-format
specifies the format for the axis tick values. You can either specify a SAS format or specify DATA, which indicates that the format from axis variable is used.

TYPE= DISCRETE | LINEAR | LOG | TIME
specifies the type of axis. Specify one of the following values:

DISCRETE
specifies an axis with discrete values. If a character variable is assigned to an axis, then that the default type for that axis is discrete. In addition, all categorization plots use a discrete axis for the category variable.

LINEAR
specifies a linear scale for the axis. This is the default axis type for numeric variables, except when the data is discrete or when the numeric variable has a date or time format.

LOG
specifies a logarithmic scale for the axis. This axis type is never a default.

Interaction: A logarithmic scale cannot be used with linear regression plots (REG statement where DEGREE=1).

TIME
specifies a time scale for the axis. If the variable assigned to an axis has a time, date, or datetime format associated with it, then time is the default axis type.
VALUEATTRS= style-element <(options)> | (options)
specifies the appearance of the axis tick value labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

(options) can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAF software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAF: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language: Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

VALUES= ( values-list )
specifies the values for the ticks on the axis.

For values on a linear axis, the values list can be one of the following:

value <...value-n>
creates ticks for specific values. For example, VALUES= (0 50 100) places tick marks at 0, 50, and 100.

value-1 TO value-2 BY increment-value
creates ticks for a range of values. The start of the value range is specified by value-1 and the end of the range is specified by value-2. The increment-value specifies the interval between the ticks. For example, VALUES= (0 to 100 by 50) creates tick marks at 0, 50, and 100.

<value ... value-n> value-1 TO value-2 BY increment-value <value ... value-n>
creates ticks for specific values, and also creates ticks for a range of values. The start of the value range is specified by value-1 and the end of the range is
specified by value-2. The increment-value specifies the interval between the ticks.

For example, VALUES= (-5 10 to 50 by 20 75) creates tick marks at -5, 10, 30, 50, and 75.

For values on a time axis, the values list can be one of the following:

value <...value-n>
creates ticks for specific values. For example, VALUES= ("25MAY08"d "04JUL08"d "23AUG08"d) places tick marks at 25MAY08, 04JUL08, and 23AUG08.

value-1 TO value-2 BY increment-value
creates ticks for a range of values. The start of the value range is specified by value-1 and the end of the range is specified by value-2. The increment-value specifies the interval between the ticks. For example, VALUES= ("01JAN08"d to "01MAY08"d by month) creates tick marks at 01JAN08, 01FEB08, 01MAR08, 01APR08, and 01MAY08.

For a list of the interval values that you can specify, see the INTERVAL= option.

Restrictions:
This option has no effect on discrete and logarithmic axes.
If your VALUES= option creates more than 1000 values, then the option has no effect.

Interaction: If a custom format is applied to the value, the raw value is plotted first and then formatted.

VALUESHINT
specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option. The values from the VALUES= option are displayed only if they are located between the minimum and maximum values.

Interaction: This option has no effect unless you also specify the VALUES= option.
Program

proc sgpanel data=sashelp.heart noautolegend;
  title "Cholesterol Distribution in Heart Study";
  panelby sex;
  histogram cholesterol;
  density cholesterol;
run;

Program Description

Create the panel and specify the title.

proc sgpanel data=sashelp.heart noautolegend;
  title "Cholesterol Distribution in Heart Study";

Specify the classification variable for the panel.

  panelby sex;

Create the histogram and density plots.

  histogram cholesterol;
  density cholesterol;
run;

Cancel the title.

title;
Example 2: Creating a Panel of Regression Curves

**Features:**
- REG statement
- Sample library member: SGPNREG

This example shows a panel of regression curves. The COLUMNS= option in the PANELBY statement specifies that the panel has three columns of graph cells.

**Output**

![Scatter plot for Fisher iris data]

**Program**

```sas
proc sgpanel data=sashelp.iris;
title "Scatter plot for Fisher iris data";
panelby species / columns=3;

reg x=sepallength y=sepalwidth / cli clm;
run;
title;
```

**Program Description**

Create the panel and specify the title.

```sas
proc sgpanel data=sashelp.iris;
title "Scatter plot for Fisher iris data";
```
Specify the classification variable for the panel. The COLUMNS= option specifies the number of columns in the panel.

```
panelby species / columns=3;
```

Create the regression curve. The CLI option creates individual predicted value confidence limits. The CLM option creates mean value confidence limits.

```
reg x=sepallength y=sepalwidth / cli clm;
run;
```

Cancel the title.

```
title;
```

Example 3: Creating a Panel of Bar Charts

Features: HBAR statement

Sample library member: SGPNBAR

This example shows a panel of bar charts. The COLUMNS= option in the PANELBY statement specifies that the panel contains a single column of cells.
Program

```sas
proc sgpanel data=sashelp.prdsale;
  title "Yearly Sales by Product";
  panelby year / novarname columns=1;
    hbar product / response=actual;
  run;
  title;
```

Program Description

Create the panel and set the title.

```sas
proc sgpanel data=sashelp.prdsale;
  title "Yearly Sales by Product";
```
Specify the classification variable for the panel. The NOVARNAME option specifies that the variable name is not shown in the heading for each cell. The COLUMNS= option specifies the number of columns in the panel.

```
panelby year / novarname columns=1;
```

Create the horizontal bar chart. The RESPONSE= option specifies the response variable for the chart.

```
hbar product / response=actual;
run;
```

Cancel the title.

```
title;
```

---

### Example 4: Creating a Panel of Line Charts

**Features:**
- VLINE statement

**Sample library member:**
- SGPNLIN

This example shows a panel of line plots with grouped data.

**Output**

![Yearly Sales by Product](image)

**Program**

```plaintext
proc sgangl panel data=sashelp.prdsale;
  where product in ('CHAIR' 'SOFA');
  title 'Yearly Sales by Product';
  panelby year / spacing=5 novarname;
```
vline month / response=actual group=product;
run;
title;

Program Description

Create the panel and specify a title.

proc sgpanel data=sashelp.prdsale;
  where product in ('CHAIR' 'SOFA');
  title "Yearly Sales by Product";
panelby year / spacing=5 novarname;

Specify the classification variable for the panel. The SPACING= option specifies the number of pixels between the panels in the plot. The NOVARNAME option specifies that the classification variable name is not shown in the headings for each cell.

Create the vertical line plot. The RESPONSE= option specifies the response variable. The GROUP= option specifies the group variable.

vline month / response=actual group=product;
run;

Cancel the title.

title;
Overview: SGPLOT Procedure

The SGPLOT procedure creates one or more plots and overlays them on a single set of axes. You can use the SGPLOT procedure to create statistical graphics such as histograms and regression plots, in addition to simple graphics such as scatter plots and line plots. Statements and options enable you to control the appearance of your graph and add additional features such as legends and reference lines.

The SGPLOT procedure can create a wide variety of plot types, and can overlay plots together to produce many different types of graphs.

Here are some examples of graphs that the SGPLOT procedure can create.

Table 7.1 Examples of Graphs That Can Be Generated by the SGPLOT Procedure

The following code creates an ellipse plot:
```
proc sgplot data=sashelp.class;
    scatter x=height y=weight;
    ellipse x=height y=weight;
run;
```

The following code creates a horizontal box plot:
```
proc sgplot data=sashelp.cars;
    hbox weight / category=origin;
run;
```
The following code creates a graph with two series plots:

```sas
title "Power Generation (GWh)";
proc sgplot data=sashelp.electric(where=(year >= 2001 and customer="Residential"));
xaxis type=discrete;
series x=year y=coal / datalabel;
series x=year y=naturalgas / datalabel y2axis;
run;
title;
```

The following code creates a graph with a histogram, a normal density curve, and a kernel density curve:

```sas
proc sgplot data=sashelp.class;
histogram height;
density height;
density height / type=kernel;
run;
```

The following code creates a graph with two bar charts:

```sas
proc sgplot data=sashelp.prdsale;
yaxis label="Sales" min=200000;
vbar country / response=predict;
vbar country / response=actual
    barwidth=0.5
    transparency=0.2;
run;
```

---

**Concepts: SGPLOT Procedure**

**Plot Type Compatibility**

There are four basic types of plots that you can create with the SGPLOT procedure.

- Basic plots
  - scatter, series, step, band, bubble, high-low, needle, and vector plots
- Fit and confidence plots
  - loess, regression, and penalized B-spline curves, and ellipses
- Distribution plots
  - box plots, histograms, and normal and kernel density estimates
Categorization plots
   dot plots, bar charts, line plots, and waterfall plots (preproduction)

Not all of the plot types can be used together in the same PROC SGPLOT step. The following table shows which of the plot types can be used together:

### Table 7.2  Plot Type Compatibility

<table>
<thead>
<tr>
<th></th>
<th>Basic</th>
<th>Fit and Confidence</th>
<th>Distribution</th>
<th>Categorization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fit and Confidence</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Categorization</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

**Note:** Box plots cannot be combined with any other plot types. Box plots can be overlaid with other box plots. However, overlaid box plots must have the same category variables.

If you submit a PROC SGPLOT step that combines two incompatible plot statements, then an error appears in the log.

The SGPLOT procedure draws the plots in your graph in the same order that you specify the plot statements. Because of this, it is important to consider the order of your plot statements so that your plots do not obscure one another. For example, if you specify a BAND statement after a SCATTER statement, then the band plot might obscure the markers in your scatter plot. You can also avoid obscuring your data by using the TRANSPARENCY= option to make your plots partially transparent.

### Plot Axes

The SGPLOT procedure contains statements that enable you to change the type and appearance of your axes: XAXIS, X2AXIS, YAXIS, and Y2AXIS.

By default, the type of each axis is determined by the types of plots that use the axis and the data that is applied to the axis.

The SGPLOT procedure supports the following axis types:

- **Discrete**
  - The axis contains independent data values rather than a range of numeric values.
  - Each distinct value is represented by a tick mark. Discrete is the default axis type for character data.

- **Linear**
  - The axis contains a linear range of numeric values. Linear is the default axis type for numeric data.

- **Logarithmic**
  - The axis contains a logarithmic range of values. The logarithmic axis type is not used as a default.
Time

The axis contains a range of time values. Time is the default axis type for data that uses a SAS time, date, or datetime format.

Some types of plot do not support all of the axis types. For example, needle plots cannot use a discrete vertical axis. See the documentation for each plot statement to determine whether any axis type restrictions apply.

Legends in the SGPLOT Procedure

The SGPLOT procedure creates a legend automatically based on the plot statements and options that you specify. The automatic legend functionality determines which information is likely to be useful in the legend. You can override the automatic legend functionality by defining your own legend with the KEYLEGEND statement or by specifying the NOAUTOLEGEND option in the PROC SGPLOT statement.

You can create customized legends by using one or more KEYLEGEND statements. You can use the KEYLEGEND statement to control the contents, title, location, and border of the legend. See “KEYLEGEND Statement” on page 360.

You can specify the labels that represent your plots in the legend by using the LEGENDLABEL= option in the corresponding plot statements.

Automatic Differentiation of Visual Attributes

Depending on the plots and options that you specify, the SGPLOT procedure can automatically assign different style attributes to the plots in your graph. For example, if you specify two series plots, then each series plot automatically uses a different line color by default. If different attributes are not assigned by default, then you can force the procedure to use different style attributes by using the CYCLEATTRS option in the PROC SGPLOT statement. For example, you can use the CYCLEATTRS option to assign different colors to a series plot and a scatter plot. You can also disable automatic attribute differentiation by using the NOCYCLEATTRS option in the PROC SGPLOT statement.

Syntax: SGPLOT Procedure

Requirement: At least one plot statement is required.

Global statements: BY, FORMAT, LABEL, ODS GRAPHICS, TITLE and FOOTNOTE, WHERE
PROC SGPLOT <option(s)>;
  BAND X= variable | Y= variable
  UPPER= numeric-value | numeric-variable LOWER= numeric-value | numeric-variable <option(s)>;
  BUBBLE X= variable Y= variable SIZE= numeric-variable <option(s)>;
  DENSITY response-variable <option(s)>;
  DOT category-variable <option(s)>;
  ELLIPSE X= numeric-variable Y= numeric-variable <option(s)>;
  HBAR category-variable <option(s)>;
  HBARPARM CATEGORY= category-variable RESPONSE= numeric-variable <option(s)>;
  HBOX analysis-variable <option(s)>;
  HIGHLIGHT X= variable | Y= variable
  HIGH= numeric-variable LOW= numeric-variable <option(s)>;
  HISTOGRAM response-variable <option(s)>;
  HLINE category-variable <option(s)>;
  INSET “text-string-1” <... “text-string-n”> | (label-list) <option(s)>;
  KEYLEGEND “name-1” ... “name-n” <option(s)>;
  LINEPARM X= numeric-value | numeric-variable
  Y= numeric-value | numeric-variable
  SLOPE= numeric-value | numeric-variable <option(s)>;
  LOESS X= numeric-variable Y= numeric-variable <option(s)>;
  NEEDLE X= variable Y= numeric-variable <option(s)>;
  PBSPLINE X= numeric-variable Y= numeric-variable <option(s)>;
  REFLINE value(s) <option(s)>;
  REG X= numeric-variable Y= numeric-variable <option(s)>;
  SCATTER X= variable Y= variable <option(s)>;
  SERIES X= variable Y= variable <option(s)>;
  STEP X= variable Y= variable <option(s)>;
  VBAR category-variable <option(s)>;
  VBARPARM CATEGORY= category-variable RESPONSE= numeric-variable <option(s)>;
  VBOX analysis-variable <option(s)>;
  VECTOR X= numeric-variable Y= numeric-variable <option(s)>;
  VLINE category-variable <option(s)>;
  WATERFALL CATEGORY= variable RESPONSE= numeric-variable <option(s)>;
  XAXIS <option(s)>;
  X2AXIS <option(s)>;
  YAXIS <option(s)>;
  Y2AXIS <option(s)>;
**PROC SGPLOT Statement**

Identifies the data set that contains the plot variables. The statement also gives you the option to specify a description, write template code to a file, control the uniformity of axes, and control automatic legends and automatic attributes.

**Requirement:** An input data set is required.

**Syntax**

```
PROC SGPLOT <DATA= input-data-set>
   < CYCLEATTRS | NOCYCLEATTRS>
   < DATTRMAP= "attribute-map-data-set" >
   < DESCRIPTION= "text-string" >
   < NOAUTOLEGEND>
   < PAD= dimension<units> | (pad-options)>
   < SGANNO= "annotation-data-set" >
   < TMPLOUT= "filename" >
   < UNIFORM= GROUP | SCALE | ALL | XSCALE | YSCALE | XSCALEGROUP | YSCALEGROUP >
```

**Summary of Optional Arguments**

- **CYCLEATTRS | NOCYCLEATTRS**
  specifies whether plots are drawn with unique attributes in the graph.

- **DATA= input-data-set**
  specifies the SAS data set that contains the variables to process.

- **DATTRMAP= attribute-map-data-set**
  specifies the SG attribute map data set that you want to use with the SGSCATTER procedure.

- **DESCRIPTION= "text-string"**
  specifies a description for the output image.

- **NOAUTOLEGEND**
  disables automatic legends from being generated.

- **PAD= dimension<units> | (pad-options)**
  specifies the amount of extra space that is reserved inside the border of an annotated graph.

- **SGANNO= annotation-data-set**
  specifies the SG annotation data set that you want to use.

- **TMPLOUT= "filename"**
  writes the Graph Template Language code for your graph to a file.

- **UNIFORM= GROUP | SCALE | ALL | XSCALE | YSCALE | XSCALEGROUP | YSCALEGROUP**
  specifies how to control axis scaling and marker attributes when you use a BY statement.
Optional Arguments

CYCLEATTRS | NOCYCLEATTRS
specifies whether plots are drawn with unique attributes in the graph. By default, the SGLOT procedure automatically assigns unique attributes in many situations, depending on the types of plots that you specify. If the plots do not have unique attributes by default, then the CYCLEATTRS option assigns unique attributes to each plot in the graph. The NOCYCLEATTRS option prevents the procedure from assigning unique attributes.

For example, if you specify the CYCLEATTRS option and you create a graph with a SERIES statement and a SCATTER statement, then the two plots will have different colors.

If you specify the NOCYCLEATTRS option, then plots have the same attributes unless you specify appearance options such as the LINEATTRS= option.

DATA= input-data-set
specifies the SAS data set that contains the variables to process. By default, the procedure uses the most recently created SAS data set.

DATTRMAP= attribute-map-data-set
specifies the SG attribute map data set that you want to use with the SGSCATTER procedure. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

DESCRIPTION= "text-string"
specifies a description for the output image. The description identifies the image in the following locations:

• the Results window
• the alternate text for the image in HTML output
• the table of contents that is created by the CONTENTS option in an ODS statement

The default description is “The SGPLOT Procedure”.

Alias: DES

Notes:
The name of the output image is specified by the IMAGENAME= option in the ODS GRAPHICS statement.

You can disable the alternate text in HTML output by specifying an empty string. That is, DESCRIPTION="".

NOAUTOLEGEND
enables automatic legends from being generated. By default, legends are created automatically for some plots, depending on their content. This option has no effect if you specify a KEYLEGEND statement.

PAD= dimension<units> | (pad-options)
specifies the amount of extra space that is reserved inside the border of an annotated graph.

You specify this option only if you are using the SG annotation feature to annotate your graph. For more information, see Chapter 10, “Annotating ODS Graphics,” on page 557.

This option creates margins around the graph for company logos, annotated notes, and so on. You can also specify the unit of measurement. The default unit is pixels.
For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Use pad options to create non-uniform padding. Edges that are not assigned padding are padded with the default amount.

pad-options can be one or more of the following:

LEFT=dimension<units>
specifies the amount of extra space to add to the left edge.

RIGHT=dimension<units>
specifies the amount of extra space to add to the right edge.

TOP=dimension<units>
specifies the amount of extra space to add to the top edge.

BOTTOM=dimension<units>
specifies the amount of extra space to add to the bottom edge.

SGANNO=annotation-data-set
specifies the SG annotation data set that you want to use. You specify this option only if you are using the SG annotation feature to annotate your graph. For more information, see Chapter 10, “Annotating ODS Graphics,” on page 557.

TMPLOUT=“filename”
writes the Graph Template Language code for your graph to a file. Writing your template code to a file can be useful for building larger Graph Template Language definitions.

Restriction: Graphs that contain summarized data (for example, bar, line, and dot) do not generate a useable template. For summarized data, the procedure sets internal values for one or more variables, and these internal values do not exist in the data set that is used with the procedure.

UNIFORM=GROUP | SCALE | ALL | XSCALE | YSCALE | XSCALEGROUP | YSCALEGROUP
specifies how to control axis scaling and marker attributes when you use a BY statement.

Specify one of the following values:

ALL
specifies that both the legend group values and the axis scaling are shared between all of the levels of the BY variable or variables.

GROUP
specifies that the legend group values are shared between all of the levels of the BY variable or variables. This option is applicable only when the GROUP= option is specified for the plot.

SCALE
specifies that the axis scaling is shared between all of the levels of the BY variable or variables.

XSCALE
specifies that the X axis scaling is shared between all of the levels of the BY variable or variables. The Y axes are unaffected.

YSCALE
specifies that the Y axis scaling is shared between all of the levels of the BY variable or variables. The X axes are unaffected.
XSCELEGROUP
specifies that both the legend group values and the X axis scaling are shared between all of the levels of the BY variable or variables. The Y axes are unaffected. This option is applicable only when the GROUP= option is specified for the plot.

YSCELEGROUP
specifies that both the legend group values and the Y axis scaling are shared between all of the levels of the BY variable or variables. The X axes are unaffected. This option is applicable only when the GROUP= option is specified for the plot.

By default, each level of the BY variable or variables can have different legend group values and different axis scaling.

Interaction: This option has no effect if you do not use a BY statement.

---

**BAND Statement**

Creates a band that highlights part of the plot.

Restriction: The axis that the UPPER and LOWER values are placed on cannot be a discrete axis. For example, if you specify a variable for Y, the plot cannot use a discrete horizontal axis.

Note: The input data should be sorted by the X or Y variable. If the data is not sorted, the graph might produce unpredictable results.

Examples:
- “About Band Plots” on page 20
- “Example 6: Creating Lines and Bands from Pre-Computed Data” on page 504

**Syntax**

```
BAND X= variable | Y= variable
UPPER= numeric-value | numeric-variable LOWER= numeric-value | numeric-variable
</option(s)>;
```

**Summary of Optional Arguments**

Band options

- **DISCRETEOFFSET= numeric-value**
  specifies an amount to offset all bands from discrete X or Y tick values.

- **FILL | NOFILL**
  specifies whether the area fill is visible.

- **FILLATTRS= style-element | (COLOR= color)**
  specifies the appearance of the area fill for the band.

- **LINEATTRS= style-element | (options) | (options)**
  specifies the appearance of the outlines for the band.

- **MODELNAME= "plot-name"**
  specifies a plot that is used as a model for the interpolation for the band.

- **NOEXTEND**
  specifies that the band does not extend beyond the first and last data points in the plot.
OUTLINE | NOOUTLINE
specifies whether the outlines of the band are visible.

TYPE= SERIES | STEP
specifies how the data points for the lower and upper band boundaries are connected.

Group options

GROUP= variable
specifies a variable that is used to group the data.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Label options

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you specify a curve label.

CURVELABELLOC= OUTSIDE | INSIDE
specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

CURVELABELLOWER = “text-string”
adds a label to the lower edge of the band.

CURVELABELPOS= AUTO | END | MAX | MIN | START
specifies the location of the curve label.

CURVELABELUPPER = “text-string”
adds a label to the upper edge of the band.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
specifies a label that identifies the elements from the band plot in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= value
specifies the degree of transparency for the plot.

X2AXIS
assigns the variable that is assigned to the primary (bottom) horizontal axis to the secondary (top) horizontal axis.

Y2AXIS
assigns the variable that is assigned to the primary (left) vertical axis to the secondary (right) vertical axis.

Required Arguments

X= variable | Y=variable
specifies a variable that is used to plot the band along the x or y axis.

LOWER= numeric-value | numeric-variable
specifies the lower value for the band. You can specify either a constant numeric value or a numeric variable.
**UPPER= numeric-value | numeric-variable**
specifies the upper value for the band. You can specify either a constant numeric value or a numeric variable.

**Optional Arguments**

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**CURVELABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you specify a curve label. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

**CURVELABELATTRS=GraphTitleText**

*options* can be one or more of the following:

**COLOR= color**
specifies the color of the line label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**FAMILY= "font-family"**
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE= n <units>**
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:
Default: The default style element is GraphValueText.

Interaction: This option has no effect unless CURVELABELLOWER or CURVELABELUPPER is also specified.

**CURVELABELLOC= OUTSIDE | INSIDE**

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

Default: INSIDE

**CURVELABELLOWER = “text-string”**

adds a label to the lower edge of the band. Specify the label text.

**CURVELABELPOS= AUTO | END | MAX | MIN | START**

specifies the location of the curve label. Specify one of the following values:

**AUTO**

places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).

Interaction: This value takes effect only when CURVELABELLOC=OUTSIDE.

**END**

places the curve label at the last point on the curve.

**MAX**

places the label at the part of the curve closest to the maximum X axis value.

**MIN**

places the label at the part of the curve closest to the minimum X axis value.

**START**

places the curve label at the first point on the curve.

Default: END

Interactions:

This option has no effect unless the CURVELABEL option is also specified.

The START and END suboptions take effect only when CURVELABELLOC=INSIDE.

**CURVELABELUPPER = “text-string”**

adds a label to the upper edge of the band. Specify the label text.

**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all bands from discrete X or Y tick values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the X or Y axis is discrete.

**FILL | NOFILL**

specifies whether the area fill is visible. The FILL option shows the area fill. The NOFILL option hides the area fill.

Default: The default status of the area fill is specified by the DisplayOpts attribute of the GraphBand style element in the current style.

Interactions:

Specifying FILL also hides any visible outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.
FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the area fill for the band. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataConfidence style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1...GraphDataN style elements in the current style.

Interaction: This option has no effect if you specify the NOFILL option.

GROUP= variable
specifies a variable that is used to group the data. A separate band is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.

LEGENDLABEL= "text-string"
specifies a label that identifies the elements from the band plot in the legend. By default, the label “band” is used for ungrouped data, and the group values are used for grouped data.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the outlines for the band. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataConfidence style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1...GraphDataN style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphConfidence style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1...GraphDataN style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1...GraphDataN style elements in the current style.
**Interaction:** This option has no effect unless you also specify the OUTLINES option.

**MODELNAME= “plot-name”**

specifies a plot that is used as a model for the interpolation for the band. If you do not specify the MODELNAME= option, then the band is interpolated in the same way as a series plot.

**NAME= “text-string”**

specifies a name for the plot. You can use the name to refer to this plot in other statements.

*Note:* The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NOEXTEND**

specifies that the band does not extend beyond the first and last data points in the plot. By default, the band extends to the edges of the plot area.

*Interaction:* This option has no effect if you do not specify numeric values for the UPPER= and LOWER= options.

**NOMISSINGGROUP**

specifies that missing values of the group variable are not included in the plot.

**OUTLINE | NOOUTLINE**

specifies whether the outlines of the band are visible. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

*Default:* The default status of the band outlines is specified by the DisplayOpts attribute of the GraphBand.

*Interactions:*

Specifying OUTLINE also hides the fill color.

If NOOUTLINE and NOFILL are both specified, then both options are ignored.

**TRANSPARENCY= value**

specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

*Default:* 0.0

**TYPE= SERIES | STEP**

specifies how the data points for the lower and upper band boundaries are connected. You can specify one of the following:

SERIES

the data points are connected directly using line segments, as in a series plot.

STEP

the data points are connected using a step function, as in a step plot.

*Default:* SERIES

**X2AXIS**

assigns the variable that is assigned to the primary (bottom) horizontal axis to the secondary (top) horizontal axis.

**Y2AXIS**

assigns the variable that is assigned to the primary (left) vertical axis to the secondary (right) vertical axis.

**Details**

The MODELNAME= option fits a band to another plot. This is particularly useful for plots that use a special interpolation such as step plots.
The following code fragment fits a band to a step plot:

```plaintext
band x=t upper=ucl lower=lcl / modelname="myname" transparency=.5;
step x=t y=survival / name="myname";
```

**Figure 7.1  Fitted Band Plot Example**

---

**BBUBLE Statement**

Creates a bubble plot in which two variables determine the location of the bubble centers and a third variable controls the size of the bubble.

**Example:**  “About Bubble Plots” on page 21

**Syntax**

```plaintext
BBUBLE X= variable Y= variable SIZE= numeric-variable </option(s)>;
```

**Summary of Optional Arguments**

**Bubble options**

- **BRADIUSMAX= numeric-value**
  
  specifies the size of the radius of the largest bubble.

- **BRADIUSMIN= numeric-value**
  
  specifies the size of the radius of the smallest bubble.

- **FILL | NOFILL**
  
  specifies whether the bubbles are filled.

- **FILLATTRS= style-element | (COLOR= color)**
  
  specifies the appearance of the fill for the bubbles.

- **LINEATTRS= style-element </(options)> | (options)**
  
  specifies the appearance of the outlines for the bubbles.

- **OUTLINE | NOOUTLINE**
  
  specifies whether the outlines of the bubbles are visible.

**Group options**

- **GROUP= variable**
  
  specifies a variable that is used to group the data.
NOMISSINGGROUP
  specifies that missing values of the group variable are not included in the plot.

Label options
  DATALABEL <=variable>
  displays a label for each data point.
  DATALABELATRBS= style-element <(options)> | (options)
  specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options
  ATTRID= variable
  specifies the value of the ID variable in an attribute map data set.
  LEGENDLABEL= “text-string”
  specifies the label that identifies the bubble plot in the legend.
  NAME= “text-string”
  specifies a name for the plot.
  TRANSPARENCY= numeric-value
  specifies the degree of transparency for the fill and outline of the bubbles.
  URL= character-variable
  specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

  X2AXIS
  assigns the variables that are assigned to the primary (bottom) horizontal axis to the secondary (top) horizontal axis.

  Y2AXIS
  assigns the variables that are assigned to the primary (left) vertical axis to the secondary (right) vertical axis.

Required Arguments
  X= variable
  specifies the variable for the X axis.

  Y= variable
  specifies the variable for the Y axis.

  SIZE= numeric-variable
  specifies the variable that controls the size of the bubbles. The minimum and maximum values automatically provide the range that is used to determine bubble sizes. You can control this range manually by using the BRADIUSMAX and BRADIUSMIN options.

Optional Arguments
  ATTRID= variable
  specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.
BRADIUSMAX= numeric-value
specifies the size of the radius of the largest bubble. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Restriction: The BRADIUSMAX= value must be greater than the BRADIUSMIN= value if one is specified. If BRADIUSMAX is not greater, an error is generated and a message is written to the SAS log.

Note: If you specify the maximum size as a percentage, this is interpreted as a percentage of the graph's height.

BRADIUSMIN= numeric-value
specifies the size of the radius of the smallest bubble. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Restriction: The BRADIUSMIN= value must be smaller than the BRADIUSMAX= value if one is specified. If BRADIUSMIN is not smaller, an error is generated and a message is written to the SAS log.

Note: If you specify the minimum size as a percentage, this is interpreted as a percentage of the graph's height.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

DATALABELATTRS= style-element <(options)>(options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

```
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**FILL | NOFILL**
specifies whether the bubbles are filled. The FILL option shows the fill color. The NOFILL option hides the fill color.

**Default:** FILL

**Interactions:**
- Specifying FILL also hides the outlines.
- If NOFILL and NOOUTLINE are both specified, then both options are ignored.

**FILLATTRS= style-element | (COLOR= color)**
specifies the appearance of the fill for the bubbles. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphDataN style elements in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

**GROUP= variable**
specifies a variable that is used to group the data. The bubbles for each group value are automatically distinguished by different colors.

When this option is used, the bubble colors are taken from the GraphData1... GraphDataN style elements. If the bubbles are filled, then the COLOR attribute is used for bubble fill and GRAPHOUTLINES is used for the bubble outline. If the bubbles are not filled, then the CONTRASTCOLOR and PATTERN are used for the bubble outlines.

When this option is used and the value is a variable associated with an ATTRID= option, the attribute mapping defined by the associated attribute map is used.

**LEGENDLABEL= “text-string”**
specifies the label that identifies the bubble plot in the legend. By default, the label for the Y variable is used for ungrouped data, and the group values are used for grouped data.
**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

**LINEATTRS= style-element <(options)> | (options)**

specifies the appearance of the outlines for the bubbles. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: **LINEATTRS=GraphData3**

For more information about style elements, see “Style Elements for Use with ODS Graphics” on page 640.

**options** can be one or more of the following:

- **COLOR= color**
  
  specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
  
  **Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

- **PATTERN= line-pattern**
  
  specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
  
  **Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

- **THICKNESS= n <units>**
  
  specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  
  **Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

Here is an example expression:

**LINEATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)**

**Default:** For ungrouped data, line attributes are derived from the GraphDataDefault style element. For grouped data, the ContrastColor attribute of the GraphData1... GraphData n style elements are used.

**NAME= “text-string”**

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NOMISSINGGROUP**

specifies that missing values of the group variable are not included in the plot.

**Interaction:** This option has no effect unless GROUP= is also specified.
OUTLINE | NOOUTLINE
specifies whether the outlines of the bubbles are visible. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: OUTLINE

Interactions:
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the fill and outline of the bubbles. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

X2AXIS
assigns the variables that are assigned to the primary (bottom) horizontal axis to the secondary (top) horizontal axis.

Y2AXIS
assigns the variables that are assigned to the primary (left) vertical axis to the secondary (right) vertical axis.

DENSITY Statement
Creates a density curve that shows the distribution of values for a numeric variable.

Restriction: The DENSITY statement cannot be used with discrete axes.

Interaction: The DENSITY statement can be combined only with DENSITY and HISTOGRAM statements in the SGPLOT procedure.

Examples:
“About Density Plots” on page 39
“Example 8: Combining Histograms with Density Plots” on page 507

Syntax

DENSITY response-variable / option(s);

Summary of Optional Arguments

Density options

LINEATTRS= style-element (options) | (options)
specifies the appearance of the density line.
SCALE= scaling-type
specifies the scaling that is used for the response axis.

TYPE = NORMAL < (normal-opts)> | KERNEL < (kernel-opts)>
specifies the type of distribution curve that is used for the density plot.

Plot options

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.

LEGENDLABEL= "text-string"
specifies a label that identifies the density plot in the legend.

NAME= "text-string"
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the density curve.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the calculated result to the secondary (right) vertical axis.

Required Argument

response-variable
specifies the variable for the x axis. The variable must be numeric.

Optional Arguments

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes. Each observation is repeated n times for computational purposes, where n is the value of the numeric variable. If n is not an integer, then it is truncated to an integer. If n is less than 1 or missing, then it is excluded from the analysis.

LEGENDLABEL= "text-string"
specifies a label that identifies the density plot in the legend. By default, the label identifies the type of density curve. If you specify TYPE=NORMAL, then the default label is “Normal.” If you specify TYPE=KERNEL, then the default label is “Kernel.”

Note: User-specified parameters from the TYPE= option are included in the label by default.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the density line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphFit style element in the current style.
PATTERN= line-pattern
    specifies the line pattern for the line. You can reference SAS patterns by number
    or by name. For a list of line patterns, see “Line Patterns” on page 663.
    Default: The default line pattern is specified by the LineStyle attribute of the
             GraphFit style element in the current style.

THICKNESS= n <units>
    specifies the thickness of the line. You can also specify the unit of measure. The
    default unit is pixels. For a list of measurement units that are supported, see
    “Units of Measurement” on page 659.
    Default: The default line thickness is specified by the LineThickness attribute of
             the GraphFit style element in the current style.

NAME= “text-string”
    specifies a name for the plot. You can use the name to refer to this plot in other
    statements.
    Note: The name is case-sensitive. When you refer to the specified name in other
          statements, you must use the same exact capitalization.

SCALE= scaling-type
    specifies the scaling that is used for the response axis. Specify one of the following
    values:
    COUNT
        the axis displays the frequency count.
    DENSITY
        the axis displays the density estimate values.
    PERCENT
        the axis displays values as a percentage of the total.
    PROPORTION
        the axis displays values in proportion to the total.
    Default: DENSITY
    Note: The PROPORTION scale can be used only when you combine a density plot
          and a histogram together.

TRANSPARENCY= numeric-value
    specifies the degree of transparency for the density curve. Specify a value from 0.0
    (completely opaque) to 1.0 (completely transparent).
    Default: 0.0

TYPE = NORMAL < (normal-opts)>| KERNEL < (kernel-opts)>
    specifies the type of distribution curve that is used for the density plot. Specify one
    of the following keywords:
    NORMAL < (normal-opts)>
        specifies a normal density estimate, with a mean and a standard deviation.
        normal-opts can be one or more of the following values:
        MU= numeric-value
            specifies the mean value that is used in the density function equation. By
            default, the mean value is calculated from the data.
        SIGMA= numeric-value
            specifies the standard deviation value that is used in the density function
            equation. The value that you specify for the SIGMA= suboption must be a
            positive number. By default, the standard deviation value is calculated from
            the data.
KERNEL < (kernel-opts)>
specifies a nonparametric kernel density estimate.

*kernel-opts* can be:

- **C= numeric-value**
  - specifies the standardized bandwidth for a number that is greater than 0 and less than or equal to 100.
  - The value that you specify for the C= suboption affects the value of \( \lambda \) as shown in the following equation:
    \[
    \lambda = c Q n^{-\frac{1}{5}}
    \]
    - In this equation, \( c \) is the standardized bandwidth, \( Q \) is the interquartile range, and \( n \) is the sample size.

- **WEIGHT= NORMAL | QUADRATIC | TRIANGULAR**
  - specifies the weight function. You can specify either normal, quadratic, or triangular weight function.
  - Default: NORMAL

- **X2AXIS**
  - assigns the X variable to the secondary (top) horizontal axis.

- **Y2AXIS**
  - assigns the calculated result to the secondary (right) vertical axis.

**Details**

**Normal Density Function**
When the type of the density curve is NORMAL, the fitted density function equation is as follows.

\[
\rho(x) = \frac{100 h %}{\sqrt{2\pi}} \exp \left( -\frac{1}{2} \left( \frac{x - \mu}{\sigma} \right)^2 \right) \text{ for } -\infty < x < \infty
\]

In the equation, \( \mu \) is the mean, and \( \sigma \) is the standard deviation. You can specify \( \mu \) by using the MU= suboption and \( \sigma \) by using the SIGMA= suboption.

**Kernel Density Function**
When the TYPE of the density curve is KERNEL, the general form of the kernel density estimator is as follows.

\[
\hat{f}_n(x) = \frac{100 h %}{n \lambda} \sum_{i=1}^{n} K_0 \left( \frac{x - x_i}{\lambda} \right)
\]

In the equation, \( K_0(\cdot) \) is the weight function, \( \lambda \) is the bandwidth, \( n \) is the sample size, and \( x_i \) is the \( i \)th observation. You can use the C= suboption to specify the bandwidth and the WEIGHT= suboption to specify the weight function \( K_0(\cdot) \).

**Kernel Density Weight Functions**
The formulas for the weight functions are as follows.
NORMAL

\[ K_0(t) = \frac{1}{\sqrt{2\pi}} \exp \left( -\frac{1}{2} t^2 \right) \text{ for } -\infty < t < \infty \]

QUADRATIC

\[ K_0(t) = \frac{3}{4} (1 - t^2) \text{ for } |t| \leq 1 \]

TRIANGULAR

\[ K_0(t) = 1 - |t| \text{ for } -1 \leq |t| \leq 1 \]

DOT Statement

Creates a dot plot that summarizes the values of a category variable.

**Interaction:**

The DOT statement can be combined only with other horizontal categorization plot statements in the SGPLOT procedure. See “Plot Type Compatibility” on page 277.

**Examples:**

“About Dot Plots” on page 46

“Example 7: Adding Statistical Limits to a Dot Plot” on page 506

**Syntax**

```
DOT category-variable < / option(s)>;
```

**Summary of Optional Arguments**

Dot options

**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all dots from discrete category values.

**LIMITATTRS= style-element (options) | (options)**

specifies the appearance of the limit lines in the plot.

**LIMITS= BOTH | LOWER | UPPER**

specifies which limit lines to display.

**LIMITSTAT= CLM | STDDEV | STDERR**

specifies the statistic for the limit lines.

**MARKERATTRS= style-element (options) | (options)**

specifies the appearance of the markers in the plot.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**NUMSTD= n**

specifies the number of standard units for the limit lines when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

**RESPONSE= response-variable**

specifies a numeric response variable for the plot.

**STAT= FREQ | MEAN | SUM**

specifies the statistic for the horizontal axis.
Group options

- **CLUSTERWIDTH= numeric-value**
  specifies the width of the group clusters as a fraction of the midpoint spacing.

- **GROUP= variable**
  specifies a variable that is used to group the data.

- **GROUPDISPLAY= CLUSTER | OVERLAY**
  specifies how to display grouped dots.

- **GROUPORDER= ASCENDING | DESCENDING | DATA**
  specifies the ordering of dots within a group.

Label options

- **DATALABEL <= variable>=**
  displays a label for each data point.

- **DATALABELATTRS= style-element <(options)> | (options)**
  specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options

- **ALPHA= numeric-value**
  specifies the confidence level for the confidence limits.

- **ATTRID= variable**
  specifies the value of the ID variable in an attribute map data set.

- **CATEGORYORDER= RESPASC | RESPDESC**
  specifies the order in which the response values are arranged.

- **FREQ= numeric-variable**
  specifies how many times observations are repeated for computational purposes.

- **LEGENDLABEL= “text-string”**
  specifies the label that identifies the dot plot in the legend.

- **MISSING**
  processes missing values as valid category value and creates a dot for it.

- **NAME= “text-string”**
  specifies a name for the plot.

- **TRANSPARENCY= numeric-value**
  specifies the degree of transparency for the plot.

- **URL= character-variable**
  specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

- **WEIGHT= numeric-variable**
  specifies how observations are weighted.

**Required Argument**

category-variable

  specifies the variable that classifies the observations into distinct subsets.

**Optional Arguments**

- **ALPHA= numeric-value**
  specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

  **Default:** .05
Interactions:
This option has no effect if you do not specify LIMITSTAT=CLM.
If your plot is overlaid with other categorization plots, then the first ALPHA
value that you specify is used for all of the plots.

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this
option only if you are using an attribute map to control visual attributes of the graph.
For more information, see “Using SG Attribute Maps to Control Visual Attributes”
on page 605.

CATEGORYORDER= RESPASC | RESPDESC
specifies the order in which the response values are arranged. Specify one of the
following values:

RESPASC
sorts the response values in ascending order.

RESPDESC
sorts the response values in descending order.

Default: By default, the plot is sorted in ascending order based on the category
values.

Restrictions:
This option takes effect only when the plot statement specifies a response
variable and the axis for that variable is numeric. If the axis is not numeric, an
error is generated and a message is written to the SAS log.
Uniform scaling and response sorting cannot occur on the same axis. If the
UNIFORM= option is used in the SGPLOT statement, the UNIFORM option is
ignored for the sorted response axis and a note is generated in the log. The
UNIFORM= option is applied to the other axes and groups if requested. Note
that the UNIFORM= option can selectively apply scaling to only the X or Y axis

Interaction: If a group variable is specified in the plot statement, the response sort
option is ignored and a note is generated in the log. (You can use a BY statement
in the procedure if you want to group data.)

Note: If CATEGORYORDER is specified in multiple statements, the procedure
sorts by the last statement in which it is specified.

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.
Specify a value from 0.0 (narrowest) to 1.0 (widest).

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified,
when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that
variable are used for the data labels. If you do not specify a variable, then the values
of the calculated response are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL=
option. You can specify the appearance by using a style element or by using
suboptions. If you specify a style element, you can also specify suboptions to
override specific appearance attributes.
Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText
options can be one or more of the following:

**COLOR= color**
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY= “font-family”**
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset all dots from discrete category values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**Requirement:** This option is applicable only when the category axis is discrete.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes. specifies that each observation is repeated n times for computational purposes, where n is the value of the numeric variable. If n is not an integer, then it is truncated to an integer. If n is less than 1 or missing, then it is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.
GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

Interaction: If you specify more than one categorization plot statement, then all of the plots must specify the same GROUP variable. If you do not specify the same GROUP= option for all of the categorization plots, then the GROUP= option has no effect.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped dots.

CLUSTER
  grouped items are drawn adjacent to each other.

OVERLAY
  grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1... GraphDataN style elements in the current style.

Default: OVERLAY

Restriction: GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

Interaction: This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of dots within a group.

ASCENDING
  displays each group in ascending group value.

DESCENDING
  displays each group in descending group value.

DATA
  displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LEGENDLABEL= "text-string"
specifies the label that identifies the dot plot in the legend. By default, the label of the response variable is used. If there is no response variable label, then the name of the response variable and the computed statistic (SUM or MEAN) is used. If the RESPONSE= option is not used, then the legend label is “Frequency”.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.
PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

LIMITS= BOTH | LOWER | UPPER
specifies which limit lines to display. Limits are displayed as heavier line segments with a serif at the end extending horizontally from each dot. Upper limits extend to the right of the dot and lower limits extend to the left of the dot. By default, no limits are displayed unless you specify either the LIMITS= or LIMITSTAT= option. Specify one of the following values:

**BOTH**
adds lower and upper limit lines to the plot.

**LOWER**
adds lower limit lines to the plot.

**UPPER**
adds upper limit lines to the plot.

**Default:** By default, no limit lines are displayed. However, if you specify the LIMITSTAT= option, then the default is BOTH.

**Interaction:** Limit lines are displayed only when you specify STAT= MEAN.

LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines. Specify one of the following statistics:

**CLM**
confidence limits

**STDDEV**
standard deviation

**STDERR**
standard error

**Default:** CLM

**Interactions:**
If you specify the LIMITSTAT= option only, then the default value for the LIMITS= option is BOTH.

Limits lines are displayed only when you specify STAT= MEAN.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData style elements in the current style.

MISSING
processes missing values as valid category value and creates a dot for it.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOSTATLABEL
removes the statistic name from the axis and legend labels.

NUMSTD= n
specifies the number of standard units for the limit lines when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive number, including decimals.

Default: 1

RESPONSE= response-variable
specifies a numeric response variable for the plot. The summarized values of the response variable for each category value are displayed on the horizontal axis.

STAT= FREQ | MEAN | SUM
specifies the statistic for the horizontal axis. Specify one of the following:

FREQ
the frequencies for the category variable. This is the default value when you do not specify the RESPONSE= option.

MEAN
the mean of the response variable.

SUM
the sum of the response variable. This is the default value when you specify the RESPONSE= option.

If you do not specify the RESPONSE= option, then only the FREQ statistic can be used. If you specify RESPONSE=, then you can use either the SUM or MEAN statistics.
**TRANSPARENCY= numeric-value**

specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**URL= character-variable**

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Default:** By default, no HTML links are created.

**Interactions:**

This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**WEIGHT= numeric-variable**

specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

---

**ELLIPSE Statement**

Adds a confidence or prediction ellipse to another plot.

**Restriction:** In order to produce useful output, the ELLIPSE statement should be used with another plot statement that uses numeric axes.

**Examples:**

“About Ellipse Plots” on page 33

“Example 5: Adding a Prediction Ellipse to a Scatter Plot” on page 503

---

**Syntax**

ELLIPSE X= numeric-variable Y= numeric-variable / option(s);

**Summary of Optional Arguments**

**Ellipse options**

**ALPHA= numeric-value**

specifies the confidence level for the ellipse.

**CLIP**

specifies that the data for the ellipse is ignored when determining the data ranges for the axes.

**FILL | NOFILL**

specifies whether the area fill is visible.

**FILLATTRS= style-element | (COLOR= color)**

specifies the appearance of the area fill for the ellipse.

**LINEATTRS= style-element </option(s)> | (options)**
specifies the appearance of the outlines for the ellipse.

**OUTLINE | NOOUTLINE**
specifies whether the outlines of the ellipse are visible.

**TYPE = MEAN | PREDICTED**
specifies the type of ellipse.

**Plot options**

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the ellipse in the legend.

**NAME= “text-string”**
specifies a name for the plot.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the area fill and outline, if displayed.

**X2AXIS**
assigns the X variable to the secondary (top) horizontal axis.

**Y2AXIS**
assigns the Y variable to the secondary (right) vertical axis.

**Required Arguments**

**X= numeric-variable**
specifies a numeric variable for the X axis.

**Y= numeric-variable**
specifies a numeric variable for the Y axis.

**Optional Arguments**

**ALPHA= numeric-value**
specifies the confidence level for the ellipse. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

**CLIP**
specifies that the data for the ellipse is ignored when determining the data ranges for the axes. By default, the data for the ellipse is considered when determining the data ranges for the axes.

**Interaction:** This option is automatically set if you specify UNIFORM=SCALE or UNIFORM=ALL option in the PROC SGPLOT statement.

**FILL | NOFILL**
specifies whether the area fill is visible. The FILL option shows the area fill. The NOFILL option hides the area fill.

Default: The default status of the area fill is specified by the DisplayOpts attribute of the GraphEllipse style element in the current style.

**Interactions:**

Specifying FILL also hides any visible outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.

**FILLATTRS= style-element | (COLOR= color)**
specifies the appearance of the area fill for the ellipse. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify
colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** The default color is specified by the Color attribute of the GraphDataDefault style element in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the ellipse in the legend. By default, the label describes the confidence value of the ellipse and the type of ellipse. For example, “95% Prediction Ellipse.”

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the outlines for the ellipse. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** The default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** The default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style.

**NAME= “text-string”**
specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**OUTLINE | NOOUTLINE**
specifies whether the outlines of the ellipse are visible. The OUTLINE option shows the outlines and hides the fill. The NOOUTLINE option hides the outlines.

**Default:** The default status of the outlines is specified by the DisplayOpts attribute of the GraphEllipse style element in the current style.

**Interactions:**
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the area fill and outline, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.5

**TYPE = MEAN | PREDICTED**
specifies the type of ellipse. MEAN specifies a confidence ellipse for the population mean. PREDICTED specifies a prediction ellipse for a new observation. Both ellipse types assume a bivariate normal distribution.

Default: PREDICTED

**X2AXIS**
assigns the X variable to the secondary (top) horizontal axis.

**Y2AXIS**
assigns the Y variable to the secondary (right) vertical axis.

---

**HBAR Statement**

Creates a horizontal bar chart that summarizes the values of a category variable.

**Interactions:**
The HBAR statement can be combined only with other categorization plot statements in the SGPLOT procedure. See “Plot Type Compatibility” on page 277. When used with particular styles, the HBAR statement produces fill patterns for grouped bars. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636.

**Example:** “About Bar Charts” on page 42

**Syntax**

```
HBAR category-variable </option(s)>;
```

**Summary of Optional Arguments**

**Bar options**

- **BARWIDTH= numeric-value**
  specifies the width of the bars as a ratio of the maximum possible width.

- **DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN**
  specifies a special effect to be used on all filled bars.

- **DISCRETEOFFSET= numeric-value**
  specifies an amount to offset all bars from the category midpoints.

- **FILL | NOFILL**
  specifies whether the bars are filled.

- **FILLATTRS= style-element | (COLOR= color)**
  specifies the appearance of the fill for the bars.

- **LIMITATTRS= style-element </(options)> | (options)**
  specifies the appearance of the limit lines in the plot.

- **LIMITS= BOTH | LOWER | UPPER**
  specifies which limit lines to display.

- **LIMITSTAT= CLM | STDDEV | STDERR**
specifies the statistic for the limit lines.

**MISSING**
processes missing values as a valid category value and creates a bar for it.

**NOSTATLABEL**
removes the statistic name from the axis and legend labels.

**NUMSTD= n**
specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

**OUTLINE | NOOUTLINE**
specifies whether the bars have outlines.

**RESPONSE= response-variable**
specifies a numeric response variable for the plot.

**STAT= FREQ | MEAN | SUM**
specifies the statistic for the horizontal axis.

### Group options

**CLUSTERWIDTH= numeric-value**
specifies the cluster width as a ratio of the maximum width.

**GROUP= variable**
specifies a variable that is used to group the data.

**GROUPDISPLAY= STACK | CLUSTER**
specifies how to display grouped bars.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of bars within a group.

### Label options

**DATALABEL <= variable>**
displays a label for each data point.

**DATALABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

### Plot options

**ALPHA= numeric-value**
specifies the confidence level for the confidence limits.

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set.

**CATEGORYORDER= RESPASC | RESPDESC**
specifies the order in which the response values are arranged.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes.

**LEGENDLABEL= “text-string”**
specifies the label that identifies the bar chart in the legend.

**NAME= “text-string”**
specifies a name for the plot.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the bars and limits, if displayed.

**URL= character-variable**
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
**WEIGHT=** *numeric-variable*

specifies how observations are weighted.

**Required Argument**

*category-variable*

specifies the variable that classifies the observations into distinct subsets.

**Optional Arguments**

**ALPHA=** *numeric-value*

specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

**Interactions:**

This option has no effect if you do not specify LIMITSTAT=CLM.

If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

**ATTRID=** *variable*

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BARWIDTH=** *numeric-value*

specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

Default: .8

1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER

**Interaction:** When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

**CATEGORYORDER=** **RESPASC | RESPDESC**

specifies the order in which the response values are arranged. Specify one of the following values:

**RESPASC**

sorts the response values in ascending order.

**RESPDESC**

sorts the response values in descending order.

Default: By default, the plot is sorted in ascending order based on the category values.

**Restrictions:**

This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.
Uniform scaling and response sorting cannot occur on the same axis. If the UNIFORM= option is used in the SGPLOT statement, the UNIFORM option is ignored for the sorted response axis and a note is generated in the log. The UNIFORM= option is applied to the other axes and groups if requested. Note that the UNIFORM= option can selectively apply scaling to only the X or Y axis.

Interaction: If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

Note: If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

**CLUSTERWIDTH= numeric-value**

specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified and when GROUPDISPLAY=CLUSTER.

**DATALABEL <= variable>**

displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

**DATALABELATTRS=GraphLabelText**

*options* can be one or more of the following:

**COLOR= color**

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPHP software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPHP: Reference.*

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY= “font-family”**

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts.*

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**

specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**

specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

`DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)`

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN**

specifies a special effect to be used on all filled bars. Specify one of the following (the samples were generated using the HTMLBlue style):

<table>
<thead>
<tr>
<th>Option</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td><img src="none.png" alt="NONE" /></td>
</tr>
<tr>
<td>CRISP</td>
<td><img src="crisp.png" alt="CRISP" /></td>
</tr>
<tr>
<td>GLOSS</td>
<td><img src="gloss.png" alt="GLOSS" /></td>
</tr>
<tr>
<td>MATTE</td>
<td><img src="matte.png" alt="MATTE" /></td>
</tr>
<tr>
<td>PRESSED</td>
<td><img src="pressed.png" alt="PRESSED" /></td>
</tr>
<tr>
<td>SHEEN</td>
<td><img src="sheel.png" alt="SHEEN" /></td>
</tr>
</tbody>
</table>

**Default:** NONE

**Interaction:** This option has no effect if the applied style uses a fill pattern and FILL is disabled for the style. If the style has both FILL and FILLPATTERN enabled, data skins will work. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about
viewing the contents of style templates, see “About Styles and Style Elements” on page 620.

This option has no effect if you also specify NOFILL.

**DISCRETEOFFSET** = numeric-value

specifies an amount to offset all bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**FILL | NOFILL**

specifies whether the bars are filled. The FILL option shows the fill color for the bars. The NOFILL option hides the fill color for the bars.

**Default:** FILL

**Interactions:**

Specifying FILL also hides the outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.

**FILLATTRS** = style-element | (COLOR= color)

specifies the appearance of the fill for the bars. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData style elements in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

**FREQ** = numeric-variable

specifies how many times observations are repeated for computational purposes. specifies that each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

**GROUP** = variable

specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY** = STACK | CLUSTER

specifies how to display grouped bars.

**STACK**

groups are overlaid without any clustering. Each group is represented by unique visual attributes derived from the GraphData style elements in the current style.

**CLUSTER**

displays group values as separate adjacent bars that replace the single category bar. Each set of group values is centered at the midpoint tick mark for the category.

**Default:** STACK

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER** = ASCENDING | DESCENDING | DATA

specifies the ordering of bars within a group.
ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LEGENDLABEL= “text-string”
specifies the label that identifies the bar chart in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, the name of the response variable and the computed statistic (SUM or MEAN) is used. If the RESPONSE= option is not used, the legend label is “Frequency”.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

Interaction: This option has no effect unless you also specify either the LIMITS= or LIMITSTAT= option.

LIMITS= BOTH | LOWER | UPPER
specifies which limit lines to display. Limits are displayed as heavier line segments with a serif at the end extending from each bar. Upper limits extend to the right of the bar and lower limits extend to the left of the bar. Specify one of the following values:

BOTH
adds lower and upper limit lines to the plot.

LOWER
adds lower limit lines to the plot.
UPPER  
adds upper limit lines to the plot.

**Default:** By default, no limits are displayed unless you specify either the LIMITS=  
or LIMITSTAT= option. If you specify the LIMITSTAT= option only, then  
LIMITS=BOTH is the default.

**Interactions:**  
Limit lines are displayed only when you specify STAT= MEAN.
The LIMITS= option has no effect if you also specify the GROUP= option in the 
plot statement.

**LIMITSTAT= CLM | STDDEV | STDERR**  
specifies the statistic for the limit lines. Specify one of the following statistics:

CLM  
confidence limits

STDDEV  
standard deviation

STDERR  
standard error

**Default:** CLM

**Interactions:**  
If you specify the LIMITSTAT= option only, then the default value for the  
LIMITS= option is BOTH.

Limits lines are displayed only when you specify STAT=MEAN.
The LIMITSTAT= option has no effect if you also specify the GROUP= option in the 
plot statement.

**MISSING**  
processes missing values as a valid category value and creates a bar for it.

**NAME= "text-string"**  
specifies a name for the plot. You can use the name to refer to this plot in other 
statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other 
statements, you must use the same exact capitalization.

**NOSTATLABEL**  
removes the statistic name from the axis and legend labels.

**NUMSTD= n**  
specifies the number of standard units for the limit lines, when you specify  
LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive 
number, including decimals.

**Default:** 1

**OUTLINE | NOOUTLINE**  
specifies whether the bars have outlines. The OUTLINE option shows the outlines. 
The NOOUTLINE option hides the outlines.

**Default:** OUTLINE

**Interactions:**  
Specifying OUTLINE also hides the fill color.

If NOOUTLINE and NOFILL are both specified, then both options are ignored.
**RESPONSE= response-variable**
specifies a numeric response variable for the plot. The summarized values of the response variable are displayed for each value on the horizontal axis.

**STAT= FREQ | MEAN | SUM**
specifies the statistic for the horizontal axis. Specify one of the following statistics:

- **FREQ**
  the frequencies for the category variable. This is the default value when you do not specify the RESPONSE= option.

- **MEAN**
  the mean of the response variable.

- **SUM**
  the sum of the response variable. This is the default value when you specify the RESPONSE= option.

If you do not specify the RESPONSE= option, then only the FREQ statistic can be used. If you specify RESPONSE=, then you can use either the SUM or MEAN statistics.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the bars and limits, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**URL= character-variable**
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Default:** By default, no HTML links are created.

**Interactions:**
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**WEIGHT= numeric-variable**
specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

---

**HBARPARM Statement**

Creates a horizontal bar chart based on a pre-summarized response value for each unique value of the category variable. You can also assign variables to the upper and lower limits.

**Requirement:** The data must contain only one response value per unique category variable. If more than one value is found, a warning is written to the SAS log, and the graph might produce unpredictable results.

**Interactions:** The HBARPARM statement can be combined only with other basic plot statements in the SGPLOT procedure. See “Plot Type Compatibility” on page 277.
When used with particular styles, the HBARPARM statement produces fill patterns for grouped bars. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636.

**Note:** An important distinction between HBARPARM and HBAR is that the response variable is required for HBARPARM. In addition, the response variable should contain pre-summarized computed values such as a sum or a mean.

**Example:** “About Bar Charts” on page 42

### Syntax

HBARPARM CATEGORY= category-variable RESPONSE= numeric-variable <option(s)>;

### Summary of Optional Arguments

#### Bar options

- **BARWIDTH= numeric-value**
  - Specifies the width of the bars as a ratio of the maximum possible width.
- **DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN**
  - Specifies a special effect to be used on all filled bars.
- **DISCRETEOFFSET= numeric-value**
  - Specifies an amount to offset all bars from the category midpoints.
- **FILL | NOFILL**
  - Specifies whether the bars are filled.
- **FILLATTRS= style-element | (COLOR= color)**
  - Specifies the appearance of the fill for the bars.
- **LIMITATTRS= style-element <(options)> | (options)**
  - Specifies the appearance of the limit lines in the plot.
- **LIMITLOWER= numeric-variable**
  - Specifies values for the lower endpoints on the limit lines.
- **LIMITUPPER= numeric-variable**
  - Specifies values for the upper endpoints on the limit lines.
- **MISSING**
  - Processes missing values as a valid category value and creates a bar for it.
- **OUTLINE | NOOUTLINE**
  - Specifies whether the bars have outlines.

#### Group options

- **CLUSTERWIDTH= numeric-value**
  - Specifies the cluster width as a ratio of the maximum width.
- **GROUP= variable**
  - Specifies a variable that is used to group the data.
- **GROUPORDER= ASCENDING | DESCENDING | DATA**
  - Specifies the ordering of bars within a group.

#### Label options

- **DATALABEL <= variable>**
  - Displays a label for each data point.
- **DATALABELATTRS= style-element <(options)> | (options)**
  - Specifies the appearance of the labels in the plot when you use the DATALABEL= option.
Plot options

ATTRID= variable
    specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
    specifies the label that identifies the bar chart in the legend.

NAME= “text-string”
    specifies a name for the plot.

TRANSPARENCY= numeric-value
    specifies the degree of transparency for the bars and limits, if displayed.

URL= character-variable
    specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Required Arguments

CATEGORY= category-variable
    specifies the variable that categorizes the data. All values are treated as discrete values. The input data for this variable should contain unique values. When the category values are not unique, a warning is logged, and multiple bars are superimposed at the duplicated category values.

    The CATEGORY axis is always discrete.

RESPONSE= numeric-variable
    specifies a numeric response variable. The input data is expected to be pre-summarized computed values (sum, mean, and so on).

Optional Arguments

ATTRID= variable
    specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BARWIDTH= numeric-value
    specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

    For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

    Default: .8

    1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER

Interaction: When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

CLUSTERWIDTH= numeric-value
    specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

    CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.
Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified and when GROUPDISPLAY=CLUSTER.

**DATALABEL <= variable>**
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
```
DATALABELATTRS=GraphLabelText
```

*options* can be one or more of the following:

**COLOR= color**
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

*Default:* For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**FAMILY= "font-family"**
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

*Default:* The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

*Default:* The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

*Default:* The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

*Default:* The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:
```
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

*Default:* The default style element is GraphDataText.
**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DATASKIN=** NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN

specifies a special effect to be used on all filled bars. Specify one of the following (the samples were generated using the HTMLBlue style):

<table>
<thead>
<tr>
<th>Option</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>CRISP</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>GLOSS</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>MATTE</td>
<td><img src="image4.png" alt="Image" /></td>
</tr>
<tr>
<td>PRESSED</td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
<tr>
<td>SHEEN</td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
</tbody>
</table>

**Default:** NONE

**Interactions:**

This option has no effect if the applied style uses a fill pattern and FILL is disabled for the style. If the style has both FILL and FILLPATTERN enabled, data skins will work. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about viewing the contents of style templates, see “About Styles and Style Elements” on page 620.

This option has no effect if you also specify NOFILL.

**DISCRETEOFFSET=** numeric-value

specifies an amount to offset all bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**FILL | NOFILL**

specifies whether the bars are filled. The FILL option shows the fill color for the bars. The NOFILL option hides the fill color for the bars.

**Default:** FILL

**Interactions:**

Specifying FILL also hides the outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.
FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the bars. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphData n style elements in the current style.

Interaction: This option has no effect if you specify the NOFILL option.

GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of bars within a group.

ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LEGENDLABEL= “text-string”
specifies the label that identifies the bar chart in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, the name of the response variable is used.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
Default: The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**LIMITLOWER= numeric-variable**
specifies values for the lower endpoints on the limit lines. Limit lines are displayed as line segments with a serif at the end.

**Default:** The lower segments of the limit lines are not displayed. (Limit lines are displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

**Interactions:**
- If LIMITUPPER= is also specified, then the plot displays the lower and upper segments of the limit lines.
- This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
- The appearance of the limit lines can be controlled by the LIMITATTRS= option.

**LIMITUPPER= numeric-variable**
specifies values for the upper endpoints on the limit lines. Limit lines are displayed as line segments with a serif at the end.

**Default:** The upper segments of the limit lines are not displayed. (Limit lines are displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

**Interactions:**
- If LIMITUPPER= is also specified, then the plot displays the lower and upper segments of the limit lines.
- This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
- The appearance of the limit lines can be controlled by the LIMITATTRS= option.

**MISSING**
processes missing values as a valid category value and creates a bar for it.

**NAME= "text-string"**
specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**OUTLINE | NOOUTLINE**
specifies whether the bars have outlines. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

**Default:** OUTLINE

**Interactions:**
- Specifying OUTLINE also hides the fill color.
- If NOOUTLINE and NOFILL are both specified, then both options are ignored.

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the bars and limits, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**URL= character-variable**
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Default:** By default, no HTML links are created.

**Interactions:**
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

HBOX Statement

Creates a horizontal box plot that shows the distribution of your data.

Interaction: The HBOX statement cannot be used with other plot statements in the SGPLOT procedure. Box plots can be overlaid with other box plots. However, overlaid box plots must have the same category variables.

Examples: "About Box Plots” on page 37
“Example 9: Creating a Horizontal Box Plot” on page 508

Syntax

HBOX analysis-variable [/ option(s)];

Summary of Optional Arguments

Box options

BOXWIDTH= numeric-value
specifies the width of the box.

CAPSHAPE= BRACKET | LINE | SERIF
specifies the shape of the whisker cap lines.

CONNECT= MEAN | MEDIAN | Q1 | Q3 | MIN | MAX
specifies that a connect line joins a statistic from box to box.

CONNECTATTRS= style-element (options) | (options)
specifies the appearance of the lines that connect multiple boxes.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all boxes from the discrete tick marks.

EXTREME
specifies that the whiskers can extend to the maximum and minimum values for the analysis variable, and that outliers are not identified.

FILL | NOFILL
specifies whether the boxes are filled with color.

FILLATTRS= style-element (COLOR= color)
specifies the appearance of the fill for the boxes.

LINEATTRS= style-element (options) | (options)
specifies the appearance of the box outlines.

MEANATTRS= style-element (options) | (options)
specifies the appearance of the marker that represents the mean in the box.

MEDIANATTRS= style-element (options) | (options)
specifies the appearance of the line that represents the median.

NOCAPS
hides the cap lines for the whiskers.
NOMEAN
  hides the mean marker.

NOMEDIAN
  hides the median line.

NOOUTLIERS
  hides the outliers from the plot.

NOTCHES
  specifies that the boxes be notched.

OUTLIERATTRS= style-element <(options)> | (options)
  specifies the appearance of the marker that represents the outliers.

WHISKERATTRS= style-element <(options)> | (options)
  specifies the appearance of the whisker and cap lines.

Group options

  CLUSTERWIDTH= numeric-value
    specifies the cluster width as a ratio of the midpoint spacing.

  GROUP= variable
    specifies a variable that is used to group the data.

  GROUPDISPLAY= CLUSTER | OVERLAY
    specifies how to display grouped boxes.

  GROUPORDER= ASCENDING | DESCENDING | DATA
    specifies the ordering of boxes within a group.

Label options

  DATALABEL <= variable>
    adds data labels for the outlier markers.

  DATALABELATTRS= style-element <(options)> | (options)
    specifies the appearance of the labels in the plot when you use the DATALABEL= option.

  LABELFAR
    specifies that only the far outliers have data labels.

Plot options

  ATTRID= variable
    specifies the value of the ID variable in an attribute map data set.

  CATEGORY= category-variable
    specifies the category variable for the plot.

  FREQ= numeric-variable
    specifies how many times observations are repeated for computational purposes.

  LEGENDLABEL= “text-string”
    specifies a label that identifies the box plot in the legend.

  MISSING
    processes missing values as a valid category value and creates a box for it.

  NAME= “text-string”
    specifies a name for the plot.

  PERCENTILE= 1 | 2 | 3 | 4 | 5
    specifies a method for computing the percentiles for the plot.

  SPREAD
    relocates outlier points that have identical values to prevent overlapping.

  TRANSPARENCY= value
specifies the degree of transparency for the plot.

**X2AXIS**
assigns the analysis variable to the secondary (top) horizontal axis.

**Y2AXIS**
assigns the analysis variable to the secondary (right) vertical axis.

**Required Argument**

*analysis-variable*
specifies the analysis variable for the plot. If you do not specify the CATEGORY= option, then one box is created for the analysis variable.

**Optional Arguments**

**ATTRID=** *variable*
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BOXWIDTH=** *numeric-value*
specifies the width of the box. Specify a value between 0.0 (0% of the available width) and 1.0 (100% of the available width).

Default: 0.4

When GROUP is specified, the default box width is 0.6.

**CAPSHAPE=** *BRACKET | LINE | SERIF*
specifies the shape of the whisker cap lines. Specify one of the following values:

- **BRACKET**
  displays a straight line with brackets.

- **LINE**
  displays a straight line.

- **SERIF**
  displays a short straight line.

**CATEGORY=** *category-variable*
specifies the category variable for the plot. A box plot is created for each distinct value of the category variable.

If you explicitly set the category axis type to LINEAR and use a numeric category variable, the box plot becomes an interval plot. Otherwise, the box plot is discrete.

**CLUSTERWIDTH=** *numeric-value*
specifies the cluster width as a ratio of the midpoint spacing. Specify a value from 0.1 (narrowest) to 1.0 (widest).

Default: 0.7

**Interaction:** This option is applicable only when a GROUP is in effect and the category axis is discrete.

**CONNECT=** *MEAN | MEDIAN | Q1 | Q3 | MIN | MAX*
specifies that a connect line joins a statistic from box to box.

**Interaction:** This option applies only when the CATEGORY option is used to generate multiple boxes.

**Tip:** You can use the CONNECTATRTRS option to specify attributes for the connect line.
CONNECTATTRS= style-element <(options)> | (options)
specifies the appearance of the lines that connect multiple boxes. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: CONNECTATTRS=GraphData3

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphConnectLine style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphConnectLine style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphConnectLine style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

Here is an example expression:

CONNECTATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)

Default: The default style element is GraphConnectLine.

Interactions:
This option takes effect only if the CONNECT= option is also specified.
This option is ignored if the GROUP= option is also specified.

DATALABEL <= variable>
adds data labels for the outlier markers. If you specified a variable, then the values for that variable are used for the data labels. If you did not specify a variable, then the values of the analysis variable are used.

Note: This option has no effect unless the plot contains outlier points.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

DATALABELATTRS=GraphLabelText
options can be one or more of the following:

COLOR= color

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.

FAMILY= “font-family”

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL

specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL

specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

DISCRETEOFFSET= numeric-value

specifies an amount to offset all boxes from the discrete tick marks.

Specify a value from -0.5 (left offset) to +0.5 (right offset). If you specify a value outside of this range, an error message appears in the SAS log and the graph is not produced.

Default: 0.0 (no offset)

EXTREME

specifies that the whiskers can extend to the maximum and minimum values for the analysis variable, and that outliers are not identified. When you do not specify the EXTREME option, the whiskers cannot be longer than 1.5 times the length of the box.
FILL | NOFILL  
specifies whether the boxes are filled with color. The FILL option shows the fill color. The NOFILL option hides the fill color.

Default:  FILL

FILLATRFS= style-element | (COLOR= color)  
specifies the appearance of the fill for the boxes. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default:  For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData$n style elements in the current style.

Interaction:  This option has no effect if you also specify the NOFILL option.

FREQ= numeric-variable  
specifies how many times observations are repeated for computational purposes.

specifies that each observation is repeated $n$ times for computational purposes, where $n$ is the value of the numeric variable. If $n$ is not an integer, then it is truncated to an integer. If $n$ is less than 1 or missing, then it is excluded from the analysis.

Interaction:  If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

GROUP= variable  
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

GROUPDISPLAY= CLUSTER | OVERLAY  
specifies how to display grouped boxes.

CLUSTER  
the boxes are drawn adjacent to each other.

OVERLAY  
all the boxes for a given group value are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1 ... GraphData$n style elements in the current style.

Default:  CLUSTER for a discrete category axis

OVERLAY for a linear axis

Restriction:  GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete.

Interaction:  This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA  
specifies the ordering of boxes within a group.

ASCENDING  
displays each group in ascending group value.

DESCENDING  
displays each group in descending group value.

DATA  
displays each group in data order of the group variable.

Interaction:  This option is ignored unless GROUP= is specified.
LABELFAR
specifies that only the far outliers have data labels. Far outliers are points whose
distance from the box is more than three times the length of the box.

Note: This option has no effect if you do not specify the DATALABEL option, or if
there are no far outliers.

LEGENDLABEL= “text-string”
specifies a label that identifies the box plot in the legend. By default, the label of the
analysis variable is used.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the box outlines. You can specify the appearance by
using a style element or by using suboptions. If you specify a style element, you can
also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: LINEATTRS=GraphData3

For more information about style elements, see “Style Elements for Use with ODS
Graphics” on page 640.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData_n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphDataDefault style element in the current style. For
grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData_n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphDataDefault style element in the current style. For
grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData_n style elements in the current style.

Here is an example expression:

LINEATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)

Default: GraphDataDefault is the default style element.

Interactions:
This option takes effect only if the CONNECT= option is also specified.
This option is ignored if the GROUP= option is also specified.
**MEANATTRS=**  
`style-element <(options)> | (options)`  
specifies the appearance of the marker that represents the mean in the box. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR=**  
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.  
**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxMean style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**SIZE=**  
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.  
**Default:** The default marker size is specified by the MarkerSize attribute of the GraphBoxMean style element in the current style.

**SYMBOL=**  
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.  
**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphBoxMean style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphDataN style elements in the current style.

**WEIGHT=**  
specifies the marker weight of the marker.  
**Default:** NORMAL

**Default:** GraphBoxMean is the default style element.

**MEDIANATTRS=**  
`style-element <(options)> | (options)`  
specifies the appearance of the line that represents the median. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR=**  
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.  
**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxMedian style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**PATTERN=**  
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphBoxMedian style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphDataN style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphBoxMedian style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphDataN style elements in the current style.

Default: GraphBoxMedian is the default style element.

Interaction: This option is ignored if the NOMEDIAN option is also specified.

MISSING
processes missing values as a valid category value and creates a box for it.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOCAPS
hides the cap lines for the whiskers.

NOMEAN
hides the mean marker.

NOMEDIAN
hides the median line.

NOOUTLIERS
hides the outliers from the plot.

NOTCHES
specifies that the boxes be notched. The endpoints of the notches are at the following computed locations:

\[ \text{median} \pm 1.58 \left( \frac{IQR}{\sqrt{N}} \right) \]

For a visual description of the parts of a box plot, see “Details” on page 334.

OUTLIERATTRS= style-element <(options)> | (options)
specifies the appearance of the marker that represents the outliers. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphOutlier style element in the current style. For grouped
data, the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData{n} style elements in the current style.

**SIZE=** *n* <units>
specifies the size of the markers. You can also specify the unit of measurement.
The default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the
GraphOutlier style element in the current style.

**SYMBOL=** symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see
“Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the
MarkerSymbol attribute of the GraphOutlier style element in the current
style. For grouped data, the default marker symbol is specified by the
MarkerSymbol attribute of the GraphData1 ... GraphData{n} style elements in
the current style.

**WEIGHT=** NORMAL | BOLD
specifies the marker weight of the marker.

**Default:** NORMAL

**Default:** GraphOutlier is the default style element.

**PERCENTILE=** 1 | 2 | 3 | 4 | 5
specifies a method for computing the percentiles for the plot. For descriptions of
each method, see “Calculating Percentiles” in the UNIVARIATE Procedure chapter

**Default:** 5

**SPREAD**
relocates outlier points that have identical values to prevent overlapping.

**Note:** This option has no effect if your data does not contain two or more outliers
with identical values for the analysis variable.

**TRANSPARENCY=** value
specifies the degree of transparency for the plot. Specify a value from 0.0
(completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**WHISKERATTRS=** style-element <(options)> | (options)
specifies the appearance of the whisker and cap lines. You can specify the
appearance by using a style element or by using suboptions. If you specify a style
element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR=** color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

**Default:** For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphBoxWhisker style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of
the GraphData1 ... GraphData{n} style elements in the current style.

**PATTERN=** line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.
Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

THICKNESS= $n <$units$>$
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

Default: GraphBoxWhisker is the default style element.

Interaction: This option is ignored if the NOMEDIAN option is also specified.

X2AXIS
assigns the analysis variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the analysis variable to the secondary (right) vertical axis.

Details
Horizontal and vertical box plots display the distribution of data by using a rectangular box and whiskers. Whiskers are lines that indicate a data range outside of the box.

Note: Though the following figure shows a vertical box plot, the basic concepts apply to horizontal box plots.
Figure 7.2 Parts of a Box Plot

Figure 7.2 on page 335 shows a diagram of a vertical box plot. The bottom and top edges of the box indicate the intra-quartile range (IQR). That is, the range of values between the first and third quartiles (the 25th and 75th percentiles). The marker inside the box indicates the mean value. The line inside the box indicates the median value.

The elements that are outside the box are dependent on your options. By default, the whiskers that extend from each box indicate the range of values that are outside of the intra-quartile range. However, they are close enough not to be considered outliers (a distance less than or equal to 1.5*IQR). If you specify the EXTREME option, then the whiskers indicate the entire range of values, including outliers.

Any points that are a distance of more than 1.5*IQR from the box are considered to be outliers. By default, these points are indicated by markers. If you specify DATALABEL= option, then the outlier points have data labels. If you also specify the LABELFAR option, then only outliers that are 3*IQR from the box have data labels.

HIGHLOW Statement

Creates a display of floating vertical or horizontal lines or bars that represent high and low values. The statement also gives you the option to display open and close values as tick marks and to specify a variety of plot attributes.

Note: This plot does not summarize data. If multiple observations have the same X or Y value, the observations are all plotted separately based on their values.

Examples: “About High-Low Charts” on page 22
“Example 11: Creating a High-Low Chart” on page 510

Syntax

```
HIGHLOW X= variable | Y= variable
HIGH= numeric-variable LOW= numeric-variable
<option(s)>
```

**Summary of Optional Arguments**

**Group options**

- `CLUSTERWIDTH= numeric-value`
  - Specifies the cluster width as a ratio of the maximum width.
- `GROUP= variable`
  - Specifies a variable that is used to group the data.
- `GROUPDISPLAY= OVERLAY | CLUSTER`
  - Specifies how to display grouped data.
- `GROUPORDER= ASCENDING | DESCENDING | DATA`
  - Specifies the ordering of lines or bars within a group.
- `NOMISSINGGROUP`
  - Specifies that missing values of the group variable are not included in the plot.

**HIGHLOW options**

- `BARWIDTH= numeric-value`
  - Specifies the width of the bars as a ratio of the maximum possible width.
- `CLOSE= numeric-variable`
  - Specifies the data for the CLOSE tick on the bar or line.
- `DISCRETEOFFSET= numeric-value`
  - Specifies an amount to offset all lines or bars from the category midpoints.
- `FILL | NOFILL`
  - Specifies whether the area fill is visible for bars.
- `FILLATTRS= style-element | (COLOR= color)`
  - Specifies the appearance of the area fill for the bar.
- `HIGHCAP= character-variable | option | NONE`
  - Specifies the type of arrowhead used at the high end of the bar or line.
- `HIGHLABEL= variable`
  - Specifies the label to be shown at the high end of the line or bar.
- `INTERVALBARWIDTH= numeric-value`
  - Specifies the thickness of the bar when the X (or Y) data is numeric.
- `LABELATTRS= style-element <(options)> | (options)`
  - Specifies the appearance of the labels in the plot when you use the `HIGHLABEL=`, `LOWLABEL=`, or both options.
- `LINEATTRS= style-element <(options)> | (options)`
  - Specifies the appearance of the outlines for the band.
- `LOWCAP= character-variable | option | NONE`
  - Specifies the type of arrowhead used at the low end of the bar or line.
- `LOWLABEL= variable`
  - Specifies the label to be shown at the low end of the line or bar.
- `OPEN= numeric-variable`
specifies the data for the OPEN tick on the bar or line.

OUTLINE | NOOUTLINE
specifies whether the outlines of the bars are visible.

TYPE= BAR | LINE
specifies how the data is to be represented.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
specifies a label that identifies the elements from the band plot in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= value
specifies the degree of transparency for the plot.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Required Arguments

X= variable | Y=variable
specifies a variable that is used to plot the values along the N or Y axis.

Note: If you specify X=variable, then the statement creates vertical lines or bars on the X axis, with the HIGH and LOW values plotted along the Y axis. Conversely, if you specify Y=variable, then the statement creates horizontal lines or bars on the Y axis, with the HIGH and LOW values plotted along the X axis.

HIGH= numeric-variable
specifies the upper value for the floating lines or bars.

LOW= numeric-variable
specifies the lower value for the floating lines or bars.

Optional Arguments

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no distance between the bars. If you specify a width of 0.5, then the width of the bars is equal to the space between the bars.

Default: 0.85

Requirement: This option is applicable only when the X or Y axis is discrete.

Interaction: This option has no effect unless TYPE= BAR.
CLOSE= numeric-variable
specifies the data for the CLOSE tick on the bar or line. For a vertical plot, the tick value is represented by an indicator on the side of the bar or line that has higher X values. For a horizontal plot, the value is represented by an indicator on the side with higher Y values.

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

Requirement: This option is applicable only when the X or Y axis is discrete.

Interactions:
This option is applicable only when TYPE= BAR.
This option is applicable only when the GROUP option is specified and GROUPDISPLAY= CLUSTER.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all lines or bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset from the category midpoints)

Requirement: This option is applicable only when the X or Y axis is discrete.

FILL | NOFILL
specifies whether the area fill is visible for bars. The FILL option shows the area fill. The NOFILL option hides the area fill.

Default: The default status of the area fill is specified by the DisplayOpts attribute of the GraphBand style element in the current style.

Interactions:
This option has no effect unless TYPE= BAR.
Specifying FILL also hides any visible outlines.
If NOFILL and NOOUTLINE are both specified, then both options are ignored.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the area fill for the bar. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataConfidence style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphData n style elements in the current style.

Interactions:
This option is applicable only when TYPE= BAR.
This option has no effect if you also specify the NOFILL option.

GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

GROUPDISPLAY= OVERLAY | CLUSTER
specifies how to display grouped data.

OVERLAY
groups are overlaid without any clustering. Each group is represented by unique visual attributes derived from the GraphData1... GraphData n style elements in the current style.
CLUSTER
observations with different group values are displayed in adjacent clusters around
the category value. Each set of group values is centered at the midpoint tick mark
for the category.

Default: OVERLAY
Restriction: GROUPDISPLAY=CLUSTER has no effect unless the X or Y axis is
discrete.

Interactions:
GROUPDISPLAY=CLUSTER is applicable only when TYPE=BAR.
This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of lines or bars within a group.

ASCENDING
displays each group of lines or bars in ascending group value.

DESCENDING
displays each group of lines or bars in descending group value.

DATA
displays each group of lines or bars in data order of the group column.

Interactions:
This option is ignored unless GROUP= is specified.
This option is applicable only when GROUPDISPLAY=CLUSTER and
TYPE=BAR.

HIGHCAP= character-variable | option | NONE
specifies the type of arrowhead used at the high end of the bar or line. You can
specify one of the following options, or you can specify a character variable that
contains one of the following options:

SERIF
a small serif.  

The serif is supported for TYPE=LINE only.

BARBEDARROW
a solid triangle with an indent at the base. 

The barbed arrow is supported for TYPE=LINE only.

FILLEDARROW
a solid triangle. 

The filled arrow is supported for TYPE=BAR and TYPE=LINE.

OPENARROW
resembles the letter "V". 

The open arrow is supported for TYPE=LINE only.

CLOSEDARROW
an outline of a triangle. 

The closed arrow is supported for TYPE=BAR only.

Default: NONE
Restriction: Arrow heads are not displayed for very short bars. Bar height must be at least twice the size of the arrow heads in order for the arrow heads to appear.

HIGHLABEL= variable
specifies the label to be shown at the high end of the line or bar.

INTERVALBARWIDTH= numeric-value
specifies the thickness of the bar when the X (or Y) data is numeric.
Default: The default thickness of the bar is derived from the minimum interval between the data values along X or Y.
Requirement: This option is applicable only when the X or Y axis is a linear or a TIME axis.
Interaction: This option has no effect unless TYPE=BAR.

LABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the HIGHLABEL= option, the LOWLABEL= option, or both options. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDatann style elements in the current style.

FAMILY= "font-family"
specifies the font family for the marker characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.
Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the characters are italic (ITALIC) or normal (NORMAL).
Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the characters are bold (BOLD) or normal (NORMAL).
Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

LEGENDLABEL= "text-string"
specifies a label that identifies the elements from the band plot in the legend. By default, the label “band” is used for ungrouped data, and the group values are used for grouped data.
The LEGENDLABEL= option has no effect if you also specify the GROUP= option.

### LINEATTRS= style-element (options) | (options)

specifies the appearance of the outlines for the band. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

- **COLOR= color**
  specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference.*

  **Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDatan style elements in the current style.

- **PATTERN= line-pattern**
  specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

  **Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphDatan style elements in the current style.

- **THICKNESS= n <units>**
  specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

  **Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphDatan style elements in the current style.

**Interaction:** This option has no effect unless you also specify the OUTLINES option.

### LOWCAP= character-variable | option | NONE

specifies the type of arrowhead used at the low end of the bar or line. You can specify one of the following options, or you can specify a character variable that contains one of the following options:

- **SERIF**
  a small serif. ↓
  The serif is supported for TYPE=LINE only.

- **BARBEDARROW**
  a solid triangle with an indent at the base. →
  The barbed arrow is supported for TYPE=LINE only.

- **FILLEDARROW**
  a solid triangle. ⬇
  The filled arrow is supported for TYPE=BAR and TYPE=LINE.
OPENARROW

resembles the letter "V".

The open arrow is supported for TYPE=LINE only.

CLOSEDARROW

an outline of a triangle.

The closed arrow is supported for TYPE=BAR only.

Default: NONE

Restriction: Arrow heads are not displayed for very short bars. Bar height must be at least twice the size of the arrow heads in order for the arrow heads to appear.

LOWLABEL= variable

specifies the label to be shown at the low end of the line or bar.

NOMISSINGGROUP

specifies that missing values of the group variable are not included in the plot.

Interaction: This option has no effect unless GROUP= is also specified.

NAME= "text-string"

specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

OPEN= numeric-variable

specifies the data for the OPEN tick on the bar or line.

For a vertical plot, the tick value is represented by an indicator on the side of the bar or line that has lower X values. For a horizontal plot, the value is represented by an indicator on the side with lower Y values.

OUTLINE | NOOUTLINE

specifies whether the outlines of the bars are visible. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: OUTLINE

Interactions:

This option has no effect unless TYPE= BAR.

Specifying OUTLINE also hides the fill color.

If NOOUTLINE and NOFILL are both specified, then both options are ignored.

TRANSPARENCY= value

specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

TYPE= BAR | LINE

specifies how the data is to be represented. BAR uses fill and outline attributes. LINE uses line attributes.

Default: LINE

URL= character-variable

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**HISTOGRAM Statement**

Creates a histogram that displays the frequency distribution of a numeric variable.

**Interaction:** The HISTOGRAM statement can be combined only with DENSITY statements in the SGPLOT procedure.

**Note:** The range of the response variable is automatically divided into an appropriate number of bins.

**Examples:** “About Histograms” on page 40
“Example 8: Combining Histograms with Density Plots” on page 507

**Syntax**

HISTOGRAM response-variable < / option(s)>;

**Summary of Optional Arguments**

**Histogram options**

- **BINSTART= numeric-value**
  specifies the X coordinate of the first bin.

- **BINWIDTH= numeric-value**
  specifies the bin width.

- **BOUNDARY= LOWER | UPPER**
  specifies how boundary values are assigned to bins.

- **FILL | NOFILL**
  specifies whether the area fill is visible.

- **FILLATTRS= style-element | (COLOR= color)**
  specifies the appearance of the area fill.

- **NBINS= numeric-value**
  specifies the number of bins.

- **OUTLINE | NOOUTLINE**
  specifies whether outlines are displayed for the bars.

- **SCALE= COUNT | PERCENT | PROPORTION**
  specifies the scaling that is applied to the vertical axis.

- **SHOWBINS**
  specifies that the midpoints of the value bins are used to create the tick marks for the horizontal axis.

**Plot options**

- **FREQ= numeric-variable**
  specifies how many times observations are repeated for computational purposes.
LEGENDLABEL= "text-string"
  specifies a label that identifies the histogram in the legend.

NAME= "text-string"
  specifies a name for the plot.

TRANSPARENCY= numeric-value
  specifies the degree of transparency for the histogram.

X2AXIS
  assigns the response variable to the secondary (top) horizontal axis.

Y2AXIS
  assigns the calculated values to the secondary (right) vertical axis.

Required Argument

response-variable
  specifies the response variable for the histogram.

Optional Arguments

BINSTART= numeric-value
  specifies the X coordinate of the first bin. Use this option in conjunction with the
  BINWIDTH= or NBINS= options to specify bins. If neither BINWIDTH= nor the
  NBINS= option is specified, the system determines the number of bins. If the
  BINSTART value results in excluding the entire range of data, it is ignored and the
  default BINSTART value is used.

  Default: The default value is determined by the system.

BINWIDTH= numeric-value
  specifies the bin width. The system determines the number of bins. The bins always
  span the range of the data.

  Default: The default value is determined by the system.

  Interactions:
  This option is ignored if the NBINS= option is also specified.

BOUNDARY= LOWER | UPPER
  specifies how boundary values are assigned to bins.

  LOWER
    specifies that boundary values are assigned to the lower bin.

  UPPER
    specifies that boundary values are assigned to the upper bin.

  Default: UPPER

FILL | NOFILL
  specifies whether the area fill is visible. The FILL option shows the area fill. The
  NOFILL option hides the area fill.

  Default: The default status of the area fill is specified by the DisplayOpts attribute
  of the GraphHistogram style element in the current style.

  Interactions:
  Specifying FILL also hides any visible outlines.
  If NOFILL and NOOUTLINE are both specified, then both options are ignored.

FILLATTRS= style-element | (COLOR= color)
  specifies the appearance of the area fill. You can specify the color of the fill by using
  a style element or by using the COLOR= suboption. You can specify colors using the
  same color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the Color attribute of the GraphDataDefault style element in the current style.

Interaction: This option has no effect if you specify the NOFILL option.

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes. Each observation is repeated \( n \) times for computational purposes, where \( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

LEGENDLABEL= ”text-string”
specifies a label that identifies the histogram in the legend. By default, the label of the response variable is used.

NAME= ”text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NBINS= numeric-value
specifies the number of bins. The system determines the BINWIDTH= value. The bins always span the range of the data.

The procedure attempts to produce tick values that are easily interpreted (for example, 5, 10, 15, 20). The procedure sometimes adjusts the location of the first bin and the bin width accordingly. As a result, the number of bins shown in the plot might not exactly match the number specified with NBINS=.

Default: The default number of bins is determined by the system.

OUTLINE | NOOUTLINE
specifies whether outlines are displayed for the bars. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: The default status of the outlines is specified by the DisplayOpts attribute of the GraphHistogram style element in the current style.

Interactions:
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

SCALE= COUNT | PERCENT | PROPORTION
specifies the scaling that is applied to the vertical axis. Specify one of the following values:

COUNT
the axis displays the frequency count.

PERCENT
the axis displays values as a percentage of the total.

PROPORTION
the axis displays values as proportions (0.0 to 1.0) of the total.

Default: PERCENT

SHOWBINS
specifies that the midpoints of the value bins are used to create the tick marks for the horizontal axis. By default, the tick marks are created at regular intervals based on the minimum and maximum values.
**TRANSPARENCY= numeric-value**  
specifies the degree of transparency for the histogram. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).  
**Default:** 0.0

**X2AXIS**  
assigns the response variable to the secondary (top) horizontal axis.

**Y2AXIS**  
assigns the calculated values to the secondary (right) vertical axis.

---

## HLINE Statement

Creates a horizontal line chart. You can use the HLINE statement with the HBAR statement to create a horizontal bar-line chart.

**Interaction:** The HLINE statement can be combined only with other categorization plot statements in the SGPLOT procedure. See “Plot Type Compatibility” on page 277.

**Example:** “About Line Charts” on page 47

---

### Syntax

```
HLINE category-variable < / option(s)>;
```

---

### Summary of Optional Arguments

**Group options**

- **CLUSTERWIDTH= numeric-value**  
specifies the width of the group clusters as a fraction of the midpoint spacing.

- **GROUP= variable**  
specifies a variable that is used to group the data.

- **GROUPDISPLAY= CLUSTER | OVERLAY**  
specifies how to display grouped lines.

- **GROUPORDER= ASCENDING | DESCENDING | DATA**  
specifies the ordering of lines within a group.

**Label options**

- **CURVELABEL <=“text-string”>**  
adds a label for the line.

- **CURVELABELATTRS= style-element <(options)> | (options)**  
specifies the appearance of the labels in the plot when you use the CURVELABEL= option.

- **CURVELABELLOC= OUTSIDE | INSIDE**  
specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

- **CURVELABELPOS= AUTO | END | MAX | MIN | START**  
specifies the location of the curve label.

- **DATALABEL <= variable>**  
displays a label for each data point.

- **DATALABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

**Line options**

**BREAK**

creates a break in the line for each missing value of the response variable.

**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all lines from the discrete category values.

**LIMITATTRS= style-element <(options)> | (options)**

specifies the appearance of the limit lines in the plot.

**LIMITS= BOTH | LOWER | UPPER**

adds limit lines to the plot.

**LIMITSTAT= CLM | STDDEV | STDERR**

specifies the statistic for the limit lines.

**LINEATTRS= style-element <(options)> | (options)**

specifies the appearance of the lines in the line plot.

**MARKERATTRS= style-element <(options)> | (options)**

specifies the appearance of the markers in the plot.

**MARKERS**

adds markers to the plot.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**NUMSTD= n**

specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

**RESPONSE= response-variable**

specifies a numeric response variable for the plot.

**STAT= FREQ | MEAN | SUM**

specifies the statistic for the horizontal axis.

**Plot options**

**ALPHA= numeric-value**

specifies the confidence level for the confidence limits.

**ATTRID= variable**

specifies the value of the ID variable in an attribute map data set.

**CATEGORYORDER= RESPASC | RESPDESC**

specifies the order in which the response values are arranged.

**FREQ= numeric-variable**

specifies how many times observations are repeated for computational purposes.

**LEGENDLABEL= “text-string”**

specifies the label that identifies the line plot in the legend.

**MISSING**

processes missing values as a valid category value and creates a line for it.

**NAME= “text-string”**

specifies a name for the plot.

**TRANSPARENCY= numeric-value**

specifies the degree of transparency for the lines and markers.

**URL= character-variable**

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
WEIGHT= numeric-variable  
  specifies how observations are weighted.

X2AXIS  
  assigns the response variable to the secondary (top) horizontal axis.

Y2AXIS  
  assigns the category variable to the secondary (right) vertical axis.

Required Argument

category-variable  
  specifies the variable that classifies the observations into distinct subsets.

Optional Arguments

ALPHA= numeric-value  
  specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

Interactions:
  This option has no effect if you do not specify LIMITSTAT=CLM.
  If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

ATTRID= variable  
  specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BREAK  
  creates a break in the line for each missing value of the response variable.

Notes:
  The observation is excluded from the graph when there is a missing value for the category variable without the specification of the MISSING option. (No break occurs in the line.)
  The observation is excluded from the graph when there is a missing value for the FREQ variable.

CATEGORYORDER= RESPASC | RESPDESC  
  specifies the order in which the response values are arranged. Specify one of the following values:

RESPASC  
  sorts the response values in ascending order.

RESPDESC  
  sorts the response values in descending order.

Default: By default, the plot is sorted in ascending order based on the category values.

Restrictions:
  This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.
  Uniform scaling and response sorting cannot occur on the same axis. If the UNIFORM= option is used in the SGPLOT= statement, the UNIFORM option is ignored for the sorted response axis and a note is generated in the log. The
UNIFORM= option is applied to the other axes and groups if requested. Note that the UNIFORM= option can selectively apply scaling to only the X or Y axis.

**Interaction:** If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

**Note:** If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

**CLUSTERWIDTH= numeric-value**

specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

**Default:** 0.8

**Interaction:** This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

**CURVELABEL <="text-string">**

adds a label for the line. You can also specify the label text. If you do not specify a label, then the label from the response variable is used.

**CURVELABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

```
CURVELABELATTRS=GraphTitleText
```

**options** can be one or more of the following:

**COLOR= color**

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**FAMILY= "font-family"**

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE= n <units>**

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE= ITALIC | NORMAL**

specifies whether the label characters are italic or normal.
**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT=** **BOLD** | **NORMAL**

specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:

\[
\text{CURVELABELATTRS}=(\text{Color}=\text{Green} \ \text{Family}=\text{Arial} \ \text{Size}=8 \ \text{Style}=\text{Italic} \ \text{Weight}=\text{Bold})
\]

**Default:** The default style element is GraphValueText.

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**CURVELABELLOC=** **OUTSIDE** | **INSIDE**

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**Default:** INSIDE

**CURVELABELPOS=** **AUTO** | **END** | **MAX** | **MIN** | **START**

specifies the location of the curve label. Specify one of the following values:

**AUTO**

places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).

**Interaction:** This value takes effect only when CURVELABELLOC=OUTSIDE.

**END**

places the curve label at the last point on the curve.

**MAX**

places the label at the part of the curve closest to the maximum X axis value.

**MIN**

places the label at the part of the curve closest to the minimum X axis value.

**START**

places the curve label at the first point on the curve.

**Default:** END

**Interactions:**

This option has no effect unless the CURVELABEL option is also specified.

The START and END suboptions take effect only when CURVELABELLOC=INSIDE.

**DATALABEL <= variable>**

displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

\[
\text{DATALABELATTRS} = \text{GraphLabelText}
\]
options can be one or more of the following:

COLOR= color

specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ...
GraphData2 style elements in the current style.

FAMILY= “font-family”

specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphDataText style element in the current style.

SIZE= n <units>

specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL

specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the
GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL

specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the
GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also
specified.

DISCRETEOFFSET= numeric-value

specifies an amount to offset all lines from the discrete category values. Specify a
value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the category axis is discrete.

FREQ= numeric-variable

specifies how many times observations are repeated for computational purposes.
specifies that each observation is repeated n times for computational purposes, where
n is the value of the numeric variable. If n is not an integer, then it is truncated to an
integer. If n is less than 1 or missing, then it is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first
FREQ variable that you specified is used for all of the plots.
GROUP= variable
specifies a variable that is used to group the data. A separate plot is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.

**Interaction:** If you specify more than one categorization plot statement, then all of the plots must specify the same GROUP variable. If you do not specify the same GROUP= option for all of the categorization plots, then the GROUP= option has no effect.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped lines.

- **CLUSTER**
  grouped items are drawn adjacent to each other.

- **OVERLAY**
  grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData... GraphData style elements in the current style.

**Default:** OVERLAY

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of lines within a group.

- **ASCENDING**
  displays each group in ascending group value.

- **DESCENDING**
  displays each group in descending group value.

- **DATA**
  displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

**LEGENDLABEL= “text-string”**
specifies the label that identifies the line plot in the legend. By default, the label of the response variable is used. If there is no response variable label, then the name of the response variable and the computed statistic (SUM or MEAN) are used. If you do not specify a response variable, then the legend label is “Frequency”.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

**LIMITATTRS= style-element <(options)> | (options)**
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.
PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by theLineStyle attribute of the GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

LIMITS= BOTH | LOWER | UPPER
adds limit lines to the plot. Specify one of the following values:

BOTH
  adds lower and upper limit lines to the plot.

LOWER
  adds lower limit lines to the plot.

UPPER
  adds upper limit lines to the plot.

By default, no limit lines are displayed. However, if you specify the LIMITSTAT= option, then the default is BOTH.

Interaction: Limit lines are displayed only when you specify STAT= MEAN.

LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines. Specify one of the following statistics:

CLM
  confidence limits

STDDEV
  standard deviation

STDERR
  standard error

Default: CLM

Interaction: If you specify the LIMITSTAT= option, then the default value for the LIMITS= option is BOTH.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the lines in the line plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.
PATTERN= *line-pattern*

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by theLineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

**THICKNESS= n <units>**

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

**MARKERATTRS= style-element <(options)> | (options)**

specifies the appearance of the markers in the plot. This option has no effect unless you also specify the MARKERS option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**

specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

**SIZE= n <units>**

specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

**SYMBOL= symbol-name**

specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

**MARKERS**

adds markers to the plot.

**MISSING**

processes missing values as a valid category value and creates a line for it.
NAME=“text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOSTATLABEL
removes the statistic name from the axis and legend labels.

NUMSTD= n
specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive number, including decimals.

Default: 1

RESPONSE= response-variable
specifies a numeric response variable for the plot. The summarized values of the response variable are displayed for each value on the horizontal axis.

STAT= FREQ | MEAN | SUM
specifies the statistic for the horizontal axis. Specify one of the following statistics:

FREQ
the frequencies for the category variable

MEAN
the mean of the response variable

SUM
the sum of the response variable

Default: If you do not specify the RESPONSE= option, then the FREQ statistic is the default. If you specify RESPONSE=, then the SUM statistic is the default.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines and markers. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of w for computational purposes, where w is the value of the numeric variable. w can be any numeric value. If w is 0, negative or missing, then that observation is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.
X2AXIS
   assigns the response variable to the secondary (top) horizontal axis.

Y2AXIS
   assigns the category variable to the secondary (right) vertical axis.

---

**INSET Statement**

Adds a text box inside of the axes of the plot.

**Example:**  “About Text Insets” on page 31

---

**Syntax**

INSET “text-string-1” <... “text-string-n”></option(s)>;
INSET (label-list)</option(s)>;

**Summary of Optional Arguments**

Inset options

- `BORDER | NOBORDER`
  - specifies whether to display a border around the text box.
- `LABELALIGN= LEFT | CENTER | RIGHT`
  - specifies how the labels are aligned when you specify label-value pairs.
- `POSITION= position-value`
  - specifies the position of the text box within the plot.
- `TEXTATTRS= style-element <(options)> | (options)`
  - specifies the appearance of the text in the text box.
- `VALUEALIGN= LEFT | CENTER | RIGHT`
  - specifies how the values are aligned when you specify label-value pairs.

Title options

- `TITLE= "text-string"`
  - specifies a title for the text box.
- `TITLEATTRS= style-element <(options)> | (options)`
  - specifies the appearance of the title.

**Required Argument**

`text-string-list | (label-list)`

you must specify one of the following arguments:

- `text-string-list`
  - specifies one or more quoted text strings. Each string is placed on a separate line in the text box (for example, “My line 1” “My line 2”).

- `(label-list)`
  - specifies a series of quoted labels and values for the text box.

Specify your label-value pairs as follows:

("label-1" = “value-1” ... “label-n” = “value-n")
Here is an example: ("My label 1" = "My value 1" "My label 2" = "My value 2").

You can format the text in insets and add special characters using the following syntax:

(*ESC*) {sup 'string'}  
Specifies that the string appears as a superscript.

(*ESC*) {sub 'string'}  
Specifies that the string appears as a subscript.

(*ESC*) {unicode 'hexadecimal-value'x } | keyword  
Specifies a glyph (graphical character) to be displayed using its Unicode hexadecimal value or a SAS keyword equivalent. For more information about SAS keywords, see Appendix 1, “SAS Keywords for Unicode Glyphs,” in SAS Graph Template Language: User’s Guide.

Note: (*ESC*) is the default ODS escape character. You can set your own escape character with the ODS ESCAPECHAR="character"; statement.

In the following inset statement, the Greek letter alpha denotes the alpha value for the confidence limits in a graph. The R-Square value is displayed using the superscript format:

inset ("(*ESC*){unicode alpha}" = "0.05"  
   "R(*ESC*){sup '2'}" = "0.7705") / border;

Here is the text inset for this example:

\[
\begin{array}{c|c}
\alpha & 0.05 \\
R^2 & 0.7705
\end{array}
\]

Optional Arguments

BORDER | NOBORDER  
specifies whether to display a border around the text box. The BORDER option displays the border. The NOBORDER option hides the border.

LABELALIGN= LEFT | CENTER | RIGHT  
specifies how the labels are aligned when you specify label-value pairs. Specify one of the following:

LEFT  
aligns the text to the left.

CENTER  
aligns the text to the center.

RIGHT  
aligns the text to the right.

Default: LEFT

POSITION= position-value  
specifies the position of the text box within the plot. The position values are as follows:
BOTTOM
places the text box at the bottom of the graph.

BOTTOMLEFT
places the text box at the bottom left corner of the graph.

BOTTOMRIGHT
places the text box at the bottom right corner of the graph.

LEFT
places the text box at the left side of the graph.

RIGHT
places the text box at the right side of the graph.

TOP
places the text box at the top of the graph.

TOPLEFT
places the text box at the top left corner of the graph.

TOPRIGHT
places the text box at the top right corner of the graph.

If you do not specify a position, then a position is determined automatically.

TEXTATTRS= style-element <options> | (options)
specifies the appearance of the text in the text box. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: TEXTATTRS=GraphDataText

options can be one or more of the following:

COLOR=color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.
**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT=** BOLD | NORMAL
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:

```
TEXTATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

**Default:** The default appearance of the text is specified by the GraphValueText style element in the current style.

**Tip:** The GraphDataText style element makes the text slightly smaller. The GraphLabelText style element makes the text slightly larger.

**TITLE=** "text-string"
specifies a title for the text box. The title text is always center-aligned.

**TITLEATTRS=** style-element <(options)> | (options)
specifies the appearance of the title. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

```
TITLEATTRS=GraphTitleText
```

**options** can be one or more of the following:

**COLOR=** color
specifies the color of the title characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of **SAS/GRAPH: Reference**.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphLabelText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY=** "font-family"
specifies the font family for the title characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphLabelText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE=** n <units>
specifies the font size of the title characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphLabelText style element in the current style.

**STYLE=** ITALIC | NORMAL
specifies whether the title characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphLabelText style element in the current style.
WEIGHT= BOLD | NORMAL
specifies whether the title characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the
GraphLabelText style element in the current style.

Here is an example expression:
TITLEATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

**Default:** The default appearance of the title text is specified by the GraphLabelText
style element in the current style.

**VALUEALIGN= LEFT | CENTER | RIGHT**
specifies how the values are aligned when you specify label-value pairs. Specify one
of the following values.

**LEFT**
  - aligns the text to the left.

**CENTER**
  - aligns the text to the center.

**RIGHT**
  - aligns the text to the right.

**Default:** RIGHT

---

**KEYLEGEND Statement**

Adds a legend to the plot.

**Examples:**
“Example 5: Adding a Prediction Ellipse to a Scatter Plot” on page 503
“Example 6: Creating Lines and Bands from Pre-Computed Data” on page 504
“Example 8: Combining Histograms with Density Plots” on page 507

**Syntax**

KEYLEGEND <“name-1” ... “name-n”> <option(s)>;

**Summary of Optional Arguments**

**Legend options**

**ACROSS=** $n$
  - specifies the number of columns in the legend.

**BORDER | NOBORDER**
  - specifies whether the border around the legend is visible.

**DOWN=** $n$
  - specifies the number of rows in the legend.

**LOCATION= OUTSIDE | INSIDE**
  - specifies whether the legend is placed outside or inside of the axis area.

**POSITION=** position-value
  - specifies the position of the legend within the graph.

**VALUEATTRS=** style-element <(options)> | (options)
  - specifies the appearance of the legend value labels.

“name-1” ... “name-n”
specifies the names of one or more plots that you want to include in legend.

**Title options**

```
TITLE= "text-string"
```
specifies a title for the legend.

```
TITLEATTRS= style-element <(options)> | (options)
```
specifies the appearance of the title.

**Optional Arguments**

```
“name-1” ... “name-n”
```
specifies the names of one or more plots that you want to include in legend. Each name that you specify must correspond to a value that you entered for the NAME= option in a plot statement.

*Note:* If you do not specify a name, then the legend contains references to all of the plots in the graph.

```
ACROSS= n
```
specifies the number of columns in the legend. By default, the number of columns is determined automatically.

*Note:* Depending on the number of legend entries and the number of columns and rows that you specify, the legend might not fit in your graph. If your legend does not appear, then you might need to specify a different value for the ACROSS= option.

```
BORDER | NOBORDER
```
specifies whether the border around the legend is visible. The BORDER option shows the border. The NOBORDER option hides the border.

**Default:** BORDER

```
DOWN= n
```
specifies the number of rows in the legend. By default, the number of rows is determined automatically.

*Note:* Depending on the number of legend entries and the number of columns and rows that you specify, the legend might not fit in your graph. If your legend does not appear, then you might need to specify a different value for the DOWN= option.

```
LOCATION= OUTSIDE | INSIDE
```
specifies whether the legend is placed outside or inside of the axis area. The OUTSIDE option places the legend outside of the axis area. The INSIDE option places the legend inside of the axis area.

**Default:** OUTSIDE

*Interaction:* If LOCATION=INSIDE and POSITION= is also specified with any value, you might need to offset the axis in order to make space for the legend within the axis area. For more information, see “Example 2: Legend with a Position Specified inside the Axis Area” on page 364.

```
POSITION= position-value
```
specifies the position of the legend within the graph. The positions are as follows:

- **BOTTOM**
  places the legend at the bottom of the graph.

- **BOTTOMLEFT**
  places the legend at the bottom left corner of the graph.
BOTTOMRIGHT
   places the legend at the bottom right corner of the graph.

LEFT
   places the legend at the left side of the graph.

RIGHT
   places the legend at the right side of the graph.

TOP
   places the legend at the top of the graph.

TOPLEFT
   places the legend at the top left corner of the graph.

TOPRIGHT
   places the legend at the top right corner of the graph.

Default: BOTTOM
   If LOCATION=INSIDE is specified, the legend is automatically positioned near
   an edge of the plot area that has the least amount of collision with the data.

Interaction: If LOCATION=INSIDE and POSITION= is also specified with any
   value, you might need to offset the axis in order to make space for the legend
   within the axis area. For more information, see “Example 2: Legend with a
   Position Specified inside the Axis Area” on page 364.

Notes:
   By default, if you use more than one KEYLEGEND statement, then each legend
   is placed in a different position.
   If you specify more than one legend with the same position, then all of your
   legends are placed at that position.

TITLE= "text-string"
   specifies a title for the legend.

TITLEATTRS= style-element <(options)> | (options)
   specifies the appearance of the title. You can specify the appearance by using a style
   element or by using suboptions. If you specify a style element, you can also specify
   suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
TITLEATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
   specifies the color of the title characters. You can specify colors using the same
   color schemes that are supported by SAS/GRAPH software. For more
   information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
   Reference.

   Default: For ungrouped data, the default color is specified by the Color attribute
   of the GraphLabelText style element in the current style. For grouped data,
   the default color is specified by the ContrastColor attribute of the
   GraphData1 ... GraphData\(n\) style elements in the current style.

FAMILY= "font-family"
   specifies the font family for the title characters. The SAS ODS styles use
   TrueType system fonts. For more information, see “TrueType Fonts Supplied by

   Default: The default font family is specified by the FontFamily attribute of the
   GraphLabelText style element in the current style.
Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the title characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphLabelText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the title characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the GraphLabelText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the title characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the GraphLabelText style element in the current style.

Here is an example expression:

TITLEATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default appearance of the title text is specified by the GraphLabelText style element in the current style.

VALUEATTRS= style-element <(options)> | (options)
specifies the appearance of the legend value labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.
**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

### Examples

**Example 1: Legend for Two Ellipses**

```sas
ods graphics / reset width=4in;
proc sgplot data=sashelp.class
   noautolegend;
scatter x=height y=weight;
ellipse x=height y=weight /
   alpha=.2
   name="eighty"
   legendlabel="80% Prediction";
ellipse x=height y=weight /
   alpha=.05
   name="ninetyfive"
   legendlabel="95% Prediction";
keylegend "eighty" "ninetyfive";
run;
```

**Example 2: Legend with a Position Specified inside the Axis Area**

If POSITION= and LOCATION= INSIDE are both specified, you might need to offset the axis in order to make space for the legend within the axis area.

The following example specifies LOCATION= INSIDE and POSITION= BOTTOM. In the graph, the legend collides with the data. To avoid this problem, the graph specifies
an OFFSETMIN= value for the Y axis. (If the legend’s position was at the top of the plot, an OFFSETMAX= value would be specified instead.)

```
ods graphics / reset width=4in;
title "Mileage by Type (Excluding Hybrids)";
proc sgplot data=sashelp.cars;
  where type ne "Hybrid";
  vbar type / response=mpg_city;
  keylegend / location=inside position=bottom;
  xaxis grid;
  yaxis offsetmin=0.15 display=(nolabel);
run;
title;
```

**Note:** For HBOX, HBAR, HLINE, and DOT plot statements, the Y axis is reversed by default, so the axis origin is at the top. As a result, you use OFFSETMAX= to create an offset at the bottom of the axis. OFFSETMIN= is used to create an offset at the top of the axis for these plot types.

The following example specifies LOCATION= INSIDE and POSITION= TOPRIGHT. To avoid having the legend collide with the graph, the code specifies an OFFSETMAX=...
value for the X axis. The OFFSETMAX= value is applied to the end of the axis farther from the origin.

odds graphics / reset width=4in;
title "Average Height of Teenage Students";
proc sgplot data=sashelp.class;
where age >= 12 and age < 16;
hbar age / response=height stat=mean;
keylegend / location=inside
position=topright;
xaxis offsetmax=0.3 display=(nolabel);
yaxis grid;
run;
title;

### LINEPARM Statement

Creates a straight line specified by a point and a slope. You can generate a single line by specifying a constant for each required argument. You can generate multiple lines by specifying a numeric variable for any or all required arguments.

**Requirement:** The statement must be used with another plot statement that is derived from data values that provide boundaries for the axis area. For example, the LINEPARM statement can be used with a scatter plot or a histogram.

**Example:** “About Parameterized Lines” on page 24

### Syntax

**LINEPARM**  
`X= numeric-value | numeric-variable`  
`Y= numeric-value | numeric-variable`  
`SLOPE= numeric-value | numeric-variable`  
`<option(s)>;`
Summary of Optional Arguments

Group options

GROUP= variable
   specifies a variable that is used to group the data.

NOMISSINGGROUP
   specifies that missing values of the group variable are not included in the plot.

Label options

CURVELABEL <="text-string">
   adds a label for the line.

CURVELabelATTRS= style-element <(options)> | (options)
   specifies the appearance of the labels in the plot when you use the CURVELABEL= option.

CURVELABELLOC= OUTSIDE | INSIDE
   specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

CURVELABELPOS= AUTO | MIN | MAX
   specifies the location of the curve label.

Line options

CLIP
   specifies that the data for the line is ignored when determining the data ranges for the axes.

LINEATTRS= style-element <(options)> | (options)
   specifies the appearance of the line.

NOEXTEND
   prevents the line from being extended beyond the axis offset.

Plot options

ATTRID= variable
   specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= "text-string"
   specifies a label that identifies the plot in the legend.

NAME= "text-string"
   specifies a name for the plot.

TRANSPARENCY= numeric-value
   specifies the degree of transparency for the lines.

X2AXIS
   assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
   assigns the Y variable to the secondary (right) vertical axis.

Required Arguments

X= numeric-value | numeric-variable
   specifies the X coordinate of a point.

Notes:
   Values are in the units of the data.
If the value specified for the X= option is outside of the data range, then the data range is extended to include the specified point. This behavior can be changed with the CLIP= option.

If you specify a variable, and the variable contains any missing values, no line is drawn for the respective observation.

\[ Y = \text{numeric-value} \mid \text{numeric-variable} \]
specifies the Y coordinate of a point.

**Notes:**
- Values are in the units of the data.
- If the value specified for the Y= option is outside of the data range, then the data range is extended to include the specified point. This behavior can be changed with the CLIP= option.
- If you specify a variable, and the variable contains any missing values, no line is drawn for the respective observation.

\[ \text{SLOPE} = \text{numeric-value} \mid \text{numeric-variable} \]
specifies the slope of the line. The slope can be positive or negative.

**Tips:**
- SLOPE= 0 creates a horizontal line (parallel to the X axis).
- SLOPE= . (missing value) creates a vertical line (parallel to the Y axis).

**Optional Arguments**

\[ \text{ATTRID} = \text{variable} \]
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

\[ \text{CLIP} \]
specifies that the data for the line is ignored when determining the data ranges for the axes. Each axis scale is determined by the other plots in the overlay. This might result in the line not being displayed if its data range is not within the data ranges of the other plots.

\[ \text{CURVELABEL} \leq \text{"text-string"} \]
adds a label for the line. You can also specify the label text. If you do not specify a label, then SLOPE=value is used. If you specify a GROUP variable, the group value is shown instead of the slope.

\[ \text{CURVELABELATTRS} = \text{style-element} \langle (\text{options}) \rangle \mid (\text{options}) \]
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

\[ \text{CURVELABELATTRS} = \text{GraphTitleText} \]

**options** can be one or more of the following:

\[ \text{COLOR} = \text{color} \]
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference.*
**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY=** "font-family"

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE=** n <units>

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE=** ITALIC | NORMAL

specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT=** BOLD | NORMAL

specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:

```
CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

**Default:** The default style element is GraphValueText.

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**CURVELABELLOC=** OUTSIDE | INSIDE

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**Default:** INSIDE

**Interactions:**

This option is used in conjunction with the CURVELABELPOS= option to determine where the labels appear.

This option has no effect unless CURVELABEL is also specified.

**CURVELABELPOS=** AUTO | MIN | MAX

specifies the location of the curve label. Specify one of the following values:

**AUTO**

determines the best label position automatically. The line label is positioned near the line boundary along unused axes whenever possible (typically Y2 and X2).

**Interaction:** This value is available only when CURVELABELLOC=OUTSIDE. If CURVELABELLOC=INSIDE, you must specify either MIN or MAX.

**MIN**

places the curve label at the minimum value for the X axis.
MAX
places the curve label at the maximum value for the X axis.

**Default:** AUTO when CURVELABELLOC=OUTSIDE
MAX when CURVELABELLOC=INSIDE

**Interaction:** This option has no effect unless CURVELABEL is also specified.

**GROUP=** *variable*
specifies a variable that is used to group the data. A separate plot is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.

**LEGENDLABEL=** "text-string"
specifies a label that identifies the plot in the legend. By default, the label “LineParm” is used (if you specify a numeric value for Y) or the Y variable name is used (if you specify a variable for Y).

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

**LINEATTRS=** *style-element* *(options)* | *(options)*
specifies the appearance of the line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: \texttt{LINEATTRS=GraphData3}

For more information about style elements, see “Style Elements for Use with ODS Graphics” on page 640.

**options** can be one or more of the following:

**COLOR=** *color*
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.

**PATTERN=** *line-pattern*
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.

**THICKNESS=** *n* *(units)*
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.

Here is an example expression:
**LINEATTRS=** *(Color= "light green" Pattern= MediumDash Thickness= 4)*

**Default:** GraphDataDefault is the default style element.

**NAME=** "text-string"

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NOEXTEND**

prevents the line from being extended beyond the axis offset. When specified, there might be a gap between the line and the axis. The gap is controlled by the axis offset. If the offset is set to 0, then there is no gap.

**NOMISSINGGROUP**

specifies that missing values of the group variable are not included in the plot.

**Interaction:** This option has no effect unless GROUP= is also specified.

**TRANSPARENCY=** numeric-value

specifies the degree of transparency for the lines. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**X2AXIS**

assigns the X variable to the secondary (top) horizontal axis.

**Y2AXIS**

assigns the Y variable to the secondary (right) vertical axis.

---

**LOESS Statement**

Creates a fitted loess curve.

**Example:** “About Loess Plots” on page 34

**Syntax**

LOESS X= numeric-variable Y= numeric-variable <option(s)>;

**Summary of Optional Arguments**

**Label options**

**CURVELABEL <="text-string”>

adds a label for the curve.

**CURVELABELLOC=** OUTSIDE | INSIDE

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**CURVELABELPOS=** AUTO | END | MAX | MIN | START

specifies the location of the curve label.

**DATALABEL <= variable>

 displays a label for each data point.

**Limit options**

**CLM <= “text-string”>
creates confidence limits.

\[
\text{CLMATTRS = style-element | (CLMAttributeOptions)}
\]

Specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes.

\[
\text{CLMTRANSPARENCY = numeric-value}
\]

Specifies the degree of transparency for the confidence limits.

**LOESS options**

\[
\text{DEGREE= 1 | 2}
\]

Specifies the degree of the local polynomials to use for each local regression.

\[
\text{INTERPOLATION= CUBIC | LINEAR}
\]

Specifies the degree of the interpolating polynomials that are used for blending local polynomial fits at the kd tree vertices.

\[
\text{LINEATTRS= style-element <(options)> | (options)}
\]

Specifies the appearance of the fit curve.

\[
\text{MARKERATTRS= style-element <(options)> | (options)}
\]

Specifies the appearance of the markers in the plot.

\[
\text{MAXPOINTS= n}
\]

Specifies the maximum number of predicted points for the loess fit and the corresponding limits.

\[
\text{NOLEGCLM}
\]

Hides the legend entry for the mean value confidence limits.

\[
\text{NOLEGFIT}
\]

Hides the legend entry for the fit line.

\[
\text{NOMARKERS}
\]

Removes the scatter markers from the plot.

\[
\text{REWEIGHT= n}
\]

Specifies the number of iterative reweighting steps to apply to the data.

\[
\text{SMOOTH= numeric-value}
\]

Specifies a smoothing parameter value.

**Plot options**

\[
\text{ALPHA= numeric-value}
\]

Specifies the confidence level for the confidence limits.

\[
\text{ATTRID= variable}
\]

Specifies the value of the ID variable in an attribute map data set.

\[
\text{GROUP= variable}
\]

Specifies a variable that is used to group the data.

\[
\text{LEGENDLABEL= "text-string"}
\]

Specifies a label that identifies the fit line in the legend.

\[
\text{NAME= "text-string"}
\]

Specifies a name for the plot.

\[
\text{WEIGHT= numeric-variable}
\]

Specifies how observations are weighted.

\[
\text{X2AXIS}
\]

Assigns the X variable to the secondary (top) horizontal axis.

\[
\text{Y2AXIS}
\]

Assigns the Y variable to the secondary (right) vertical axis.
**Required Arguments**

**X= numeric-variable**
specifies the variable for the x axis.

**Y= numeric-variable**
specifies the variable for the y axis.

**Optional Arguments**

**ALPHA= numeric-value**
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

**Default**: .05

**Interaction**: This option has no effect unless you also specify the CLM option.

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**CLM <= “text-string”>**
creates confidence limits. The optional text string overrides the default legend label for the confidence limit.

**CLMATTRS = style-element | (CLMAttributeOptions )**
specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes. **CLMAttributeOptions** can be one or both of the following:

**CLMFILLATTRS=style-element | (COLOR= color)**
You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**CLMLINEATTRS= style-element <(options) > | (options)**
You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

The confidence limits have no outlines by default (for most styles). To make the outlines appear, you can change the DISPLAYOPTS in the GRAPHBAND style element. Then you can specify attributes for the outlines. The following code provides an example.

```sas
proc template;
  define style MyStyleDefault;
  parent=Styles.Default;
  style GraphBand from GraphBand /
      DisplayOpts = "Fill outline";
  end;
run;

ods listing style= MyStyleDefault;
proc sgplot data=sashelp.class;
  reg x=height y=weight / CLM
    CLMATTRS=(CLMLINEATTRS=
```
run;

The CLMLINEATTRS= options can be one or more of the following:

**COLOR=**<color>

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphConfidence style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**PATTERN=**<line-pattern>

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphConfidence style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphDataN style elements in the current style.

**THICKNESS=**<n><units>

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphConfidence style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphDataN style elements in the current style.

**Interaction:** This suboption has no effect unless you change the display options in the style element to display outlines. See the preceding code example.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**Interaction:** The CLMATTRS = option has no effect unless you also specify the CLM option.

**CLMTRANSPARENCY=**<numeric-value>

specifies the degree of transparency for the confidence limits. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**Interaction:** This option takes effect only if you also specify the CLM option.

**CURVELABEL <=**<text-string>

adds a label for the curve. You can also specify the label text. If you do not specify a label, the label from the Y variable is used.

**CURVELABELLOC=**<OUTSIDE | INSIDE>

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**Default:** INSIDE
CURVELABELPOS= AUTO | END | MAX | MIN | START
specifies the location of the curve label. Specify one of the following values:

AUTO
places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).

Interaction: This value takes effect only when CURVELABELLOC=OUTSIDE.

END
places the curve label at the last point on the curve.

MAX
places the label at the part of the curve closest to the maximum X axis value.

MIN
places the label at the part of the curve closest to the minimum X axis value.

START
places the curve label at the first point on the curve.

Default: END

Interactions:
The START and END suboptions take effect only when CURVELABELLOC=INSIDE.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

Interaction: This option has no effect if you also specify the NOMARKERS option.

DEGREE= 1 | 2
specifies the degree of the local polynomials to use for each local regression. 1 specifies a linear fit and 2 specifies a quadratic fit.

Default: 1

GROUP= variable
specifies a variable that is used to group the data. A separate plot is created for each unique value of the category variable. The plot elements for each group value are automatically distinguished by different visual attributes.

Interaction: If you specify the GROUP= option in multiple fit plot statements, then the first GROUP= variable is used for all of the fit plots that specify GROUP=.

INTERPOLATION= CUBIC | LINEAR
specifies the degree of the interpolating polynomials that are used for blending local polynomial fits at the kd tree vertices.

Default: CUBIC

LEGENDLABEL= “text-string”
specifies a label that identifies the fit line in the legend. By default, the label “Loess” is used, along with the value of the SMOOTH= option if specified.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the fit curve. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:
COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData_n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData_n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData_n style elements in the current style.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData_n style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData_n style elements in the current style.
MAXPOINTS= \( n \)
specifies the maximum number of predicted points for the loess fit and the corresponding limits.

Default: 201

NAME= "text-string"
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOLEGCLM
hides the legend entry for the mean value confidence limits.

NOLEGFIT
hides the legend entry for the fit line.

NOMARKERS
removes the scatter markers from the plot.

REWEIGHT= \( n \)
specifies the number of iterative reweighting steps to apply to the data.

Default: 0

Interaction: This option has no affect if you do not specify the WEIGHT option.

SMOOTH= numeric-value
specifies a smoothing parameter value. If you do not specify this option, a smoothing value is determined automatically.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

Details
For the SMOOTH= option, the smoothing parameter value must be greater than the minimum value that is determined by the following equation.

\[
minimum = \frac{degree + 1}{number \ of \ observations}
\]

NEEDLE Statement
Creates a plot with needles connecting each point to the baseline.

Restriction: The vertical axis that is used with the NEEDLE statement cannot be a discrete axis.

Example: "About Needle Plots" on page 26
Syntax

NEEDLE X= variable Y= numeric-variable < option(s)>;

Summary of Optional Arguments

Group options

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.

GROUP= variable
specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped needles.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of needles within a group.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options) | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Needle options

BASELINE= numeric-value
specifies a value on the Y axis for the baseline.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all needle lines from discrete X values.

LINEATTRS= style-element <(options) | (options)
specifies the appearance of the needle lines.

MARKERATTRS= style-element <(options) | (options)
specifies the appearance of the markers in the plot.

MARKERS
adds markers to the tips of the needles.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL=" text-string"
specifies a label that identifies the needle plot in the legend.

NAME= "text-string"
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the needle plot.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

**Required Arguments**

X= variable
   specifies the variable for the x axis.

Y= numeric-variable
   specifies the variable for the y axis.

**Optional Arguments**

ATTRID= variable
   specifies the value of the ID variable in an attribute map data set. You specify this
   option only if you are using an attribute map to control visual attributes of the graph.
   For more information, see “Using SG Attribute Maps to Control Visual Attributes”
   on page 605.

BASELINE= numeric-value
   specifies a value on the Y axis for the baseline.

CLUSTERWIDTH= numeric-value
   specifies the width of the group clusters as a fraction of the midpoint spacing.
   Specify a value from 0.0 (narrowest) to 1.0 (widest).
   **Default:** 0.8
   **Interaction:** This option is applicable only when the GROUP option is specified,
   when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

DATALABEL <= variable>
   displays a label for each data point. If you specify a variable, the values of that
   variable are used for the data labels. If you do not specify a variable, then the values
   of the Y variable are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
   specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using
   suboptions. If you specify a style element, you can also specify suboptions to
   override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

**options** can be one or more of the following:

COLOR= color
   specifies the color of the label characters. You can specify colors using the same
   color schemes that are supported by SAS/GRAPH software. For more
   information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
   **Default:** For ungrouped data, the default color is specified by the Color attribute
   of the GraphDataText style element in the current style. For grouped data, the
   default color is specified by the ContrastColor attribute of the GraphData1 ... 
   GraphDataN style elements in the current style.
FAMILY="font-family"
    specifies the font family for the label characters. The SAS ODS styles use
    TrueType system fonts. For more information, see “TrueType Fonts Supplied by
    **Default:** The default font family is specified by the FontFamily attribute of the
    GraphDataText style element in the current style.

SIZE= n <units>
    specifies the font size of the label characters. You can also specify the unit of
    measurement. The default unit is pixels. For a list of measurement units that are
    supported, see “Units of Measurement” on page 659.
    **Default:** The default font size is specified by the FontSize attribute of the
    GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
    specifies whether the label characters are italic (ITALIC) or normal (NORMAL).
    **Default:** The default font style is specified by the FontStyle attribute of the
    GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
    specifies whether the label characters are bold (BOLD) or normal (NORMAL).
    **Default:** The default font weight is specified by the FontWeight attribute of the
    GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also
specified.

**DISCRETEOFFSET= numeric-value**
    specifies an amount to offset all needle lines from discrete X values. Specify a value
    from -0.5 (left offset) to +0.5 (right offset).
    **Default:** 0.0 (no offset)
    **Requirement:** This option is applicable only when the X axis is discrete.

**GROUP= variable**
    specifies a variable that is used to group the data. The plot elements for each group
    value are automatically distinguished by different visual attributes.

**GROUPDISPLAY= CLUSTER | OVERLAY**
    specifies how to display grouped needles.
    **CLUSTER**
        grouped items are drawn adjacent to each other.
    **OVERLAY**
        grouped items are drawn at the exact coordinate and might overlap. Each group
        is represented by unique visual attributes derived from the GraphData1...
        GraphData2 style elements in the current style.
    **Default:** OVERLAY
    **Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category
    axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis
    statement.
    **Interaction:** This option is ignored unless GROUP= is specified.
GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of needles within a group.

ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LEGENDLABEL=" text-string"
specifies a label that identifies the needle plot in the legend. By default, the label of
the Y variable or the group value for each marker is used.

Interaction: The LEGENDLABEL= option has no effect if you also specify the
GROUP= option in the same plot statement.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the needle lines. You can specify the appearance by using
a style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of
the GraphData1 ... GraphDatann style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphDatann style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphDatann style elements in the current style.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. This option has no effect unless
you also specify the MARKERS option. You can specify the appearance by using a
style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

options can be one or more of the following:
COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDatan style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphDatan style elements in the current style.

MARKERS
adds markers to the tips of the needles.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Interaction: This option has no effect unless GROUP= is also specified.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the needle plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.
Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

PBSPLINE Statement
Creates a fitted penalized B-spline curve.

Example: “About Penalized B-Spline Plots” on page 35

Syntax
PBSPLINE x= numeric-variable y= numeric-variable </ options>;

Summary of Optional Arguments

Label options
CURVELABEL <=”text-string”>
adds a label for the curve.
CURVELABELLOC= OUTSIDE | INSIDE
specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).
CURVELABELPOS= AUTO | END | MAX | MIN | START
specifies the location of the curve label.
DATALABEL <= variable>
displays a label for each data point.

Limit options
CLI <= “text-string”>
creates prediction limits for the individual predicted values.
CLIATTRS = style-element | (CLILINEATTRS= style-element <(options)> | (options))
specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines.
CLM <= “text-string”>
creates confidence limits.
CLMATTRS = style-element | (CLMAttributeOptions)
specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes.
CLMTRANSPARENCY= numeric-value
specifies the degree of transparency for the confidence limits.

PBSPLINE options
DEGREE= n
specifies the degree of the spline transformation.
LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the fitted curve.
MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot.
MAXPOINTS= n
specifies the maximum number of predicted points for the spline curve and for any confidence limits.

\textbf{NKNOTS= }n

specifies the number of evenly spaced internal knots.

\textbf{NOLEGCLI}

hides the legend entry for the individual value prediction limits.

\textbf{NOLEGCLM}

hides the legend entry for the mean value confidence limits.

\textbf{NOLEGFIT}

hides the legend entry for the fit line.

\textbf{NOMARKERS}

removes the scatter markers from the plot.

\textbf{SMOOTH= numeric-value}

specifies a smoothing parameter value.

\textbf{Plot options}

\textbf{ALPHA= numeric-value}

specifies the confidence level for the confidence limits.

\textbf{ATTRID= variable}

specifies the value of the ID variable in an attribute map data set.

\textbf{FREQ= numeric-variable}

specifies how many times observations are repeated for computational purposes.

\textbf{GROUP= variable}

specifies a variable that is used to group the data.

\textbf{LEGENDLABEL= "text-string"}

specifies a label that identifies the B-spline curve in the legend.

\textbf{NAME= "text-string"}

specifies a name for the plot.

\textbf{WEIGHT= numeric-variable}

specifies how observations are weighted.

\textbf{X2AXIS}

assigns the X variable to the secondary (top) horizontal axis.

\textbf{Y2AXIS}

assigns the Y variable to the secondary (right) vertical axis.

\textbf{Required Arguments}

\textbf{X= numeric-variable}

specifies the variable for the x axis.

\textbf{Y= numeric-variable}

specifies the variable for the y axis.

\textbf{Optional Arguments}

\textbf{ALPHA= numeric-value}

specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

\textbf{Default: } .05

\textbf{Interaction: } This option has no effect unless you specify the CLI or CLM option (or both).
ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

CLI <= “text-string”>
creates prediction limits for the individual predicted values. The optional text string overrides the default legend label for the prediction limits.

CLIATTRS = style-element | (CLILINEATTRS= style-element <(options)> | (options))
specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines. The outline attributes can be the following:

CLILINEATTRS= style-element <(options)> | (options)
You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by theLineStyle attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line pattern is specified by theLineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

Default: The default style element is GraphPredictionLimits.

Interaction: The CLIATTRS = option has no effect unless you also specify the CLI option.
CLM <= “text-string”>
creates confidence limits. The optional text string overrides the default legend label for the confidence limit.

CLMATTRS = style-element | (CLMAttributeOptions)
specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes. CLMAttributeOptions can be one or both of the following:

CLMFILLATTRS=style-element | (COLOR= color)
   You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

CLMLINEATTRS= style-element <(options)> | (options)
   You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

   The confidence limits have no outlines by default (for most styles). To make the outlines appear, you can change the DISPLAYOPTS in the GRAPHBAND style element. Then you can specify attributes for the outlines. The following code provides an example.

   proc template;
      define style MyStyleDefault;
         parent=Styles.Default;
         style GraphBand from GraphBand /
            DisplayOpts = "Fill outline";
      end;
   run;
   ods listing style= MyStyleDefault;
   proc sgplot data=sashelp.class;
      reg x=height y=weight / CLM
         CLMATTRS=(CLMLINEATTRS=
                     (COLOR=Green PATTERN= ShortDash));
   run;

   The CLMLINEATTRS= options can be one or more of the following:

COLOR= color
   specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

   Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphConfidence style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
   specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

   Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphConfidence style element in the current style. For grouped data, the default line pattern is specified by the
LineStyle attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

**THICKNESS**\(= n <\text{units}>\)

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphConfidence style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\textsubscript{n} style elements in the current style.

**Interaction:** This suboption has no effect unless you change the display options in the style element to display outlines. See the preceding code example.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**Interaction:** The CLMATTRS = option has no effect unless you also specify the CLM option.

**CLMTRANSPARENCY**\(= \text{numeric-value}\)

specifies the degree of transparency for the confidence limits. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**Interaction:** This option takes effect only if you also specify the CLM option.

**CURVELABEL <"text-string">**

adds a label for the curve. You can also specify the label text. If you do not specify a label, the label from the Y variable is used.

**CURVELABELLOC** \(= \text{OUTSIDE} | \text{INSIDE}\)

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**Default:** INSIDE

**CURVELABELPOS** \(= \text{AUTO} | \text{END} | \text{MAX} | \text{MIN} | \text{START}\)

specifies the location of the curve label. Specify one of the following values:

**AUTO**

places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).

**Interaction:** This value takes effect only when CURVELABELLOC=OUTSIDE.

**END**

places the curve label at the last point on the curve.

**MAX**

places the label at the part of the curve closest to the maximum X axis value.

**MIN**

places the label at the part of the curve closest to the minimum X axis value.

**START**

places the curve label at the first point on the curve.

**Default:** END

**Interactions:**

This option has no effect unless the CURVELABEL option is also specified.
The START and END suboptions take effect only when 
CURVELABELLOC=INSIDE.

**DATALABEL <= variable>**
displays a label for each data point. If you specify a variable, then the values of that 
variable are used for the data labels. If you do not specify a variable, then the values 
of the Y variable are used for the data labels.

**Interaction:** This option has no effect if you also specify the NOMARKERS option.

**DEGREE= n**
specifies the degree of the spline transformation.

**Default:** 3

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes.
Each observation is repeated n times for computational purposes, where n is the 
value of the numeric variable. If n is not an integer, then it is truncated to an integer.
If n is less than 1 or missing, then it is excluded from the analysis.

**GROUP= variable**
specifies a variable that is used to group the data. A separate plot is created for each 
unique value of the grouping variable. The plot elements for each group value are 
automatically distinguished by different visual attributes.

**Interaction:** If you specify the GROUP= option in multiple fit plot statements, then 
the first GROUP= variable is used for all of the fit plots that specify GROUP=.

**LEGENDLABEL= "text-string"**
specifies a label that identifies the B-spline curve in the legend. By default, the label 
“Penalized B-Spline” is used with the SMOOTH= value if specified, or else the 
group value for each B-spline is used.

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the fitted curve. You can specify the appearance by using 
a style element or by using suboptions. If you specify a style element, you can also 
specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color 
schemes that are supported by SAS/GRAPH software. For more information, see 

**Default:** For ungrouped data, the default color is specified by the ContrastColor 
attribute of the GraphFit style element in the current style. For grouped data, 
the default color is specified by the ContrastColor attribute of the 
GraphData1 ... GraphData<n> style elements in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number 
or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the 
LineStyle attribute of the GraphFit style element in the current style. For 
grouped data, the default line pattern is specified by the LineStyle attribute of the 
GraphData1 ... GraphData<n> style elements in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The 
default unit is pixels. For a list of measurement units that are supported, see 
“Units of Measurement” on page 659.
**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

**MARKERATTRS= style-element <(options)> | (options)**

specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR= color**

specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**SIZE= n <(units)>**

specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

**SYMBOL= symbol-name**

specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData n style elements in the current style.

**MAXPOINTS= n**

specifies the maximum number of predicted points for the spline curve and for any confidence limits.

**Default:** 201

**NAME= “text-string”**

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**NKNOTS= n**

specifies the number of evenly spaced internal knots.

**Default:** 100

**Range:** 1 to 1000

**NOLEGCLI**

hides the legend entry for the individual value prediction limits.

**NOLEGCLM**

hides the legend entry for the mean value confidence limits.
NOLEGFIT
hides the legend entry for the fit line.

NOMARKERS
removes the scatter markers from the plot.

SMOOTH= numeric-value
specifies a smoothing parameter value. If you do not specify this option, a smoothing value is determined automatically.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

Details
For the SMOOTH= option, the smoothing parameter value must be greater than the minimum value that is determined by the following equation.

\[
minimum = \frac{degree + 1}{number of observations}
\]

REFLINE Statement
Creates a horizontal or vertical reference line.

Example:  “About Reference Lines” on page 23

Syntax
REFLINE variable | value-1 <... value-n> </ option(s)>;

Summary of Optional Arguments

Line options
AXIS= X | X2 | Y | Y2
specifies the axis that contains the reference line values.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all lines from discrete X or Y values.

LABEL <= (“text-string-1” ... “text-string-n”)> creates labels for each reference line.

LABELLOC= INSIDE | OUTSIDE
specifies whether the labels are placed inside or outside of the plot area.

LABELPOS= AUTO | MIN | MAX
specifies the position of the labels.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the reference line.
NOCLIP
extends the plot axes to contain the reference lines.

Plot options

LEGENDLABEL= “text-string”
specifies a label that identifies the markers from the plot in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the reference lines.

Required Arguments

variable
draws a reference line for each value of the specified variable.

value-I <... value-n>
draws one or more reference lines at the values that you specify.

Optional Arguments

AXIS= X | X2 | Y | Y2
specifies the axis that contains the reference line values. For example, if you specify AXIS= X, vertical reference lines are drawn at points on the X axis.

Default: Y

DISCRETEOFFSET= numeric-value
specifies an amount to offset all lines from discrete X or Y values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the X or Y axis is discrete.

LABEL <= ("text-string-1" ... "text-string-n")>
creates labels for each reference line. If you do not specify a label for a line, the reference value for that line is used as the label.

LABELLOC= INSIDE | OUTSIDE
specifies whether the labels are placed inside or outside of the plot area. The INSIDE option places the labels inside of the plot area. The OUTSIDE option places the labels outside of the plot area.

Default: OUTSIDE

LABELPOS= AUTO | MIN | MAX
specifies the position of the labels. MIN specifies that the label is placed at the minimum value of the data axis. MAX specifies that the label is placed at the maximum value of the data axis. AUTO places the label automatically.

Default: AUTO

LEGENDLABEL= “text-string”
specifies a label that identifies the markers from the plot in the legend. By default, the label “Reference Line” is used.

Interaction: This option has no effect unless you also specify the NAME= option.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the reference line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.
options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphReference style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the GraphReference style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphReference style element in the current style.

NAME= "text-string"
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOCLIP
extends the plot axes to contain the reference lines. By default, if a reference line is created outside of the data range, then the reference line is not visible. This option has no effect if you do not create reference lines that are outside of the data range.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the reference lines. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

REG Statement
Creates a fitted regression line or curve.

Interaction:
A linear regression (DEGREE=1) cannot be used with logarithmic axes.

Examples:
"About Regression Plots” on page 36
“Example 4: Adding Prediction and Confidence Bands to a Regression Plot” on page 502

Syntax
REG X= numeric-variable Y= numeric-variable <\ option(s)>;

Summary of Optional Arguments

Label options
CURVELABEL <="text-string">  
adds a label for the curve.

CURVELABELLOC= OUTSIDE | INSIDE  
specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

CURVELABELPOS= AUTO | END | MAX | MIN | START  
specifies the location of the curve label.

DATALABEL <= variable >  
displays a label for each data point.

Limit options

CLI <= “text-string”>  
creates prediction limits for the individual predicted values.

CLIATTRS = style-element | (CLILINEATTRS= style-element <(options)> | (options))  
specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines.

CLM <= “text-string”>  
creates confidence limits.

CLMATTRS = style-element | (CLMAttributeOptions )  
specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes.

CLMTRANSPARENCY= numeric-value  
specifies the degree of transparency for the confidence limits.

Plot options

ALPHA= numeric-value  
specifies the confidence level for the confidence limits.

ATTRID= variable  
specifies the value of the ID variable in an attribute map data set.

FREQ= numeric-variable  
specifies how many times observations are repeated for computational purposes.

GROUP= variable  
specifies a variable that is used to group the data.

LEGENDLABEL= “text-string”  
specifies a label that identifies the regression curve in the legend.

NAME= “text-string”  
specifies a name for the plot.

WEIGHT= numeric-variable  
specifies how observations are weighted.

X2AXIS  
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS  
assigns the Y variable to the secondary (right) vertical axis.

REG options

DEGREE= n  
specifies the degree of the polynomial fit.

LINEATTRS= style-element <(options)> | (options)  
specifies the appearance of the fit line.
MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot.

MAXPOINTS= n
specifies the maximum number of predicted points for the regression curve and for any confidence limits.

NOLEGCLI
hides the legend entry for the individual value confidence limits.

NOLEGCLM
hides the legend entry for the mean value confidence limits.

NOLEGFIT
hides the legend entry for the fit line.

NOMARKERS
removes the scatter markers from the plot.

Required Arguments

X= numeric-variable
specifies the variable for the x axis.

Y= numeric-variable
specifies the variable for the y axis.

Optional Arguments

ALPHA= numeric-value
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

Interaction: This option has no effect unless you specify the CLI or CLM option (or both).

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

CLI <= “text-string”>
creates prediction limits for the individual predicted values. The optional text string overrides the default legend label for the prediction limits.

CLIATTRS = style-element | (CLILINEATTRS= style-element <(options)> | (options))
specifies the appearance of the individual value prediction limits by using an ODS style element or by specifying attributes for the outlines. The outline attributes can be the following:

CLILINEATTRS= style-element <(options)> | (options)
You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**PATTERN=** *line-pattern*

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

**THICKNESS=** *n* < *units>*

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphPredictionLimits style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

**Default:** The default style element is GraphPredictionLimits.

**Interaction:** The CLIATTRS = option has no effect unless you also specify the CLI option.

**CLM <= “text-string” >**

creates confidence limits. The optional text string overrides the default legend label for the confidence limit.

**CLMATTRS =** *style-element | (CLMAttributeOptions)*

specifies the appearance of the mean value confidence limits by using an ODS style element or by specifying fill and line attributes. CLMAttributeOptions can be one or both of the following:

**CLMFILLATTRS=** *style-element | (COLOR= color)*

You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**CLMLINEATTRS=** *style-element <(options)> | (options)*

You can specify the appearance of the outline by using a style element or by using suboptions. If you specify a style element, then you can also specify suboptions to override specific appearance attributes.

The confidence limits have no outlines by default (for most styles). To make the outlines appear, you can change the DISPLAYOPTS in the GRAPHBAND style element. Then you can specify attributes for the outlines. The following code provides an example.

```sas
proc template;
define style MyStyleDefault;
parent=Styles.Default;
style GraphBand from GraphBand /
   DisplayOpts = "Fill outline";
```
ods listing style= MyStyleDefault;
proc sgplot data=sashelp.class;
  reg x=height y=weight / CLM
    CLMATTRS=(CLMLINEATTRS=
      (COLOR=Green PATTERN= ShortDash));
run;

The CLMATTRS= options can be one or more of the following:

COLOR= color
    specifies the color of the line. You can specify colors using the same color
    schemes that are supported by SAS/GRAPH software. For more information,
    see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
    
    Default: For ungrouped data, the default color is specified by the
    ContrastColor attribute of the GraphConfidence style element in the
    current style. For grouped data, the default color is specified by the
    ContrastColor attribute of the GraphData1 ... GraphData n style elements
    in the current style.

    PATTERN= line-pattern
    specifies the line pattern for the line. You can reference SAS patterns by
    number or by name. For a list of line patterns, see “Line Patterns” on page
    663.
    
    Default: For ungrouped data, the default line pattern is specified by the
    LineStyle attribute of the GraphConfidence style element in the current
    style. For grouped data, the default line pattern is specified by the
    LineStyle attribute of the GraphData1 ... GraphData n style elements
    in the current style.

    THICKNESS= n <units>
    specifies the thickness of the line. You can also specify the unit of measure.
    The default unit is pixels. For a list of measurement units that are supported,
    see “Units of Measurement” on page 659.
    
    Default: For ungrouped data, the default line thickness is specified by the
    LineThickness attribute of the GraphConfidence style element in the current
    style. For grouped data, the default line thickness is specified by the
    LineThickness attribute of the GraphData1 ... GraphData n style elements
    in the current style.

    Interaction: This suboption has no effect unless you change the display options
    in the style element to display outlines. See the preceding code example.

    Default: The default appearance of the confidence limits is specified by the
    GraphConfidence style element in the current style.

    Interaction: The CLMATTRS = option has no effect unless you also specify the
    CLM option.

CLMTRANSPARENCY= numeric-value
    specifies the degree of transparency for the confidence limits. Specify a value from
    0.0 (completely opaque) to 1.0 (completely transparent).

    Default: 0.0

    Interaction: This option takes effect only if you also specify the CLM option.
CURVELABEL <=“text-string”>
adds a label for the curve. You can also specify the label text. If you do not specify a label, the label from the Y variable is used.

CURVELABELLOC= OUTSIDE | INSIDE
specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

Default: INSIDE

CURVELABELPOS= AUTO | END | MAX | MIN | START
specifies the location of the curve label. Specify one of the following values:

AUTO
places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).

Interaction: This value takes effect only when CURVELABELLOC=OUTSIDE.

END
places the curve label at the last point on the curve.

MAX
places the label at the part of the curve closest to the maximum X axis value.

MIN
places the label at the part of the curve closest to the minimum X axis value.

START
places the curve label at the first point on the curve.

Default: END

Interactions:

This option has no effect unless the CURVELABEL option is also specified.
The START and END suboptions take effect only when CURVELABELLOC=INSIDE.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

Interaction: This option has no effect if you also specify the NOMARKERS option.

DEGREE= n
specifies the degree of the polynomial fit. For example, 1 specifies a linear fit, 2 specifies a quadratic fit, and 3 specifies a cubic fit.

Default: 1

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes. Each observation is repeated n times for computational purposes, where n is the value of the numeric variable. If n is not an integer, then it is truncated to an integer. If n is less than 1 or missing, then it is excluded from the analysis.

GROUP= variable
specifies a variable that is used to group the data. A separate plot is created for each unique value of the grouping variable. The plot elements for each group value are automatically distinguished by different visual attributes.

Interaction: If you specify the GROUP= option in multiple fit plot statements, then the first GROUP= variable is used for all of the fit plots that specify GROUP=.
LEGENDLABEL= "text-string"
  specifies a label that identifies the regression curve in the legend. By default, the
  label “Regression” is used.

Interaction: The LEGENDLABEL= option has no effect if you also specify the
  GROUP= option in the same plot statement.

LINEATTRS= style-element <(options)> | (options)
  specifies the appearance of the fit line. You can specify the appearance by using a
  style element or by using suboptions. If you specify a style element, then you can
  also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
  specifies the color of the line. You can specify colors using the same color
  schemes that are supported by SAS/GRAPH software. For more information, see
  Default: For ungrouped data, the default color is specified by the GraphFit style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
  specifies the line pattern for the line. You can reference SAS patterns by number
  or by name. For a list of line patterns, see “Line Patterns” on page 663.
  Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
  specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
  “Units of Measurement” on page 659.
  Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

MARKERATTRS= style-element <(options)> | (options)
  specifies the appearance of the markers in the plot. You can specify the appearance
  by using a style element or by using suboptions. If you specify a style element, you
  can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
  specifies the color of the markers. You can specify colors using the same color
  schemes that are supported by SAS/GRAPH software. For more information, see
  Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

SIZE= n <units>
  specifies the size of the markers. You can also specify the unit of measurement.
The default unit is pixels. For a list of measurement units that are supported, see
  “Units of Measurement” on page 659.
**Default:** The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

`SYMBOL= symbol-name`

specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData n style elements in the current style.

`MAXPOINTS= n`

specifies the maximum number of predicted points for the regression curve and for any confidence limits.

**Default:** 10

`NAME= "text-string"

specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

`NOLEGCLI`

hides the legend entry for the individual value confidence limits.

`NOLEGCLM`

hides the legend entry for the mean value confidence limits.

`NOLEGFIT`

hides the legend entry for the fit line.

`NOMARKERS`

removes the scatter markers from the plot.

`WEIGHT= numeric-variable`

specifies how observations are weighted. Each observation is weighted by a factor of \( w \) for computational purposes, where \( w \) is the value of the numeric variable. \( w \) can be any numeric value. If \( w \) is 0, negative or missing, then that observation is excluded from the analysis.

`X2AXIS`

assigns the X variable to the secondary (top) horizontal axis.

`Y2AXIS`

assigns the Y variable to the secondary (right) vertical axis.

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**SCATTER Statement**

Creates a scatter plot.

**Examples:**

- “About Scatter Plots” on page 27
- “Example 1: Grouping a Scatter Plot” on page 498
- “Example 5: Adding a Prediction Ellipse to a Scatter Plot” on page 503
- “Example 6: Creating Lines and Bands from Pre-Computed Data” on page 504
Syntax

SCATTER X= variable Y= variable < / option(s)>;

Summary of Optional Arguments

Group options

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.

GROUP= variable
specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped markers.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of markers within a group.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.

LEGENDLABEL= "text-string"
specifies a label that identifies the markers from the plot in the legend.

NAME= "text-string"
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the markers and error bars.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

Scatter options

DISCRETEOFFSET= numeric-value
specifies an amount to offset all markers from discrete X or Y values.

ERRORBARATTRS= style-element <(options)> | (options)
specifies the appearance of the error bars in the plot.
MARKERATRERS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot.

MARKERCHAR= variable
specifies a variable whose values replace the marker symbols in the plot.

MARKERCHARATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot when you use the MARKERCHAR= option.

XERRORLOWER= numeric-variable
specifies a variable that contains the lower endpoints for the X error bars.

XERRORUPPER= numeric-variable
specifies a variable that contains the upper endpoints for the X error bars.

YERRORLOWER= numeric-variable
specifies a variable that contains the lower endpoints for the Y error bars.

YERRORUPPER= numeric-variable
specifies a variable that contains the upper endpoints for the Y error bars.

**Required Arguments**

**X= variable**
specifies the variable for the x axis.

**Y= variable**
specifies the variable for the y axis.

**Optional Arguments**

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

- **Default:** 0.8
- **Interaction:** This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

DATALABELATTRS=GraphLabelText

**options** can be one or more of the following:
COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATRGS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all markers from discrete X or Y values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the X or Y axis is discrete.

ERRORBARATTRS= style-element <(options)> | (options)
specifies the appearance of the error bars in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes. Each observation is repeated n times for computational purposes, where n is the value of the numeric variable. If n is not an integer, then it is truncated to an integer. If n is less than 1 or missing, then it is excluded from the analysis.

**GROUP= variable**
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY= CLUSTER | OVERLAY**
specifies how to display grouped markers.

**CLUSTER**
grouped items are drawn adjacent to each other.

**OVERLAY**
grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1... GraphData style elements in the current style.

**Default:** OVERLAY

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of markers within a group.

**ASCENDING**
displays each group in ascending group value.

**DESCENDING**
displays each group in descending group value.

**DATA**
displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

**LEGENDLABEL= “text-string”**
specifies a label that identifies the markers from the plot in the legend. By default, the label of the Y variable or the group value for each marker is used.

**Interaction:** The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.
MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphDataN style elements in the current style.

MARKERCHAR= variable
specifies a variable whose values replace the marker symbols in the plot. If a format is associated with the variable, then the formatted values are used as the marker symbols. If there is not a format associated with the variable and the variable contains numeric data, then the BEST6. format is used.

Interaction: The MARKERCHAR= option overrides the DATALABEL= option and the SYMBOL= suboption of the MARKERATTRS= option.

MARKERCHARATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot when you use the MARKERCHAR= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the marker characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.
FAMILY="font-family"
    specifies the font family for the marker characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.
    Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
    specifies the font size of the marker characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
    Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
    specifies whether the marker characters are italic (ITALIC) or normal (NORMAL).
    Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
    specifies whether the marker characters are bold (BOLD) or normal (NORMAL).
    Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

NAME= "text-string"
    specifies a name for the plot. You can use the name to refer to this plot in other statements.
    Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOMISSINGGROUP
    specifies that missing values of the group variable are not included in the plot.
    Interaction: This option has no effect unless GROUP= is also specified.

TRANSPARENCY= numeric-value
    specifies the degree of transparency for the markers and error bars. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
    Default: 0.0

URL= character-variable
    specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.
    Default: By default, no HTML links are created.
    Interactions: This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
    This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

X2AXIS
    assigns the X variable to the secondary (top) horizontal axis.

XERRORLOWER= numeric-variable
    specifies a variable that contains the lower endpoints for the X error bars.
**SERIES Statement**

Creates a line plot.

**Examples:**

“About Series Plots” on page 29
“Example 3: Plotting Three Series” on page 500

---

**Syntax**

```plaintext
SERIES X= variable Y= variable < / option(s)>;
```

**Summary of Optional Arguments**

**Group options**

- `CLUSTERWIDTH= numeric-value`
  specifies the width of the group clusters as a fraction of the midpoint spacing.
- `GROUP= variable`
  specifies a variable that is used to group the data.
- `GROUPDISPLAY= CLUSTER | OVERLAY`
  specifies how to display grouped lines.
- `GROUPORDER= ASCENDING | DESCENDING | DATA`
  specifies the ordering of lines within a group.
- `NOMISSINGGROUP`
  specifies that missing values of the group variable are not included in the plot.

**Label options**

- `CURVELABEL <=“text-string”>`
  adds a label for the curve.
- `CURVELABELATTRS= style-element <(options)> | (options)`
  specifies the appearance of the labels in the plot when you use the CURVELABEL= option.
- `CURVELABELLOC= OUTSIDE | INSIDE`
  specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).
- `CURVELABELPOS= AUTO | END | MAX | MIN | START`
  specifies the location of the curve label.
- `DATALABEL <= variable>`
  displays a label for each data point.
- `DATALABELATTRS= style-element <(options)> | (options)`

---

**XERRORUPPER= numeric-variable**

specifies a variable that contains the upper endpoints for the X error bars.

**Y2AXIS**

assigns the Y variable to the secondary (right) vertical axis.

**YERRORLOWER= numeric-variable**

specifies a variable that contains the lower endpoints for the Y error bars.

**YERRORUPPER= numeric-variable**

specifies a variable that contains the upper endpoints for the Y error bars.
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

**Marker options**

**MARKERATTRS=** style-element *(options)* | *(options)*

specifies the appearance of the markers in the plot.

**MARKERS**

adds data point markers to the series plot data points.

**Plot options**

**ATTRID=** *variable*

specifies the value of the ID variable in an attribute map data set.

**LEGENDLABEL=** "*text-string*"

specifies a label that identifies the series plot in the legend.

**NAME=** "*text-string*

specifies a name for the plot.

**TRANSPARENCY=** numeric-value

specifies the degree of transparency for the lines and markers.

**URL=** character-variable

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**X2AXIS**

assigns the X variable to the secondary (top) horizontal axis.

**Y2AXIS**

assigns the Y variable to the secondary (right) vertical axis.

**Series options**

**BREAK**

creates a break in the line for each missing value for the Y variable.

**DISCRETEOFFSET=** numeric-value

specifies an amount to offset all lines from discrete X or Y values.

**LINEATTRS=** style-element *(options)* | *(options)*

specifies the appearance of the series line.

**Required Arguments**

**X=** *variable*

specifies the variable for the x axis.

**Y=** *variable*

specifies the variable for the y axis.

**Optional Arguments**

**ATTRID=** *variable*

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BREAK**

creates a break in the line for each missing value for the Y variable.
CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.
Specify a value from 0.0 (narrowest) to 1.0 (widest).

Default: 0.8

Interaction: This option is applicable only when the GROUP option is specified,
when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

CURVELABEL <=“text-string”>
adds a label for the curve. You can also specify the label text. If you do not specify a
label, the label from the Y variable is used.

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using
suboptions. If you specify a style element, you can also specify suboptions to
override specific appearance attributes.

Here is an example that specifies a style element:
CURVELABELATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphValueText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the
GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphValueText style element in the current style.

Here is an example expression:
The default style element is GraphValueText.

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**CURVELABELLOC= OUTSIDE | INSIDE**

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**Default:** INSIDE

**CURVELABELPOS= AUTO | END | MAX | MIN | START**

specifies the location of the curve label. Specify one of the following values:

- **AUTO**
  - places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).
  - **Interaction:** This value takes effect only when CURVELABELLOC=OUTSIDE.

- **END**
  - places the curve label at the last point on the curve.

- **MAX**
  - places the label at the part of the curve closest to the maximum X axis value.

- **MIN**
  - places the label at the part of the curve closest to the minimum X axis value.

- **START**
  - places the curve label at the first point on the curve.

**Default:** END

**Interactions:**

This option has no effect unless the CURVELABEL option is also specified.

The START and END suboptions take effect only when CURVELABELLOC=INSIDE.

**DATALABEL <= variable>**

displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

**DATALABELATTRS=GraphLabelText**

**options** can be one or more of the following:

- **COLOR= color**
  - specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
  - **Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all lines from discrete X or Y values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the X or Y axis is discrete.

GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped lines.

CLUSTER
grouped items are drawn adjacent to each other.

OVERLAY
grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1... GraphData style elements in the current style.

Default: OVERLAY

Restriction: GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.
**Interaction:** This option is ignored unless `GROUP=` is specified.

**GROUPORDER=** **ASCENDING | DESCENDING | DATA**

specifies the ordering of lines within a group.

**ASCENDING**

displays each group in ascending group value.

**DESCENDING**

displays each group in descending group value.

**DATA**

displays each group in data order of the group variable.

**Interaction:** This option is ignored unless `GROUP=` is specified.

**LEGENDLABEL=** "text-string”

specifies a label that identifies the series plot in the legend. By default, the label of the Y variable or the group value for each marker is used.

**LINEATTRS=** **style-element <(options)> | (options)**

specifies the appearance of the series line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

`options` can be one or more of the following:

**COLOR=** **color**

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**PATTERN=** **line-pattern**

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by theLineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by theLineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

**THICKNESS=** n **<units>**

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

**MARKERATTRS=** **style-element <(options)> | (options)**

specifies the appearance of the markers in the plot. This option has no effect unless you also specify the MARKERS option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

`options` can be one or more of the following:
COLOR= *color*
  specifies the color of the markers. You can specify colors using the same color
  schemes that are supported by SAS/GRAPH software. For more information, see

  **Default:** For ungrouped data, the default color is specified by the ContrastColor
  attribute of the GraphDataDefault style element in the current style. For
  grouped data, the default color is specified by the ContrastColor attribute of
  the GraphData1 ... GraphData*n* style elements in the current style.

SIZE= *n <units>*
  specifies the size of the markers. You can also specify the unit of measurement.
  The default unit is pixels. For a list of measurement units that are supported, see
  “Units of Measurement” on page 659.

  **Default:** The default marker size is specified by the MarkerSize attribute of the
  GraphDataDefault style element in the current style.

SYMBOL= *symbol-name*
  specifies the symbol for the markers. For a list of valid marker symbols, see
  “Marker Symbols” on page 661.

  **Default:** For ungrouped data, the default marker symbol is specified by the
  MarkerSymbol attribute of the GraphDataDefault style element in the current
  style. For grouped data, the default marker symbol is specified by the
  MarkerSymbol attribute of the GraphData1 ... GraphData*n* style elements in
  the current style.

MARKERS
  adds data point markers to the series plot data points.

NAME= “*text-string*”
  specifies a name for the plot. You can use the name to refer to this plot in other
  statements.

  **Note:** The name is case-sensitive. When you refer to the specified name in other
  statements, you must use the same exact capitalization.

NOMISSINGGROUP
  specifies that missing values of the group variable are not included in the plot.

  **Interaction:** This option has no effect unless GROUP= is also specified.

TRANSPARENCY= *numeric-value*
  specifies the degree of transparency for the lines and markers. Specify a value from
  0.0 (completely opaque) to 1.0 (completely transparent).

  **Default:** 0.0

URL= *character-variable*
  specifies a character variable that contains URLs for Web pages to be displayed
  when parts of the plot are selected within an HTML page.

  **Default:** By default, no HTML links are created.

  **Interactions:**
  This option affects graphics output that is created through the ODS HTML
  destination only. For more information about ODS destinations, see “Specifying
  a Destination” on page 649.

  This option has no effect unless you also specify IMAGEMAP in the ODS
  GRAPHICS statement. For more information, see “Using the ODS GRAPHICS
  Statement” on page 651.

X2AXIS
  assigns the X variable to the secondary (top) horizontal axis.
Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

---

**STEP Statement**

Creates a step plot.

**Restriction:**
The vertical axis that is used with the STEP statement cannot be a discrete axis.

**Example:**
"About Step Plots" on page 30

---

**Syntax**

```
STEP X= variable Y= numeric-variable < / option(s)>;
```

**Summary of Optional Arguments**

**Group options**

- **CLUSTERWIDTH= numeric-value**
  specifies the width of the group clusters as a fraction of the midpoint spacing.

- **GROUP= variable**
  specifies a variable that is used to group the data.

- **GROUPDISPLAY= CLUSTER | OVERLAY**
  specifies how to display grouped step lines.

- **GROUPORDER= ASCENDING | DESCENDING | DATA**
  specifies the ordering of step lines within a group.

- **NOMISSINGGROUP**
  specifies that missing values of the group variable are not included in the plot.

**Label options**

- **CURVELABEL <="text-string">**
  adds a label for the curve.

- **CURVELABELATTRS= style-element <(options)> | (options)**
  specifies the appearance of the labels in the plot when you use the CURVELABEL= option.

- **CURVELABELLOC= OUTSIDE | INSIDE**
  specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

- **CURVELABELPOS= AUTO | END | MAX | MIN | START**
  specifies the location of the curve label.

- **DATALABEL <= variable**
  displays a label for each data point.

- **DATALABELATTRS= style-element <(options)> | (options)**
  specifies the appearance of the labels in the plot when you use the DATALABEL= option.

**Marker options**

- **MARKERATTRS= style-element <(options)> | (options)**
  specifies the appearance of the markers in the plot.
MARKERS
adds markers to the step plot data points.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
specifies a label that identifies the step plot in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

Step options

BREAK
creates a break in the line for each missing value for the Y variable.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all step lines from discrete X values.

ERRORBARATTRS= style-element <(options)> | (options)
specifies the appearance of the error bars in the plot.

JUSTIFY= LEFT | CENTER | RIGHT
specifies the location of each step relative to its data point.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the step line.

YERRORLOWER= numeric-variable
specifies a variable that contains the lower endpoints for the Y error bars.

YERRORUPPER= numeric-variable
specifies a variable that contains the upper endpoints for the Y error bars.

Required Arguments

X= variable
specifies the variable for the x axis.

Y= numeric-variable
specifies the variable for the y axis.

Optional Arguments

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.
BREAK
creates a break in the line for each missing value for the Y variable.

CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.
Specify a value from 0.0 (narrowest) to 1.0 (widest).
Default: 0.8
Interaction: This option is applicable only when the GROUP option is specified,
when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

CURVELABEL <="text-string">
adds a label for the curve. You can also specify the label text. If you do not specify a
label, the label from the Y variable is used.

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL=
option. You can specify the appearance by using a style element or by using
suboptions. If you specify a style element, you can also specify suboptions to
override specific appearance attributes.

Here is an example that specifies a style element:
CURVELABELATTRS=GraphTitleText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.
Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphValueText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphDataN style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by
Default: The default font family is specified by the FontFamily attribute of the
GraphValueText style element in the current style.
Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.
Default: The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.
Default: The default font style is specified by the FontStyle attribute of the
GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.
Default: The default font weight is specified by the FontWeight attribute of the
GraphValueText style element in the current style.
Here is an example expression:

```
CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

**Default:** The default style element is GraphValueText.

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.

**CURVELABELLOC= OUTSIDE | INSIDE**

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**Default:** INSIDE

**CURVELABELPOS= AUTO | END | MAX | MIN | START**

specifies the location of the curve label. Specify one of the following values:

- **AUTO**
  places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).
  **Interaction:** This value takes effect only when CURVELABELLOC=OUTSIDE.

- **END**
  places the curve label at the last point on the curve.

- **MAX**
  places the label at the part of the curve closest to the maximum X axis value.

- **MIN**
  places the label at the part of the curve closest to the minimum X axis value.

- **START**
  places the curve label at the first point on the curve.

**Default:** END

**Interactions:**

This option has no effect unless the CURVELABEL option is also specified.

The START and END suboptions take effect only when CURVELABELLOC=INSIDE.

**DATALABEL <= variable>**

displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

```
DATALABELATTRS=GraphLabelText
```

**options** can be one or more of the following:

- **COLOR= color**
  specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAph software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAph: Reference.
Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData style elements in the current style.

FAMILY="font-family"
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all step lines from discrete X values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

Requirement: This option is applicable only when the X axis is discrete.

ERRORBARATTRS= style-element <(options)> | (options)
specifies the appearance of the error bars in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
**Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

**THICKNESS=** *n <units>*
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**GROUP=** *variable*
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY=** CLUSTER | OVERLAY
specifies how to display grouped step lines.

- **CLUSTER**
  grouped items are drawn adjacent to each other.

- **OVERLAY**
  grouped items are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1... GraphData*n* style elements in the current style.

**Default:** OVERLAY

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis statement.

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER=** ASCENDING | DESCENDING | DATA
specifies the ordering of step lines within a group.

- **ASCENDING**
  displays each group in ascending group value.

- **DESCENDING**
  displays each group in descending group value.

- **DATA**
  displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

**JUSTIFY=** LEFT | CENTER | RIGHT
specifies the location of each step relative to its data point. Figure 7.3 on page 418 shows the effect of each option:

**Figure 7.3 Values for JUSTIFY=**

![Diagram showing values for JUSTIFY= LEFT, CENTER, RIGHT]

**LEGENDLABEL=** “text-string”
specifies a label that identifies the step plot in the legend. By default, the label of the Y variable or the group value for each marker is used.
LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the step line. You can specify the appearance by using a
style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

$options$ can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of
the GraphData1 ... GraphData$n$ style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the
LineStyle attribute of the GraphDataDefault style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle
attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the
LineThickness attribute of the GraphDataDefault style element in the current
style. For grouped data, the default line thickness is specified by the
LineThickness attribute of the GraphData1 ... GraphData$n$ style elements in
the current style.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. This option has no effect unless
you also specify the MARKERS option. You can specify the appearance by using a
style element or by using suboptions. If you specify a style element, you can also
specify suboptions to override specific appearance attributes.

$options$ can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of
the GraphData1 ... GraphData$n$ style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement.
The default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the
GraphDataDefault style element in the current style.
SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData n style elements in the current style.

MARKERS
adds markers to the step plot data points.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

Interaction: This option has no effect unless GROUP= is also specified.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
- This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
- This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

YERRORLOWER= numeric-variable
specifies a variable that contains the lower endpoints for the Y error bars.

YERRORUPPER= numeric-variable
specifies a variable that contains the upper endpoints for the Y error bars.

Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

VBAR Statement
Creates a vertical bar chart that summarizes the values of a category variable.

Interaction: The VBAR statement can be combined only with other categorization plot statements in the SG PLOT procedure. See “Plot Type Compatibility” on page 277.
Examples: “About Bar Charts” on page 42
“Example 10: Creating a Bar-Line Chart” on page 509

Syntax

VBAR category-variable <\ option(s)>;

Summary of Optional Arguments

Bar options

BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
specifies a special effect to be used on all filled bars.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all bars from the category midpoints.

FILL | NOFILL
specifies whether the bars are filled.

FILLATRTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the bars.

MISSING
processes missing values as a valid category value and creates a bar for it.

NOSTATLABEL
removes the statistic name from the axis and legend labels.

NUMSTD= n
specifies the number of standard units for the limit lines, when you specify
LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

OUTLINE | NOOUTLINE
specifies whether the bars have outlines.

RESPONSE= response-variable
specifies a numeric response variable for the plot.

STAT= FREQ | MEAN | SUM
specifies the statistic for the vertical axis.

Group options

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the maximum width.

GROUP= variable
specifies a variable that is used to group the data.

GROUPDISPLAY= STACK | CLUSTER
specifies how to display grouped bars.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of bars within a group.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the
DATALABEL= option.
**DATA LABELPOS=** DATA | BOTTOM | TOP
specifies the location of the data label.

**Limit options**

**LIMITATTRS=** style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot.

**LIMITS=** BOTH | LOWER | UPPER
specifies which limit lines to display.

**LIMITSTAT=** CLM | STDDEV | STDERR
specifies the statistic for the limit lines.

**Plot options**

**ALPHA=** numeric-value
specifies the confidence level for the confidence limits.

**ATTRID=** variable
specifies the value of the ID variable in an attribute map data set.

**CATEGORYORDER=** RESPASC | RESPDESC
specifies the order in which the response values are arranged.

**FREQ=** numeric-variable
specifies how many times observations are repeated for computational purposes.

**LEGENDLABEL=** “text-string”
specifies the label that identifies the bar chart in the legend.

**NAME=** “text-string”
specifies a name for the plot.

**TRANSPARENCY=** numeric-value
specifies the degree of transparency for the bars and limits, if displayed.

**URL=** character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**WEIGHT=** numeric-variable
specifies how observations are weighted.

**Required Argument**

**category-variable**
specifies the variable that classifies the observations into distinct subsets.

**Optional Arguments**

**ALPHA=** numeric-value
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

**Default:** .05

**Interactions:**
- This option has no effect if you do not specify LIMITSTAT=CLM.
- If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

**ATTRID=** variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph.
For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BARWIDTH= numeric-value**

specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

**Default:** .8

1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER

**Interaction:** When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

**CATEGORYORDER= RESPASC | RESPDESC**

specifies the order in which the response values are arranged. Specify one of the following values:

- **RESPASC** sorts the response values in ascending order.
- **RESPDESC** sorts the response values in descending order.

**Default:** By default, the plot is sorted in ascending order based on the category values.

**Restrictions:**

This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.

Uniform scaling and response sorting cannot occur on the same axis. If the UNIFORM= option is used in the SGPLOT statement, the UNIFORM option is ignored for the sorted response axis and a note is generated in the log. The UNIFORM= option is applied to the other axes and groups if requested. Note that the UNIFORM= option can selectively apply scaling to only the X or Y axis.

**Interaction:** If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

**Note:** If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

**CLUSTERWIDTH= numeric-value**

specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.

**Default:** 0.8

**Interaction:** This option is applicable only when the GROUP option is specified and when GROUPDISPLAY=CLUSTER.
DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that
variable are used for the data labels. If you do not specify a variable, then the values
of the calculated response are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL=
option. You can specify the appearance by using a style element or by using
suboptions. If you specify a style element, you can also specify suboptions to
override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphDataText style element in the current style. For grouped data, the
default color is specified by the ContrastColor attribute of the GraphData1 ...
GraphData style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the
GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the
GraphDataText style element in the current style.

Here is an example expression:
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also
specified.

DATALABELPOS= DATA | BOTTOM | TOP
specifies the location of the data label. Specify one of the following values:
DATA
  places the label on the data primitives (at the upper boundary of the bars).

BOTTOM
  places the label below the bars.

TOP
  places the label above the bars.

Default:  DATA

Interactions:
  This option displays limit information when limits are specified. When limits are
  specified, the default data label position is BOTTOM.
  This option displays group values for each category when GROUP= is also
  specified.
  This option displays response values for each overlaid chart.
  This option has no effect unless you also specify the DATALABEL option.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
  specifies a special effect to be used on all filled bars. Specify one of the following
  (the samples were generated using the HTMLBlue style):

<table>
<thead>
<tr>
<th>NONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRISP</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>GLOSS</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>MATTE</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>PRESSED</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>SHEEN</td>
</tr>
</tbody>
</table>

Default:  NONE

Interactions:
  This option has no effect if the applied style uses a fill pattern and FILL is
  disabled for the style. If the style has both FILL and FILLPATTERN enabled,
  data skins will work. For more information about fill patterns, see “Using Fill
  Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about
  viewing the contents of style templates, see “About Styles and Style Elements”
  on page 620.
This option has no effect if you also specify NOFILL.

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset all bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**FILL | NOFILL**
specifies whether the bars are filled. The FILL option shows the fill color for the bars. The NOFILL option hides the fill color for the bars.

**Default:** FILL

**Interactions:**
Specifying FILL also hides the outlines.
If NOFILL and NOOUTLINE are both specified, then both options are ignored.

**FILLATTRS= style-element | \(COLOR= color\)**
specifies the appearance of the fill for the bars. You can specify the color of the fill using a style element or by using the \(COLOR=\) suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphData\(n\) style elements in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

**FREQ= numeric-variable**
specifies how many times observations are repeated for computational purposes.
specifies that each observation is repeated \(n\) times for computational purposes, where \(n\) is the value of the numeric variable. If \(n\) is not an integer, then it is truncated to an integer. If \(n\) is less than 1 or missing, then it is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

**GROUP= variable**
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY= STACK | CLUSTER**
specifies how to display grouped bars.

**STACK**
groups are overlaid without any clustering. Each group is represented by unique visual attributes derived from the GraphData1... GraphData\(n\) style elements in the current style.

**CLUSTER**
displays group values as separate adjacent bars that replace the single category bar. Each set of group values is centered at the midpoint tick mark for the category.

**Default:** STACK

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER= ASCENDING | DESCENDING | DATA**
specifies the ordering of bars within a group.
ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LEGENDLABEL= \"text-string\"
specifies the label that identifies the bar chart in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, the name of the response variable and the computed statistic (SUM or MEAN) is used. If the RESPONSE= option is not used, the legend label is “Frequency”.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)>
| (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

LIMITS= BOTH | LOWER | UPPER
specifies which limit lines to display. Limits are displayed as heavier line segments with a serif at the end extending from each bar. Upper limits extend to the right of the bar and lower limits extend to the left of the bar. By default, no limits are displayed unless you specify either the LIMITS= or LIMITSTAT= option. If you specify the LIMITSTAT= option only, then LIMITS=BOTH is the default. Specify one of the following values:

BOTH
adds lower and upper limit lines to the plot.

LOWER
adds lower limit lines to the plot.
UPPER
  adds upper limit lines to the plot.

By default, no limit lines are displayed. However, if you specify the LIMITSTAT= option, then the default is BOTH.

Interactions:
  Limit lines are displayed only when you specify STAT= MEAN.
  The LIMITS= option has no effect if you also specify the GROUP= option in the plot statement.

LIMITSTAT= CLM | STDDEV | STDERR
  specifies the statistic for the limit lines. Specify one of the following statistics:

  CLM
    confidence limits

  STDDEV
    standard deviation

  STDERR
    standard error

Default: CLM

Interactions:
  If you specify the LIMITSTAT= option only, then the default value for the LIMITS= option is BOTH.
  Limits lines are displayed only when you specify STAT=MEAN.
  The LIMITSTAT= option has no effect if you also specify the GROUP= option in the plot statement.

MISSING
  processes missing values as a valid category value and creates a bar for it.

NAME= "text-string"
  specifies a name for the plot. You can use the name to refer to this plot in other statements.

  Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOSTATLABEL
  removes the statistic name from the axis and legend labels.

NUMSTD= n
  specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive number, including decimals.

Default: 1

OUTLINE | NOOUTLINE
  specifies whether the bars have outlines. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: OUTLINE

Interactions:
  Specifying OUTLINE also hides the fill color.
  If NOOUTLINE and NOFILL are both specified, then both options are ignored.

RESPONSE= response-variable
  specifies a numeric response variable for the plot. The summarized values of the response variable are displayed on the vertical axis.
STAT: FREQ | MEAN | SUM
specifies the statistic for the vertical axis. Specify one of the following statistics:

FREQ
the frequencies for the category variable. This is the default value when you do not specify the RESPONSE= option.

MEAN
the mean of the response variable.

SUM
the sum of the response variable. This is the default value when you specify the RESPONSE= option.

Interaction: If you do not specify the RESPONSE= option, then only FREQ can be used. If you specify RESPONSE=, then you can use either SUM or MEAN.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions: This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of $w$ for computational purposes, where $w$ is the value of the numeric variable. $w$ can be any numeric value. If $w$ is 0, negative or missing, then that observation is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first WEIGHT variable that you specified is used for all of the plots.

VBARPARM Statement

Creates a vertical bar chart based on a pre-summarized response value for each unique value of the category variable. You can also assign variables to the upper and lower limits.

Requirement: The data must contain only one response value per unique category variable. If more than one value is found, a warning is written to the SAS log, and the graph might produce unpredictable results.

Interactions: The HBARPARM statement can be combined only with other basic plot statements in the SGPLOT procedure. See “Plot Type Compatibility” on page 277.
When used with particular styles, the VBARPARM statement produces fill patterns for grouped bars. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636.
An important distinction between VBARPARM and VBAR is that the response variable is required for VBARPARM. In addition, the response variable should contain pre-summarized computed values such as a sum or a mean.

Example: “About Bar Charts” on page 42

Syntax

VBARPARM CATEGORY= category-variable RESPONSE= numeric-variable < option(s)>;

Summary of Optional Arguments

Bar options

BARWIDTH= numeric-value
  specifies the width of the bars as a ratio of the maximum possible width.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
  specifies a special effect to be used on all filled bars.

DISCRETEOFFSET= numeric-value
  specifies an amount to offset all bars from the category midpoints.

FILL | NOFILL
  specifies whether the bars are filled.

FILLATTRS= style-element | (COLOR= color)
  specifies the appearance of the fill for the bars.

LIMITATTRS= style-element <(options)> | (options)
  specifies the appearance of the limit lines in the plot.

LIMITLOWER= numeric-variable
  specifies values for the lower endpoints on the limit lines.

LIMITUPPER= numeric-variable
  specifies values for the upper endpoints on the limit lines.

MISSING
  processes missing values as a valid category value and creates a bar for it.

OUTLINE | NOOUTLINE
  specifies whether the bars have outlines.

Group options

CLUSTERWIDTH= numeric-value
  specifies the cluster width as a ratio of the maximum width.

GROUP= variable
  specifies a variable that is used to group the data.

GROUPORDER= ASCENDING | DESCENDING | DATA
  specifies the ordering of bars within a group.

Label options

DATALABEL <= variable>
  displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
  specifies the appearance of the labels in the plot when you use the DATALABEL= option.

DATALABELPOS= DATA | BOTTOM | TOP
  specifies the location of the data label.
Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= "text-string"
specifies the label that identifies the bar chart in the legend.

NAME= "text-string"
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed.

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Required Arguments

CATEGORY= category-variable
specifies the variable that categorizes the data. All values are treated as discrete values. The input data for this variable should contain unique values. When the category values are not unique, a warning is logged, and multiple bars are superimposed at the duplicated category values.

The CATEGORY axis is always discrete.

RESPONSE= numeric-variable
specifies a numeric response variable. The input data is expected to be pre-summarized computed values (sum, mean, and so on).

Optional Arguments

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

Default: .8

1.0 when the GROUP option is specified and GROUPDISPLAY=CLUSTER

Interaction: When the GROUP option is specified, the bar width is determined by the maximum number of bars in any one group cluster. All bars are drawn with the same width, with the cluster being positioned symmetrically around the midpoint.

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the maximum width. Specify a value from 0.0 (narrowest) to 1.0 (widest).

CLUSTERWIDTH is the fraction of the midpoint spacing used by all bars that are clustered around a midpoint (category value). The bar width is applied to the maximum bar spacing divided by the maximum number of bars in any one cluster.
Interaction: This option is applicable only when the GROUP option is specified and when GROUPDISPLAY=CLUSTER.

**DATALABEL <= variable>**

displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

*DATALABELATTRS=GraphLabelText*

*options* can be one or more of the following:

**COLOR= color**
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**FAMILY= “font-family”**
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

*DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)*

Default: The default style element is GraphDataText.
**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DATALABELPOS= DATA | BOTTOM | TOP**

specifies the location of the data label. Specify one of the following values:

- DATA
  places the label on the data primitives (at the upper boundary of the bars).

- BOTTOM
  places the label below the bars.

- TOP
  places the label above the bars.

**Default:** DATA

**Interactions:**

- This option displays limit information when limits are specified. When limits are specified, the default data label position is BOTTOM.
- This option displays group values for each category when GROUP= is also specified.
- This option displays response values for each overlaid chart.
- This option has no effect unless you also specify the DATALABEL option.

**DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN**

specifies a special effect to be used on all filled bars. Specify one of the following (the samples were generated using the HTMLBlue style):

<table>
<thead>
<tr>
<th>None</th>
<th>CRISP</th>
<th>GLOSS</th>
<th>MATTE</th>
<th>PRESSED</th>
<th>SHEEN</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="None" /></td>
<td><img src="image" alt="Crisp" /></td>
<td><img src="image" alt="Gloss" /></td>
<td><img src="image" alt="Matte" /></td>
<td><img src="image" alt="Pressed" /></td>
<td><img src="image" alt="Sheen" /></td>
</tr>
</tbody>
</table>

**Default:** NONE

**Interactions:**
This option has no effect if the applied style uses a fill pattern and FILL is disabled for the style. If the style has both FILL and FILLPATTERN enabled, data skins will work. For more information about fill patterns, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636. For instructions about viewing the contents of style templates, see “About Styles and Style Elements” on page 620.

This option has no effect if you also specify NOFILL.

**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all bars from the category midpoints. Specify a value from -0.5 (left offset) to +0.5 (right offset).

*Default:* 0.0 (no offset)

**FILL | NOFILL**

specifies whether the bars are filled. The FILL option shows the fill color for the bars. The NOFILL option hides the fill color for the bars.

*Default:* FILL

**Interactions:**

Specifying FILL also hides the outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.

**FILLATTRS= style-element | (COLOR= color)**

specifies the appearance of the fill for the bars. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

*Default:* For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the Color attribute of the GraphData1... GraphData n style elements in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

**GROUP= variable**

specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPORDER= ASCENDING | DESCENDING | DATA**

specifies the ordering of bars within a group.

**ASCENDING**

displays each group in ascending group value.

**DESCENDING**

displays each group in descending group value.

**DATA**

displays each group in data order of the group variable.

*Interaction:* This option is ignored unless GROUP= is specified.

**LEGENDLABEL= “text-string”**

specifies the label that identifies the bar chart in the legend. By default, the label of the RESPONSE= variable is used. If there is no response variable label, the name of the response variable is used.

*Interaction:* The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.
LIMITATTRS= style-element *(options)* | *(options)*
specifies the appearance of the limit lines in the plot. You can specify the appearance
by using a style element or by using suboptions. If you specify a style element, you
can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

COLOR= *color*
specifies the color of the line. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see
“Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference.*

**Default:** The default color is specified by the ContrastColor attribute of the
GraphError style element in the current style.

PATTERN= *line-pattern*
specifies the line pattern for the line. You can reference SAS patterns by number
or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** The default line pattern is specified by the LineStyle attribute of the
GraphError style element in the current style.

THICKNESS= *n* *<units>*
specifies the thickness of the line. You can also specify the unit of measure. The
default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of
the GraphError style element in the current style.

LIMITLOWER= *numeric-variable*
specifies values for the lower endpoints on the limit lines. Limit lines are displayed
as line segments with a serif at the end.

**Default:** The lower segments of the limit lines are not displayed. (Limit lines are
displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

**Interactions:**
If LIMITUPPER= is also specified, then the plot displays the lower and upper
segments of the limit lines.
This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
The appearance of the limit lines can be controlled by the LIMITATTRS= option.

LIMITUPPER= *numeric-variable*
specifies values for the upper endpoints on the limit lines. Limit lines are displayed
as line segments with a serif at the end.

**Default:** The upper segments of the limit lines are not displayed. (Limit lines are
displayed only if either LIMITLOWER= or LIMITUPPER= is specified.)

**Interactions:**
If LIMITLOWER= is also specified, then the plot displays the lower and upper
segments of the limit lines.
This option is ignored if GROUP= is specified and GROUPDISPLAY=STACK.
The appearance of the limit lines can be controlled by the LIMITATTRS= option.

MISSING
processes missing values as a valid category value and creates a bar for it.

NAME= “*text-string*”
specifies a name for the plot. You can use the name to refer to this plot in other
statements.
Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

OUTLINE | NOOUTLINE
specifies whether the bars have outlines. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

Default: OUTLINE

Interactions:
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the bars and limits, if displayed. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

VBOX Statement
Creates a vertical box plot that shows the distribution of your data.

Interaction: The VBOX statement cannot be used together with other plot statements in the SGPLOT procedure. Box plots can be overlaid with other box plots. However, overlaid box plots must have the same category variables.

Example: “About Box Plots” on page 37

Syntax
VBOX analysis-variable </option(s)>;

Summary of Optional Arguments

Box options

BOXWIDTH= numeric-value
specifies the width of the box.

CAPSHAPE= BRACKET | LINE | SERIF
specifies the shape of the whisker cap lines.

CONNECT= MEAN | MEDIAN | Q1 | Q3 | MIN | MAX
specifies that a connect line joins a statistic from box to box.

CONNECTATTRS= style-element <(options)> | (options)
specifies the appearance of the lines that connect multiple boxes.

DISCRETEOFFSET= numeric-value
specifies an amount to offset all boxes from the discrete tick marks.

EXTREME
specifies that the whiskers can extend to the maximum and minimum values for the analysis variable, and that outliers are not identified.

FILL | NOFILL
specifies whether the boxes are filled with color.

FILLATTRS= style-element | (COLOR= color)
specifies the appearance of the fill for the boxes.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the box outlines.

MEANATTRS= style-element <(options)> | (options)
specifies the appearance of the marker that represents the mean in the box.

MEDIANATTRS= style-element <(options)> | (options)
specifies the appearance of the line that represents the median.

NOCAPS
hides the cap lines for the whiskers.

NOMEAN
hides the mean marker.

NOMEDIAN
hides the median line.

NOOUTLIERS
hides the outliers from the plot.

NOTCHES
specifies that the boxes be notched.

OUTLIERATTRS= style-element <(options)> | (options)
specifies the appearance of the marker that represents the outliers.

WHISKERATTRS= style-element <(options)> | (options)
specifies the appearance of the whisker and cap lines.

Group options

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the midpoint spacing.

GROUP= variable
specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped boxes.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of boxes within a group.

Label options

DATALABEL <= variable>
adds data labels for the outlier markers.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

LABELFAR
specifies that only the far outliers have data labels.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

CATEGORY= category-variable
specifies the category variable for the plot.

FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.

LEGENDLABEL= “text-string”
specifies a label that identifies the box plot in the legend.

MISSING
processes missing values as a valid category value and creates a box for it.

NAME= “text-string”
specifies a name for the plot.

PERCENTILE= 1 | 2 | 3 | 4 | 5
specifies a method for computing the percentiles for the plot.

SPREAD
relocates outlier points that have identical values to prevent overlapping.

TRANSPARENCY= value
specifies the degree of transparency for the plot.

X2AXIS
assigns the category variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the response variable to the secondary (right) vertical axis.

**Required Argument**

*analysis-variable*
specifies the analysis variable for the plot. If you do not specify the CATEGORY= option, then one box is created for the analysis variable.

**Optional Arguments**

ATTRID= variable
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

BOXWIDTH= numeric-value
specifies the width of the box. Specify a value between 0.0 (0% of the available width) and 1.0 (100% of the available width).

Default: 0.4
When GROUP is specified, the default box width is 0.6.

CAPSHAPE= BRACKET | LINE | SERIF
specifies the shape of the whisker cap lines. Specify one of the following values:

BRACKET
displays a straight line with brackets.

LINE
displays a straight line.

SERIF
displays a short straight line.
CATEGORY= category-variable
specifies the category variable for the plot. A box plot is created for each distinct value of the category variable.

If you explicitly set the category axis type to LINEAR and use a numeric category variable, the box plot becomes an interval plot. Otherwise, the box plot is discrete.

CLUSTERWIDTH= numeric-value
specifies the cluster width as a ratio of the midpoint spacing. Specify a value from 0.1 (narrowest) to 1.0 (widest).

Default: 0.7

Interaction: This option is applicable only when a GROUP is in effect and the category axis is discrete.

CONNECT= MEAN | MEDIAN | Q1 | Q3 | MIN | MAX
specifies that a connect line joins a statistic from box to box.

Interaction: This option applies only when the CATEGORY option is used to generate multiple boxes.

Tip: You can use the CONNECTATTRS option to specify attributes for the connect line.

CONNECTATTRS= style-element <(options)> | (options)
specifies the appearance of the lines that connect multiple boxes. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: CONNECTATTRS=GraphData3

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphConnectLine style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphConnectLine style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThick attribute of the GraphConnectLine style element in the current style. For grouped data, the default line thickness is specified by the LineThick attribute of the GraphData1 ... GraphData n style elements in the current style.

Here is an example expression:

CONNECTATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)
Default: The default style element is GraphConnectLine.

Interactions:
This option takes effect only if the CONNECT= option is also specified.
This option is ignored if the GROUP= option is also specified.

**DATALABEL <= variable>
adds data labels for the outlier markers. If you specified a variable, then the values for that variable are used for the data labels. If you did not specify a variable, then the values of the analysis variable are used.

**Note:** This option has no effect unless the plot contains outlier points.

**DATALABELATTRS= style-element <(options)> | (options)
**specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

DATALABELATTRS=GraphLabelText

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY= “font-family”**
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

**SIZE= n <units>**
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

**Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

**Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
**VBOX Statement**

**Default:** The default style element is GraphDataText.

**Interaction:** This option has no effect unless the DATALABEL option is also specified.

**DISCRETEOFFSET=** numeric-value

specifies an amount to offset all boxes from the discrete tick marks.

Specify a value from -0.5 (left offset) to +0.5 (right offset). If you specify a value outside of this range, an error message appears in the SAS log and the graph is not produced.

**Default:** 0.0 (no offset)

**EXTREME**

specifies that the whiskers can extend to the maximum and minimum values for the analysis variable, and that outliers are not identified. When you do not specify the EXTREME option, the whiskers cannot be longer than 1.5 times the length of the box.

**FILL | NOFILL**

specifies whether the boxes are filled with color. The FILL option shows the fill color. The NOFILL option hides the fill color.

**Default:** FILL

**FILLATTRS=** style-element | (COLOR= color)

specifies the appearance of the fill for the boxes. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\(n\) style elements in the current style.

**Interaction:** This option has no effect if you also specify the NOFILL option.

**FREQ=** numeric-variable

specifies how many times observations are repeated for computational purposes. specifies that each observation is repeated \(n\) times for computational purposes, where \(n\) is the value of the numeric variable. If \(n\) is not an integer, then it is truncated to an integer. If \(n\) is less than 1 or missing, then it is excluded from the analysis.

**Interaction:** If your plot is overlaid with other categorization plots, then the first FREQ variable that you specified is used for all of the plots.

**GROUP=** variable

specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

**GROUPDISPLAY=** CLUSTER | OVERLAY

specifies how to display grouped boxes.

**CLUSTER**

the boxes are drawn adjacent to each other.

**OVERLAY**

all the boxes for a given group value are drawn at the exact coordinate and might overlap. Each group is represented by unique visual attributes derived from the GraphData1... GraphData\(n\) style elements in the current style.

**Default:** CLUSTER for a discrete category axis
OVERLAY for a linear axis

**Restriction:** GROUPDISPLAY=CLUSTER can take effect only when the category axis is discrete.

**Interaction:** This option is ignored unless GROUP= is specified.

**GROUPORDER=** ASCENDING | DESCENDING | DATA

specifies the ordering of boxes within a group.

- **ASCENDING** displays each group in ascending group value.
- **DESCENDING** displays each group in descending group value.
- **DATA** displays each group in data order of the group variable.

**Interaction:** This option is ignored unless GROUP= is specified.

**LABELFAR** specifies that only the far outliers have data labels. Far outliers are points whose distance from the box is more than three times the length of the box.

**Note:** This option has no effect if you do not specify the DATALABEL option, or if there are no far outliers.

**LEGENDLABEL=** "text-string"

specifies a label that identifies the box plot in the legend. By default, the label of the analysis variable is used.

**LINEATTRS= style-element <(options)> | (options)**

specifies the appearance of the box outlines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element: `LINEATTRS=GraphData3`

For more information about style elements, see “Style Elements for Use with ODS Graphics” on page 640.

**options** can be one or more of the following:

- **COLOR=** color specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

  **Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

- **PATTERN=** line-pattern specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

  **Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphDataN style elements in the current style.

- **THICKNESS=** n <units> specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

Here is an example expression:

```
LINEATTRS=(Color= "light green" Pattern= MediumDash Thickness= 4)
```

**Default:** For ungrouped data, line attributes are derived from the GraphDataDefault style element. For grouped data, the ContrastColor attribute of the GraphData1 ... GraphData$n$ style elements are used.

**Interactions:**

This option takes effect only if the CONNECT= option is also specified.

This option is ignored if the GROUP= option is also specified.

**MEANATTRS= style-element <(options)> | (options)**

specifies the appearance of the marker that represents the mean in the box. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

- **COLOR= color**
  specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
  
  **Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxMean style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

- **SIZE= n <units>**
  specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  
  **Default:** The default marker size is specified by the MarkerSize attribute of the GraphBoxMean style element in the current style.

- **SYMBOL= symbol-name**
  specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.
  
  **Default:** For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphBoxMean style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

- **WEIGHT= NORMAL | BOLD**
  specifies the marker weight of the marker.
  
  **Default:** NORMAL

  **Default:** GraphBoxMean is the default style element.

**MEDIANATTRS= style-element <(options)> | (options)**

specifies the appearance of the line that represents the median. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.
options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxMedian style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\_n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphBoxMedian style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData\_n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphBoxMedian style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\_n style elements in the current style.

**Default:** GraphBoxMedian is the default style element.

**Interaction:** This option is ignored if the NOMEDIAN option is also specified.

MISSING
processes missing values as a valid category value and creates a box for it.

NAME= “text-string”
specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOCAPS
hides the cap lines for the whiskers.

NOMEAN
hides the mean marker.

NOMEDIAN
hides the median line.

NOOUTLIERS
hides the outliers from the plot.

NOTCHES
specifies that the boxes be notched. The endpoints of the notches are at the following computed locations:

\[ \text{median} \pm 1.58 \left( \frac{IQR}{\sqrt{N}} \right) \]

For a visual description of the parts of a box plot, see “Details” on page 446.
OUTLIERATTRS= style-element <(options)> | (options)
specifies the appearance of the marker that represents the outliers. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphOutlier style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphOutlier style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphOutlier style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData n style elements in the current style.

WEIGHT= NORMAL | BOLD
specifies the marker weight of the marker.

Default: NORMAL

Default: GraphOutlier is the default style element.

PERCENTILE= 1 | 2 | 3 | 4 | 5
specifies a method for computing the percentiles for the plot. For descriptions of each method, see “Calculating Percentiles” in the UNIVARIATE Procedure chapter of Base SAS Procedures Guide: Statistical Procedures.

Default: 5

SPREAD
relocates outlier points that have identical values to prevent overlapping.

Note: This option has no effect if your data does not contain two or more outliers with identical values for the analysis variable.

TRANSPARENCY= value
specifies the degree of transparency for the plot. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

WHISKERATTRS= style-element <(options)> | (options)
specifies the appearance of the whisker and cap lines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:
COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphBoxWhisker style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

**Default:** GraphBoxWhisker is the default style element.

**Interaction:** This option is ignored if the NOMEDIAN option is also specified.

X2AXIS
assigns the category variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the response variable to the secondary (right) vertical axis.

**Details**
Horizontal and vertical box plots display the distribution of data by using a rectangular box and whiskers. Whiskers are lines that indicate a data range outside of the box.
Figure 7.4 on page 447 shows a diagram of a vertical box plot. The bottom and top edges of the box indicate the intra-quartile range (IQR). That is, the range of values between the first and third quartiles (the 25th and 75th percentiles). The marker inside the box indicates the mean value. The line inside the box indicates the median value.

The elements that are outside the box are dependent on your options. By default, the whiskers that extend from each box indicate the range of values that are outside of the intra-quartile range. However, the values are close enough not to be considered outliers (a distance less than or equal to 1.5*IQR). If you specify the EXTREME option, then the whiskers indicate the entire range of values, including outliers.

Any points that are a distance of more than 1.5*IQR from the box are considered to be outliers. By default, these points are indicated by markers. If you specify DATALABEL= option, then the outlier points have data labels. If you also specify the LABELFAR option, then only outliers that are 3*IQR from the box have data labels.

VECTOR Statement

Creates a vector plot that draws arrows from a point of origin to each data point.

Example:  "About Vector Plots" on page 31

Syntax

VECTOR X= numeric-variable Y= numeric-variable </ option(s)>;
Summary of Optional Arguments

Group options

GROUP= variable
specifies a variable that is used to group the data.

Label options

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

Plot options

ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

LEGENDLABEL= “text-string”
specifies a label that identifies the vector plot in the legend.

NAME= “text-string”
specifies a name for the plot.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the lines.

X2AXIS
assigns the X variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the Y variable to the secondary (right) vertical axis.

Vector options

ARROWDIRECTION= IN | OUT | BOTH
specifies the location of the arrowheads for the vectors.

ARROWHEADSHAPE= shape
specifies the shape of the arrowheads for the vectors.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the vector line.

NOARROWHEADS
removes the arrowheads from the vectors.

NOMISSINGGROUP
specifies that missing values of the group variable are not included in the plot.

XORIGIN= numeric-value | numeric-variable
specifies the X coordinate of the origin for the vectors.

YORIGIN= numeric-value | numeric-variable
specifies the Y coordinate of the origin for the vectors.

Required Arguments

X= numeric-variable
specifies a numeric variable for the x axis.

Y= numeric-variable
specifies numeric variable for the y axis.
**Optional Arguments**

**ARROWDIRECTION**= IN | OUT | BOTH

specifies the location of the arrowheads for the vectors. Specify one of the following:

- **IN** places the arrowheads at the origin of the vector.
- **OUT** places the arrowheads at the ending point of the vector.
- **BOTH** places arrowheads at both the origin and the ending point of the vector.

**Default:** OUT

**ARROWHEADSHAPE**= shape

specifies the shape of the arrowheads for the vectors. Specify one of the following:

- **OPEN** resembles the letter "V":

- **CLOSED**

- **FILLED** a solid triangle.

- **BARBED** a solid triangle with an indent at the base.

**Default:** OPEN

**ATTRID**= variable

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**DATALABEL <= variable>=

displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, then the values of the Y variable are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

**DATALABELATTRS=GraphLabelText**

**options** can be one or more of the following:

**COLOR**= color

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data,
default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.

Interaction: This option has no effect unless the DATALABEL option is also specified.

GROUP= variable
specifies a variable that is used to group the data. The plot elements for each group value are automatically distinguished by different visual attributes.

LEGENDLABEL= “text-string”
specifies a label that identifies the vector plot in the legend. By default, the label of the Y variable or the group value for each plot element is used.

Interaction: The LEGENDLABEL= option has no effect if you also specify the GROUP= option in the same plot statement.

LINEATTRS= style-element <(options)> | (options)
specifies the appearance of the vector line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData style elements in the current style.
PATTERN= line-pattern
  specifies the line pattern for the line. You can reference SAS patterns by number
  or by name. For a list of line patterns, see “Line Patterns” on page 663.

  Default: For ungrouped data, the default line pattern is specified by the
  LineStyle attribute of the GraphDataDefault style element in the current style.
  For grouped data, the default line pattern is specified by the LineStyle
  attribute of the GraphData1 ... GraphData style elements in the current style.

THICKNESS= n <units>
  specifies the thickness of the line. You can also specify the unit of measure. The
  default unit is pixels. For a list of measurement units that are supported, see
  “Units of Measurement” on page 659.

  Default: For ungrouped data, the default line thickness is specified by the
  LineThickness attribute of the GraphDataDefault style element in the current
  style. For grouped data, the default line thickness is specified by the
  LineThickness attribute of the GraphData1 ... GraphData style elements in
  the current style.

NAME= “text-string”
  specifies a name for the plot. You can use the name to refer to this plot in other
  statements.

  Note: The name is case-sensitive. When you refer to the specified name in other
  statements, you must use the same exact capitalization.

NOARROWHEADS
  removes the arrowheads from the vectors.

NOMISSINGGROUP
  specifies that missing values of the group variable are not included in the plot.

TRANSPARENCY= numeric-value
  specifies the degree of transparency for the lines. Specify a value from 0.0
  (completely opaque) to 1.0 (completely transparent).

  Default: 0.0

X2AXIS
  assigns the X variable to the secondary (top) horizontal axis.

XORIGIN= numeric-value | numeric-variable
  specifies the X coordinate of the origin for the vectors. You can specify either a
  numeric value or a numeric variable.

  Default: 0

Y2AXIS
  assigns the Y variable to the secondary (right) vertical axis.

YORIGIN= numeric-value | numeric-variable
  specifies the Y coordinate of the origin for the vectors. You can specify either a
  numeric value or a numeric variable.

  Default: 0

**VLINE Statement**

Creates a vertical line chart (the line is horizontal). You can use the VLINE statement with the VBAR statement to create a bar-line chart.
Interaction: The VLINE statement can be combined only with other categorization plot statements in the SGPLOT procedure. See “Plot Type Compatibility” on page 277.

Examples: “About Line Charts” on page 47
“Example 10: Creating a Bar-Line Chart” on page 509

Syntax
VLINE category-variable < / option(s)>;

Summary of Optional Arguments

Group options
CLUSTERWIDTH= numeric-value
specifies the width of the group clusters as a fraction of the midpoint spacing.

GROUP= variable
specifies a variable that is used to group the data.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped lines.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of lines within a group.

Label options
CURVELABEL <"text-string”>
adds a label for the line plot.

CURVELABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the CURVELABEL= option.

CURVELABELLOC= OUTSIDE | INSIDE
specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

CURVELABELPOS= AUTO | END | MAX | MIN | START
specifies the location of the curve label.

DATALABEL <= variable>
displays a label for each data point.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option.

DATALABELPOS= DATA | BOTTOM | TOP
specifies the location of the data label.

Limit options
LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot.

LIMITS= BOTH | LOWER | UPPER
adds limit lines to the plot.

LIMITSTAT= CLM | STDDEV | STDERR
specifies the statistic for the limit lines.

Line options
BREAK
creates a break in the line for each missing value of the response variable.

**DISCRETEOFFSET= numeric-value**

specifies an amount to offset all lines from discrete category values.

**LINEATTRS= style-element (options) | (options)**

specifies the appearance of the lines in the line plot.

**MARKERATTRS= style-element (options) | (options)**

specifies the appearance of the markers in the plot.

**MARKERS**

adds markers to the plot.

**MISSING**

processes missing values as a valid category value and creates a line for it.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**NUMSTD= n**

specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR.

**RESPONSE= response-variable**

specifies a numeric response variable for the plot.

**STAT= FREQ | MEAN | SUM**

specifies the statistic for the vertical axis.

**Plot options**

**ALPHA= numeric-value**

specifies the confidence level for the confidence limits.

**ATTRID= variable**

specifies the value of the ID variable in an attribute map data set.

**CATEGORYORDER= RESPASC | RESPDESC**

specifies the order in which the response values are arranged.

**FREQ= numeric-variable**

specifies how many times observations are repeated for computational purposes.

**LEGENDLABEL= “text-string”**

specifies the label that identifies the line plot in the legend.

**NAME= “text-string”**

specifies a name for the plot.

**TRANSPARENCY= numeric-value**

specifies the degree of transparency for the lines and markers.

**URL= character-variable**

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**WEIGHT= numeric-variable**

specifies how observations are weighted.

**X2AXIS**

assigns the category variable to the secondary (top) horizontal axis.

**Y2AXIS**

assigns the response variable to the secondary (right) vertical axis.

**Required Argument**

**category-variable**

specifies the variable that classifies the observations into distinct subsets.
Optional Arguments

**ALPHA= numeric-value**
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

*Default:* 0.05

*Interactions:* This option has no effect if you do not specify LIMITSTAT=CLM.
If your plot is overlaid with other categorization plots, then the first ALPHA value that you specify is used for all of the plots.

**ATTRID= variable**
specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

**BREAK**
creates a break in the line for each missing value of the response variable.

*Notes:*
The observation is excluded from the graph when there is a missing value for the category variable without the specification of the MISSING option. (No break occurs in the line.)
The observation is excluded from the graph when there is a missing value for the FREQ variable.

**CATEGORYORDER= RESPASC | RESPDESC**
specifies the order in which the response values are arranged. Specify one of the following values:

- **RESPASC** sorts the response values in ascending order.
- **RESPDESC** sorts the response values in descending order.

*Default:* By default, the plot is sorted in ascending order based on the category values.

*Restrictions:* This option takes effect only when the plot statement specifies a response variable and the axis for that variable is numeric. If the axis is not numeric, an error is generated and a message is written to the SAS log.
Uniform scaling and response sorting cannot occur on the same axis. If the UNIFORM= option is used in the SGPLOT statement, the UNIFORM option is ignored for the sorted response axis and a note is generated in the log. The UNIFORM= option is applied to the other axes and groups if requested. Note that the UNIFORM= option can selectively apply scaling to only the X or Y axis

*Interaction:* If a group variable is specified in the plot statement, the response sort option is ignored and a note is generated in the log. (You can use a BY statement in the procedure if you want to group data.)

*Note:* If CATEGORYORDER is specified in multiple statements, the procedure sorts by the last statement in which it is specified.

**CLUSTERWIDTH= numeric-value**
specifies the width of the group clusters as a fraction of the midpoint spacing. Specify a value from 0.0 (narrowest) to 1.0 (widest).

*Default:* 0.8
**Interaction:** This option is applicable only when the GROUP option is specified, when GROUPDISPLAY=CLUSTER, and when the category axis is discrete.

**CURVELABEL <"text-string"**>
adds a label for the line plot. You can also specify the label text. If you do not specify a label, the label from the response variable is used.

**CURVELABELATTRS= style-element <(options)> | (options)**
specifies the appearance of the labels in the plot when you use the CURVELABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
```
CURVELABELATTRS=GraphTitleText
```

Options can be one or more of the following:

**COLOR= color**
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData$n$ style elements in the current style.

**FAMILY= "font-family"**
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE= n <units>**
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE= ITALIC | NORMAL**
specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.

**WEIGHT= BOLD | NORMAL**
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphValueText style element in the current style.

Here is an example expression:
```
CURVELABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

**Default:** The default style element is GraphValueText.

**Interaction:** This option has no effect unless the CURVELABEL option is also specified.
**CURVELABELLOC= OUTSIDE | INSIDE**

specifies whether the curve label is placed inside the plot axes (INSIDE) or outside of the plot axes (OUTSIDE).

**Default:** INSIDE

**CURVELABELPOS= AUTO | END | MAX | MIN | START**

specifies the location of the curve label. Specify one of the following values:

- **AUTO**
  places the curve label outside the plot area near the end of the curve along unused axes whenever possible (typically Y2 or X2).

  **Interaction:** This value takes effect only when CURVELABELLOC=OUTSIDE.

- **END**
  places the curve label at the last point on the curve.

- **MAX**
  places the label at the part of the curve closest to the maximum X axis value.

- **MIN**
  places the label at the part of the curve closest to the minimum X axis value.

- **START**
  places the curve label at the first point on the curve.

**Default:** END

**Interactions:**

This option has no effect unless the CURVELABEL option is also specified.

The START and END suboptions take effect only when CURVELABELLOC=INSIDE.

**DATALABEL <= variable>**

displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

**DATALABELATTRS= style-element <(options)> | (options)**

specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:

**DATALABELATTRS=GraphLabelText**

**options** can be one or more of the following:

**COLOR= color**

specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphDataText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.
FAMILY= "font-family"
  specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

  **Default:** The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
  specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

  **Default:** The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
  specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

  **Default:** The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
  specifies whether the label characters are bold (BOLD) or normal (NORMAL).

  **Default:** The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:

```
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)
```

  **Default:** The default style element is GraphDataText.

  **Interaction:** This option has no effect unless the DATALABEL option is also specified.

DATALABELPOS= DATA | BOTTOM | TOP
  specifies the location of the data label. Specify one of the following values:

  **DATA**
  places the label at the data points of the lines.

  **BOTTOM**
  places the label below the lines.

  **TOP**
  places the label above the lines.

  **Default:** DATA

  **Interactions:**
  This option displays limit information when limits are specified. When limits are specified, the default data label position is BOTTOM.
  This option displays group values for each category when GROUP= is also specified.
  This option displays response values for each overlaid chart.
  This option has no effect unless you also specify the DATALABEL option.

DISCRETEOFFSET= numeric-value
  specifies an amount to offset all lines from discrete category values. Specify a value from -0.5 (left offset) to +0.5 (right offset).

  **Default:** 0.0 (no offset)

  **Requirement:** This option is applicable only when the category axis is discrete.
FREQ= numeric-variable
specifies how many times observations are repeated for computational purposes.
specifies that each observation is repeated \( n \) times for computational purposes, where
\( n \) is the value of the numeric variable. If \( n \) is not an integer, then it is truncated to an
integer. If \( n \) is less than 1 or missing, then it is excluded from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first
FREQ variable that you specified is used for all of the plots.

GROUP= variable
specifies a variable that is used to group the data. A separate plot is created for each
unique value of the grouping variable. The plot elements for each group value are
automatically distinguished by different visual attributes.

Interaction: If you specify more than one categorization plot statement, then all of
the plots must specify the same GROUP variable. If you do not specify the same
GROUP= option for all of the categorization plots, then the GROUP= option has
no effect.

GROUPDISPLAY= CLUSTER | OVERLAY
specifies how to display grouped lines.

CLUSTER
grouped items are drawn adjacent to each other.

OVERLAY
grouped items are drawn at the exact coordinate and might overlap. Each group
is represented by unique visual attributes derived from the GraphData1...
GraphData\( n \) style elements in the current style.

Default: OVERLAY

Restriction: GROUPDISPLAY=CLUSTER can take effect only when the category
axis is discrete. If necessary, use a TYPE=DISCRETE option on the axis
statement.

Interaction: This option is ignored unless GROUP= is specified.

GROUPORDER= ASCENDING | DESCENDING | DATA
specifies the ordering of lines within a group.

ASCENDING
displays each group in ascending group value.

DESCENDING
displays each group in descending group value.

DATA
displays each group in data order of the group variable.

Interaction: This option is ignored unless GROUP= is specified.

LEGENDLABEL= "text-string"
specifies the label that identifies the line plot in the legend. By default, the label of
the response variable is used. If there is no response variable label, then the name of
the response variable and the computed statistic (SUM or MEAN) are used. If you do
not specify a response variable, then the legend label is “Frequency”.

Interaction: The LEGENDLABEL= option has no effect if you also specify the
GROUP= option in the same plot statement.

LIMITATTRS= style-element <(options)> | (options)
specifies the appearance of the limit lines in the plot. You can specify the appearance
by using a style element or by using suboptions. If you specify a style element, you
can also specify suboptions to override specific appearance attributes.
options can be one or more of the following:

**COLOR= color**

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** The default color is specified by the ContrastColor attribute of the GraphError style element in the current style.

**PATTERN= line-pattern**

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** The default line pattern is specified by the LineStyle attribute of the GraphError style element in the current style.

**THICKNESS= n <units>**

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**LIMITS= BOTH | LOWER | UPPER**

adds limit lines to the plot. Specify one of the following values:

**BOTH**

adds lower and upper limit lines to the plot.

**LOWER**

adds lower limit lines to the plot.

**UPPER**

adds upper limit lines to the plot.

By default, no limit lines are displayed. However, if you specify the LIMITSTAT= option, then the default is BOTH.

**Interaction:** Limit lines are displayed only when you specify STAT= MEAN.

**LIMITSTAT= CLM | STDDEV | STDERR**

specifies the statistic for the limit lines. Specify one of the following statistics:

**CLM**

confidence limits

**STDDEV**

standard deviation

**STDERR**

standard error

**Default:** CLM

**Interaction:** If you specify the LIMITSTAT= option, then the default value for the LIMITS= option is BOTH.

**LINEATTRS= style-element <(options)> | (options)**

specifies the appearance of the lines in the line plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:
COLOR= color
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphDataDefault style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n<units>
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphDataDefault style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. This option has no effect unless you also specify the MARKERS option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the
MARKERS
adds markers to the plot.

MISSING
processes missing values as a valid category value and creates a line for it.

NAME= "text-string"
specifies a name for the plot. You can use the name to refer to this plot in other statements.

Note: The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

NOSTATLABEL
removes the statistic name from the axis and legend labels.

NUMSTD= n
 specifies the number of standard units for the limit lines, when you specify LIMITSTAT= STDDEV or LIMITSTAT= STDERR. You can specify any positive number, including decimals.

Default: 1

RESPONSE= response-variable
 specifies a numeric response variable for the plot. The summarized values of the response variable are displayed on the vertical axis.

STAT= FREQ | MEAN | SUM
 specifies the statistic for the vertical axis. Specify one of the following statistics:

FREQ
the frequencies for the category variable. This is the default value when you do not specify the RESPONSE= option.

MEAN
the mean of the response variable.

SUM
the sum of the response variable. This is the default value when you specify the RESPONSE= option.

Interaction: If you do not specify the RESPONSE= option, then only FREQ can be used. If you specify RESPONSE=, then you can use either SUM or MEAN.

TRANSPARENCY= numeric-value
 specifies the degree of transparency for the lines and markers. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

URL= character-variable
 specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

Default: By default, no HTML links are created.

Interactions:
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.
WEIGHT= numeric-variable
specifies how observations are weighted. Each observation is weighted by a factor of
w for computational purposes, where w is the value of the numeric variable. w can be
any numeric value. If w is 0, negative or missing, then that observation is excluded
from the analysis.

Interaction: If your plot is overlaid with other categorization plots, then the first
WEIGHT variable that you specified is used for all of the plots.

X2AXIS
assigns the category variable to the secondary (top) horizontal axis.

Y2AXIS
assigns the response variable to the secondary (right) vertical axis.

WATERFALL (Preproduction) Statement
Creates a waterfall chart computed from input data. In the chart, bars represent an initial value of Y and a
series of intermediate values identified by X leading to a final value of Y.

Example: “About Waterfall Charts (Preproduction)” on page 49

Syntax
WATERFALL CATEGORY=variable RESPONSE= numeric-variable < / option(s)>;

Summary of Optional Arguments

Bar options
BARWIDTH= numeric-value
specifies the width of the bars as a ratio of the maximum possible width.

COLORGROUP= variable
specifies a variable that is used to discretely color the bars.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN
specifies a special effect to be used on all filled bars.

FILL | NOFILL
specifies whether the bars are filled.

FILLATTRS= style-element | (COLOR= color)
specifies the color of the fill for the bars.

FINALBARATTRS= style-element | (COLOR= color)
specifies the appearance of the final bar, if displayed.

FINALBARTICKVALUE= “text-string”
specifies the tick value used on the X axis for the final bar, if displayed.

INITIALBARATTRS= style-element | (COLOR= color)
specifies the appearance of the initial bar, if displayed.

INITIALBARTICKVALUE= “text-string”
specifies the tick value used on the X axis for the initial bar, if displayed.

INITIALBARVALUE= number
specifies the value of the initial bar.

MISSING
processes missing values as a valid category value and creates a bar for it.

OUTLINE | NOOUTLINE
specifies whether the bars have outlines.

\texttt{STAT= MEAN | SUM}

specifies the statistic for the response axis.

\textbf{Label options}

\texttt{DATALABEL <= variable>}

displays a label for each data point.

\texttt{DATALABELATTRS= style-element <(options)> | (options)}

specifies the appearance of the labels in the plot when you use the \texttt{DATALABEL=} option.

\textbf{Plot options}

\texttt{ATTRID= variable}

specifies the value of the ID variable in an attribute map data set.

\texttt{NAME= “text-string”}

specifies a name for the plot.

\texttt{TRANSPARENCY= numeric-value}

specifies the degree of transparency for the bars.

\texttt{URL= character-variable}

specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

\texttt{X2AXIS}

assigns the variables that are assigned to the primary (bottom) horizontal axis to the secondary (top) horizontal axis.

\texttt{Y2AXIS}

assigns the variables that are assigned to the primary (left) vertical axis to the secondary (right) vertical axis.

\textbf{Required Arguments}

\texttt{CATEGORY= variable}

specifies the variable for the category values. Duplicated category values are summarized into a unique value. All values are treated as discrete.

\texttt{RESPONSE= numeric-variable}

specifies the variable for the response values.

\textbf{Optional Arguments}

\texttt{ATTRID= variable}

specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

\texttt{BARWIDTH= numeric-value}

specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the distance between the center of each bar and the centers of the adjacent bars. Specify a value from 0.0 (narrowest) to 1.0 (widest).

For example, if you specify a width of 1, then there is no space between the bars. If you specify a width of .5, then the width of the bars is equal to the space between the bars.

\texttt{Default:} .8
COLORGROUP= variable
specifies a variable that is used to discretely color the bars. Once the variable values are found, the transaction bar colors are taken from the GraphData1...GraphData n style elements in the current style. If the transaction bars are filled, then the COLOR attribute is used for the fill. The CONTRASTCOLOR attribute is used for the transaction bar outlines.

DATALABEL <= variable>
displays a label for each data point. If you specify a variable, then the values of that variable are used for the data labels. If you do not specify a variable, then the values of the calculated response are used for the data labels.

DATALABELATTRS= style-element <(options)> | (options)
specifies the appearance of the labels in the plot when you use the DATALABEL= option. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

Here is an example that specifies a style element:
DATALABELATTRS=GraphLabelText

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: The default color is specified by the Color attribute of the GraphDataText style element in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphDataText style element in the current style.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphDataText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic (ITALIC) or normal (NORMAL).

Default: The default font style is specified by the FontStyle attribute of the GraphDataText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold (BOLD) or normal (NORMAL).

Default: The default font weight is specified by the FontWeight attribute of the GraphDataText style element in the current style.

Here is an example expression:
DATALABELATTRS=(Color=Green Family=Arial Size=8 Style=Italic Weight=Bold)

Default: The default style element is GraphDataText.
Interaction: This option has no effect unless the DATALABEL option is also specified.

DATASKIN= NONE | CRISP | GLOSS | MATTE | PRESSED | SHEEN

specifies a special effect to be used on all filled bars. Specify one of the following (the samples were generated using the LISTING style):

<table>
<thead>
<tr>
<th>NONE</th>
<th>CRISP</th>
<th>GLOSS</th>
<th>MATTE</th>
<th>PRESSED</th>
<th>SHEEN</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="NONE" /></td>
<td><img src="image" alt="CRISP" /></td>
<td><img src="image" alt="GLOSS" /></td>
<td><img src="image" alt="MATTE" /></td>
<td><img src="image" alt="PRESSED" /></td>
<td><img src="image" alt="SHEEN" /></td>
</tr>
</tbody>
</table>

Default: NONE

Interaction: This option has no effect if you specify the NOFILL option.

FILL | NOFILL

specifies whether the bars are filled. The FILL option shows the fill color for the bars. The NOFILL option hides the fill color for the bars.

Default: FILL

Interactions:

Specifying FILL also hides the outlines.

If NOFILL and NOOUTLINE are both specified, then both options are ignored.

FILLATTRS= style-element | (COLOR= color)

specifies the color of the fill for the bars.

You can specify the color of the fill by using a style element or by using the COLOR= suboption. For more information about specifying colors, see “Specifying Colors in SAS/GRAPH Programs” in Chapter 14 of SAS/GRAPH: Reference in the “Using Colors in SAS/GRAPH Programs” chapter in the SAS/GRAPH: Reference

Here is an example that specifies a style element: FILLATTRS=GraphData3

Here is an example that specifies a color name: FILLATTRS= (COLOR= "Very light red")
For ungrouped data, the default color is specified by the Color attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData3 style elements in the current style.

**Interaction:** This option has no effect if you also specify the NOFILL option.

**FINALBARATTRS= style-element | (COLOR= color)**
specifies the appearance of the final bar, if displayed. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** The default color is specified by the Color attribute of the GraphFinal style element in the current style.

**Interaction:** This option has no effect if you specify the NOFILL option.

**FINALBARTICKVALUE= “text-string”**
specifies the tick value used on the X axis for the final bar, if displayed.

**Default:** "Final"

**INITIALBARATTRS= style-element | (COLOR= color)**
specifies the appearance of the initial bar, if displayed. You can specify the color of the fill by using a style element or by using the COLOR= suboption. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** The default color is specified by the Color attribute of the GraphInitial style element in the current style.

**Interactions:**

This option has no effect if you specify the NOFILL option.

This option has no effect unless INITIALBARVALUE is also specified.

**INITIALBARTICKVALUE= “text-string”**
specifies the tick value used on the X axis for the initial bar, if displayed.

**Default:** "Initial"

**Interaction:** This option has no effect unless INITIALBARVALUE is also specified.

**INITIALBARVALUE= number**
specifies the value of the initial bar. When specified, the first transaction bar to be drawn starts at that initial value instead of zero.

**Default:** If the INITIALBARVALUE option is not specified, the initial bar is not included in the chart and the first transaction bar is drawn from zero.

**MISSING**
processes missing values as a valid category value and creates a bar for it.

**NAME= “text-string”**
specifies a name for the plot. You can use the name to refer to this plot in other statements.

**Note:** The name is case-sensitive. When you refer to the specified name in other statements, you must use the same exact capitalization.

**OUTLINE | NOOUTLINE**
specifies whether the bars have outlines. The OUTLINE option shows the outlines. The NOOUTLINE option hides the outlines.

**Default:** OUTLINE
**Interactions:**
Specifying OUTLINE also hides the fill color.
If NOOUTLINE and NOFILL are both specified, then both options are ignored.

**STAT= MEAN | SUM**
specifies the statistic for the response axis. Specify one of the following statistics:

- MEAN-the mean of the response variable.
- SUM-the sum of the response variable.

**Default:** SUM

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the bars. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**URL= character-variable**
specifies a character variable that contains URLs for Web pages to be displayed when parts of the plot are selected within an HTML page.

**Default:** By default, no HTML links are created.

**Interactions:**
This option affects graphics output that is created through the ODS HTML destination only. For more information about ODS destinations, see “Specifying a Destination” on page 649.
This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**X2AXIS**
assigns the variables that are assigned to the primary (bottom) horizontal axis to the secondary (top) horizontal axis.

**Y2AXIS**
assigns the variables that are assigned to the primary (left) vertical axis to the secondary (right) vertical axis.

---

**XAXIS Statement**
Specifies the axis options for the X axis. You can control the features of the axis (for example, the axis label, grid lines, and minor tick marks). You can also control the structure of the axis (for example, the data range, data type, and tick mark values).

**Syntax**

```plaintext
XAXIS option(s);
```

**Summary of Optional Arguments**

**Axis options**

- **DISCRETEORDER= DATA | FORMATTED | UNFORMATTED**
  specifies the order in which discrete tick values are placed on the axis.
DISPLAY= \texttt{ALL} \mid \texttt{NONE} \mid (\textit{options})
specifies which features of the axis are displayed.

FITPOLICY= \textit{policy-value}
specifies the method that is used to fit tick mark values on a horizontal axis
when there is not enough room to draw them normally.

GRID
creates grid lines at each tick on the axis.

INTEGER
specifies that only integers are used for tick mark values.

INTERVAL= \textit{interval-value}
specifies the tick interval for a time axis.

LABEL= “\textit{text-string}”
specifies a label for the axis.

LABELATTRS= \textit{style-element} \langle(\textit{options})\rangle \mid (\textit{options})
specifies the appearance of the axis labels.

LOGBASE= 2 \mid 10 \mid e
specifies the base value for the logarithmic scale.

LOGSTYLE= \texttt{LINEAR} \mid \texttt{LOGEXPAND} \mid \texttt{LOGEXponent}
specifies how to scale and format the values for the major tick marks for
logarithmic axes.

MAX= \textit{numeric-value}
specifies the maximum value for the axis.

MIN= \textit{numeric-value}
specifies the minimum value for the axis.

MINOR
adds minor tick marks to a log or time axis.

NOTIMESPLIT
prevents a time axis from splitting the time, date, or datetime values into two
rows.

OFFSETMAX= \textit{numeric-value}
specifies an offset that follows the highest data value on the axis.

OFFSETMIN= \textit{numeric-value}
specifies an offset that precedes the lowest data value on the axis.

REFTICKS
adds tick marks to axis that is opposite from the specified axis.

REVERSE
specifies that the tick values are displayed in reverse (descending) order.

THRESHOLDMAX= \textit{numeric-value}
Specifies a threshold for displaying one more tick mark at the high end of the
axis.

THRESHOLDMIN= \textit{numeric-value}
Specifies a threshold for displaying one more tick mark at the low end of the
axis.

TICKVALUEFORMAT= \texttt{DATA} \mid \texttt{SAS-format}
specifies the format for the axis tick values.

TYPE= \texttt{DISCRETE} \mid \texttt{LINEAR} \mid \texttt{LOG} \mid \texttt{TIME}
specifies the type of axis.

VALUEATTRS= \textit{style-element} \langle(\textit{options})\rangle \mid (\textit{options})
specifies the appearance of the axis tick value labels.

VALUES= \langle \textit{values-list} \rangle
specifies the values for the ticks on an axis.

**VALUESHINT**

specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option.

### Optional Arguments

**DISCRETEORDER=** **DATA | FORMATTED | UNFORMATTED**

specifies the order in which discrete tick values are placed on the axis. Specify one of the following values:

- **DATA**
  
  places the values in the order in which they appear in the data.

- **FORMATTED**
  
  sorts the formatted values in ascending character order.

- **UNFORMATTED**
  
  sorts the unformatted values in ascending character order.

**Default:** **UNFORMATTED**

**Restriction:** This option affects only box plots, dot plots, bar charts, and line plots, or for any axis where TYPE=DISCRETE.

**DISPLAY=** **ALL | NONE |** (options)

specifies which features of the axis are displayed. **ALL** displays all of the features of the axis. **NONE** specifies that none of the features of the axis are displayed. You can also hide specific features:

- **NOLABEL**
  
  hides the axis label

- **NOLINE**
  
  hides the axis line

- **NOTICKS**
  
  hides the tick marks on the axis

- **NOVALUES**
  
  hides the tick mark values on the axis

**Default:** **ALL**

**FITPOLICY=** **policy-value**

specifies the method that is used to fit tick mark values on a horizontal axis when there is not enough room to draw them normally. Select one of the following values:

- **ROTATE**
  
  rotates the value text 45 degrees. This is the default for discrete axes.

- **ROTATETHIN**
  
  attempts to use ROTATE, and then THIN to fit the values.

- **STAGGER**
  
  shifts the values up and down.

- **STAGGERROTATE**
  
  attempts to use STAGGER, and then ROTATE to fit the values.

- **STAGGERTHIN**
  
  attempts to use STAGGER, and then THIN to fit the values.
THIN
removes some of the values from the axis. This is the default for linear and time axes.

Note: This option has no effect if used with the vertical (Y or Y2) axes; only the THIN fit policy is used for vertical axes.

GRID
creates grid lines at each tick on the axis.

INTEGER
specifies that only integers are used for tick mark values. This option affects only linear axes.

INTERVAL= interval-value
specifies the tick interval for a time axis. Specify one of the following values:

AUTO
determines the tick interval automatically based on the data.

SECOND
places ticks one second apart. The default tick value format is TIME8.

MINUTE
places ticks one minute apart. The default tick value format is TIME8.

HOUR
places ticks one hour apart. The default tick value format is TIME8.

DAY
places ticks one day apart. The default tick value format is DATE9.

WEEK
places ticks one week apart. The default tick value format is DATE9.

TENDAY
places ticks ten days apart. The default tick value format is DATE9.

SEMIMONTH
places ticks at the first and sixteenth day of each month. The default tick value format is DATE9.

MONTH
places ticks one month apart. The default tick value format is MONYY7.

QUARTER
places ticks three months apart. The default tick value format is YYQC6.

SEMIYEAR
places ticks six months apart. The default tick value format is MONYY7.

YEAR
places ticks one year apart. The default tick value format is YEAR4.

Default: AUTO

LABEL= "text-string"
specifies a label for the axis.

LABELATTRS= style-element (options) | (options)
specifies the appearance of the axis labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:
COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute
of the GraphLabelText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData_n style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

**Default:** The default font family is specified by the FontFamily attribute of the
GraphLabelText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the
GraphLabelText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the
GraphLabelText style element in the current style.

**Interaction:** This option has no effect unless CURVELABEL is also specified.

LOGBASE= 2 | 10 | e
specifies the base value for the logarithmic scale.

**Default:** 10

**Interaction:** This option has no effect unless you also specify TYPE=LOG.

LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT
specifies how to scale and format the values for the major tick marks for logarithmic
axes. Specify one of the following values:

LOGEXPAND
places the tick marks at integer powers of the base. For example, if you specified
LOGBASE=2, the tick marks might be at 1, 2, 4, 8, 16. See Figure 7.5 on page
472.
Figure 7.5  Graph Axes with LOGEXPAND

LOGEXPONENT
places the tick marks at integer powers of the base, but identifies the values by the exponent. For example, if you specified LOGBASE=10, the tick marks might be at 1, 10, 100, 1000, but the tick values would read 0, 1, 2, 3. See Figure 7.6 on page 472.

Figure 7.6  An Axis with LOGEXPONENT

LINEAR
places the tick marks at uniform linear intervals, but spaces them logarithmically. In some cases an intermediate tick mark is placed between the first and second marks.

For example, if the data on this axis range from 14 to 1154, and you specify LOGBASE=10, then the tick marks might be at 10, 40, 200, 400, 600, 800, 1000, 1200. See Figure 7.7 on page 472.

Figure 7.7  An Axis with LINEAR

Default: LOGEXPAND
Interaction: This option has no effect unless you also specify TYPE=LOG.

MAX= numeric-value
specifies the maximum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MIN= numeric-value
specifies the minimum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MINOR
adds minor tick marks to a log or time axis.
Restriction: This option has no effect on linear or discrete axes.
Interaction: This option has no effect if you specify the VALUES= option.

NOTIMESPLIT
prevents a time axis from splitting the time, date, or datetime values into two rows.
Restriction: This option applies to time axes only.
OFFSETMAX= numeric-value
specifies an offset that follows the highest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset follows the highest data value or highest tick value, whichever is greater. For a discrete axis, the offset is applied to the end of the axis farther from the origin.

**Default:** The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

OFFSETMIN= numeric-value
specifies an offset that precedes the lowest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset precedes the lowest data value or lowest tick value, whichever is less. For a discrete axis, the offset is applied to the end of the axis nearer to the origin.

**Default:** The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

REFTICKS
adds tick marks to axis that is opposite from the specified axis. For example, if you specify the REFTICKS option in the XAXIS statement, then tick marks are added to the X2 axis.

**Note:** This option has no effect if the target axis already contains data.

REVERSE
specifies that the tick values are displayed in reverse (descending) order.

THRESHOLDMAX= numeric-value
Specifies a threshold for displaying one more tick mark at the high end of the axis.

THRESHOLDMIN= numeric-value
Specifies a threshold for displaying one more tick mark at the low end of the axis.

TICKVALUEFORMAT= DATA | SAS-format
specifies the format for the axis tick values. You can either specify a SAS format or specify DATA, which indicates that the format from the axis variable is used.

**TYPE= DISCRETE | LINEAR | LOG | TIME**
specifies the type of axis. Specify one of the following values:

**DISCRETE**
specifies an axis with discrete values. If a character variable is assigned to an axis, then the default type for that axis is discrete. In addition, all categorization plots use a discrete axis for the category variable.

**LINEAR**
specifies a linear scale for the axis. This is the default axis type for numeric variables, except when the data is discrete or when the numeric variable has a date or time format.

**LOG**
specifies a logarithmic scale for the axis. This axis type is never a default.

**Interaction:** A logarithmic scale cannot be used with linear regression plots (REG statement where DEGREE=1).
TIME

specifies a time scale for the axis. If the variable assigned to an axis has a time,
date, or datetime format associated with it, then time is the default axis type.

VALUEATTRS= style-element <(options)> | (options)
specifies the appearance of the axis tick value labels. You can specify the appearance
by using a style element or by using suboptions. If you specify a style element, you
can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color

specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphValueText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData_n style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the
GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphValueText style element in the current style.

VALUES= ( values-list )
specifies the values for the ticks on an axis.

For values on a linear axis, the values list can be one of the following:

value <...value-n>
creates ticks for specific values. For example, VALUES= (0 50 100) places
tick marks at 0, 50, and 100.

value-1 TO value-2 BY increment-value
creates ticks for a range of values. The start of the value range is specified by
value-1 and the end of the range is specified by value-2. The increment-value
specifies the interval between the ticks. For example, VALUES= (0 to 100
by 50) creates tick marks at 0, 50, and 100.
<value ... value-n> value-1 TO value-2 BY increment-value <value ... value-n>
creates ticks for specific values, and also creates ticks for a range of values. The
start of the value range is specified by value-1 and the end of the range is
specified by value-2. The increment-value specifies the interval between the
ticks.

For example, VALUES= (-5 10 to 50 by 20 75) creates tick marks at -5, 10, 30, 50, and 75.

For values on a time axis, the values list can be one of the following:

value <...value-n>
creates ticks for specific values. For example, VALUES= (*25MAY08"d
*04JUL08"d *23AUG08"d) places tick marks at 25MAY08, 04JUL08, and
23AUG08.

value-1 TO value-2 BY increment-value
creates ticks for a range of values. The start of the value range is specified by
value-1 and the end of the range is specified by value-2. The increment-value
specifies the interval between the ticks. For example, VALUES= (*01JAN08"d
to "01MAY08"d by month) creates tick marks at 01JAN08, 01FEB08,
01MAR08, 01APR08, and 01MAY08.

For a list of the interval values that you can specify, see the INTERVAL= option.

Restrictions:
This option has no effect on discrete and logarithmic axes.
If your VALUES= option creates more than 1000 values, then the option has no
effect.

Interaction: If a custom format is applied to the value, the raw value is plotted first
and then formatted.

VALUESHINT
specifies that the minimum and maximum axis values are determined independently
of the values that you specify in the VALUES= option. The values from the
VALUES= option are displayed only if they are located between the minimum and
maximum values.

Interaction: This option has no effect unless you also specify the VALUES= option.
specifies which features of the axis are displayed.

**FITPOLICY=** *policy-value*

specifies the method that is used to fit tick mark values on a horizontal axis when there is not enough room to draw them normally.

**GRID**

creates grid lines at each tick on the axis.

**INTEGER**

specifies that only integers are used for tick mark values.

**INTERVAL=** *interval-value*

specifies the tick interval for a time axis.

**LABEL=** "*text-string"

specifies a label for the axis.

**LABELATTRS=** *style-element* *(options)> | (options)*

specifies the appearance of the axis labels.

**LOGBASE=** 2 | 10 | *e*  
specifies the base value for the logarithmic scale.

**LOGSTYLE=** LINEAR | LOGEXPAND | LOGEXPONENT

specifies how to scale and format the values for the major tick marks for logarithmic axes.

**MAX=** *numeric-value*

specifies the maximum value for the axis.

**MIN=** *numeric-value*

specifies the minimum value for the axis.

**MINOR**

adds minor tick marks to a log or time axis.

**NOTIMESPLIT**

prevents a time axis from splitting the time, date, or datetime values into two rows.

**OFFSETMAX=** *numeric-value*

specifies an offset that follows the highest data value on the axis.

**OFFSETMIN=** *numeric-value*

specifies an offset that precedes the lowest data value on the axis.

**REFTICKS**

adds tick marks to axis that is opposite from the specified axis.

**REVERSE**

specifies that the tick values are displayed in reverse (descending) order.

**THRESHOLDMAX=** *numeric-value*

Specifies a threshold for displaying one more tick mark at the high end of the axis.

**THRESHOLDMIN=** *numeric-value*

Specifies a threshold for displaying one more tick mark at the low end of the axis.

**TICKVALUEFORMAT=** DATA | *SAS-format*

specifies the format for the axis tick values.

**TYPE=** DISCRETE | LINEAR | LOG | TIME

specifies the type of axis.

**VALUEATTRS=** *style-element* *(options)> | (options)*

specifies the appearance of the axis tick value labels.

**VALUES=** *(values-list)*

specifies the values for the ticks on an axis.
VALUESHINT
specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option.

Optional Arguments

DISCRETEORDER= DATA | FORMATTED | UNFORMATTED
specifies the order in which discrete tick values are placed on the axis. Specify one of the following values:

DATA
places the values in the order in which they appear in the data.

FORMATTED
sorts the formatted values in ascending character order.

UNFORMATTED
sorts the unformatted values in ascending character order.

Default: UNFORMATTED
Restriction: This option affects only box plots, dot plots, bar charts, and line plots, or for any axis where TYPE=DISCRETE.

DISPLAY= ALL | NONE | (options)
specifies which features of the axis are displayed. ALL displays all of the features of the axis. NONE specifies that none of the features of the axis are displayed. You can also hide specific features:

NOLABEL
hides the axis label

NOLINE
hides the axis line

NOTICKS
hides the tick marks on the axis

NOVALUES
hides the tick mark values on the axis

Default: ALL

FITPOLICY= policy-value
specifies the method that is used to fit tick mark values on a horizontal axis when there is not enough room to draw them normally. Select one of the following values:

ROTATE
rotates the value text 45 degrees. This is the default for discrete axes.

ROTATETHIN
attempts to use ROTATE, and then THIN to fit the values.

STAGGER
shifts the values up and down.

STAGGERROTATE
attempts to use STAGGER, and then ROTATE to fit the values.

STAGGERTHIN
attempts to use STAGGER, and then THIN to fit the values.

THIN
removes some of the values from the axis. This is the default for linear and time axes.
Note: This option has no effect if used with the vertical (Y or Y2) axes; only the THIN fit policy is used for vertical axes.

GRID
creates grid lines at each tick on the axis.

INTEGER
specifies that only integers are used for tick mark values. This option affects only linear axes.

INTERVAL= interval-value
specifies the tick interval for a time axis. Specify one of the following values:

AUTO
determines the tick interval automatically based on the data.

SECOND
places ticks one second apart. The default tick value format is TIME8.

MINUTE
places ticks one minute apart. The default tick value format is TIME8.

HOUR
places ticks one hour apart. The default tick value format is TIME8.

DAY
places ticks one day apart. The default tick value format is DATE9.

WEEK
places ticks one week apart. The default tick value format is DATE9.

TENDAY
places ticks ten days apart. The default tick value format is DATE9.

SEMIMONTH
places ticks at the first and sixteenth day of each month. The default tick value format is DATE9.

MONTH
places ticks one month apart. The default tick value format is MONYY7.

QUARTER
places ticks three months apart. The default tick value format is YYQC6.

SEMIYEAR
places ticks six months apart. The default tick value format is MONYY7.

YEAR
places ticks one year apart. The default tick value format is YEAR4.

Default: AUTO

LABEL= "text-string"
specifies a label for the axis.

LABELATTRS= style-element <(options)> | (options)
specifies the appearance of the axis labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphLabelText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY=** “font-family”

specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** The default font family is specified by the FontFamily attribute of the GraphLabelText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE=** $n<$units$>

specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE=** ITALIC | NORMAL

specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphLabelText style element in the current style.

**WEIGHT=** BOLD | NORMAL

specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphLabelText style element in the current style.

**Interaction:** This option has no effect unless CURVELABEL is also specified.

**LOGBASE=** 2 | 10 | e

specifies the base value for the logarithmic scale.

**Default:** 10

**Interaction:** This option has no effect unless you also specify TYPE=LOG.

**LOGSTYLE=** LINEAR | LOGEXPAND | LOGEXPONENT

specifies how to scale and format the values for the major tick marks for logarithmic axes. Specify one of the following values:

**LOGEXPAND**

places the tick marks at integer powers of the base. For example, if you specified LOGBASE=2, the tick marks might be at 1, 2, 4, 8, 16. See Figure 7.5 on page 472.

**Figure 7.8** Graph Axes with LOGEXPAND

![Graph Axes with LOGEXPAND](image)
LOGEXPONENT
places the tick marks at integer powers of the base, but identifies the values by the exponent. For example, if you specified LOGBASE=10, the tick marks might be at 1, 10, 100, 1000, but the tick values would read 0, 1, 2, 3. See Figure 7.6 on page 472.

**Figure 7.9** An Axis with LOGEXPONENT

LINEAR
places the tick marks at uniform linear intervals, but spaces them logarithmically. In some cases an intermediate tick mark is placed between the first and second marks.

For example, if the data on this axis range from 14 to 1154, and you specify LOGBASE=10, then the tick marks might be at 10, 40, 200, 400, 600, 800, 1000, 1200. See Figure 7.7 on page 472.

**Figure 7.10** An Axis with LINEAR

**Default:** LOGEXPAND
**Interaction:** This option has no effect unless you also specify TYPE=LOG.

**MAX** = numeric-value
specifies the maximum value for the axis.
**Restriction:** This option affects linear, log, and time axes only.
**Interaction:** This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

**MIN** = numeric-value
specifies the minimum value for the axis.
**Restriction:** This option affects linear, log, and time axes only.
**Interaction:** This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MINOR
adds minor tick marks to a log or time axis.
**Restriction:** This option has no effect on linear or discrete axes.
**Interaction:** This option has no effect if you specify the VALUES= option.

NOTIMESPLIT
prevents a time axis from splitting the time, date, or datetime values into two rows.
**Restriction:** This option applies to time axes only.

OFFSETMAX = numeric-value
specifies an offset that follows the highest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset follows the highest data value or highest tick value, whichever is greater. For a discrete axis, the offset is applied to the end of the axis farther from the origin.
**Default:** The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

**OFFSETMIN= numeric-value**
specifies an offset that precedes the lowest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset precedes the lowest data value or lowest tick value, whichever is less. For a discrete axis, the offset is applied to the end of the axis nearer to the origin.

**Default:** The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

**REFTICKS**
adds tick marks to axis that is opposite from the specified axis. For example, if you specify the REFTICKS option in the XAXIS statement, then tick marks are added to the X2 axis.

**Note:** This option has no effect if the target axis already contains data.

**REVERSE**
specifies that the tick values are displayed in reverse (descending) order.

**THRESHOLDMAX= numeric-value**
Specifies a threshold for displaying one more tick mark at the high end of the axis.

**THRESHOLDMIN= numeric-value**
Specifies a threshold for displaying one more tick mark at the low end of the axis.

**TICKVALUEFORMAT= DATA | SAS-format**
specifies the format for the axis tick values. You can either specify a SAS format or specify DATA, which indicates that the format from the axis variable is used.

**TYPE= DISCRETE | LINEAR | LOG | TIME**
specifies the type of axis. Specify one of the following values:

**DISCRETE**
specifies an axis with discrete values. If a character variable is assigned to an axis, then the default type for that axis is discrete. In addition, all categorization plots use a discrete axis for the category variable.

**LINEAR**
specifies a linear scale for the axis. This is the default axis type for numeric variables, except when the data is discrete or when the numeric variable has a date or time format.

**LOG**
specifies a logarithmic scale for the axis. This axis type is never a default.

**Interaction:** A logarithmic scale cannot be used with linear regression plots (REG statement where DEGREE=1).

**TIME**
specifies a time scale for the axis. If the variable assigned to an axis has a time, date, or datetime format associated with it, then time is the default axis type.

**VALUEATTRS= style-element <options> | (options)**
specifies the appearance of the axis tick value labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:
COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphValueText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphDataₙ style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the
GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphValueText style element in the current style.

VALUES= ( values-list )
specifies the values for the ticks on an axis.

For values on a linear axis, the values list can be one of the following:

value ... value-n> creates ticks for specific values. For example, VALUES= (0 50 100) places
tick marks at 0, 50, and 100.

value-1 TO value-2 BY increment-value creates ticks for a range of values. The start of the value range is specified by
value-1 and the end of the range is specified by value-2. The increment-value
specifies the interval between the ticks. For example, VALUES= (0 to 100
by 50) creates tick marks at 0, 50, and 100.

<value ... value-n>value-1 TO value-2 BY increment-value <value ... value-n>
creates ticks for specific values, and also creates ticks for a range of values. The
start of the value range is specified by value-1 and the end of the range is
specified by value-2. The increment-value specifies the interval between the
ticks.

For example, VALUES= (-5 10 to 50 by 20 75) creates tick marks a -5, 10, 30, 50, and 75.

For values on a time axis, the values list can be one of the following:
value <...value-n> creates ticks for specific values. For example, VALUES= ("25MAY08"d "04JUL08"d "23AUG08"d) places tick marks at 25MAY08, 04JUL08, and 23AUG08.

value-1 TO value-2 BY increment-value creates ticks for a range of values. The start of the value range is specified by value-1 and the end of the range is specified by value-2. The increment-value specifies the interval between the ticks. For example, VALUES= ("01JAN08"d to "01MAY08"d by month) creates tick marks at 01JAN08, 01FEB08, 01MAR08, 01APR08, and 01MAY08.

For a list of the interval values that you can specify, see the INTERVAL= option.

Restrictions: This option has no effect on discrete and logarithmic axes.
If your VALUES= option creates more than 1000 values, then the option has no effect.

Interaction: If a custom format is applied to the value, the raw value is plotted first and then formatted.

VALUESHINT specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option. The values from the VALUES= option are displayed only if they are located between the minimum and maximum values.

Interaction: This option has no effect unless you also specify the VALUES= option.

YAXIS Statement
Specifies the axis options for the Y axis. You can control the features of the axis (for example, the axis label, grid lines, and minor tick marks). You can also control the structure of the axis (for example, the data range, data type, and tick mark values).

Syntax
YAXIS option(s);

Summary of Optional Arguments
Axis options

DISCRETEORDER= DATA | FORMATTED | UNFORMATTED specifies the order in which discrete tick values are placed on the axis.

DISPLAY= ALL | NONE | (options) specifies which features of the axis are displayed.

GRID creates grid lines at each tick on the axis.

INTEGER specifies that only integers are used for tick mark values.

INTERVAL= interval-value specifies the tick interval for a time axis.

LABEL= "text-string"
specifies a label for the axis.

**LABELATTRS= style-element *(options)* | *(options)*

specifies the appearance of the axis labels.

**LOGBASE= 2 | 10 | e**
specifies the base value for the logarithmic scale.

**LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT**
specifies how to scale and format the values for the major tick marks for logarithmic axes.

**MAX= numeric-value**
specifies the maximum value for the axis.

**MIN= numeric-value**
specifies the minimum value for the axis.

**MINOR**
adds minor tick marks to a log or time axis.

**NOTIMESPLIT**
prevents a time axis from splitting the time, date, or datetime values into two rows.

**OFFSETMAX= numeric-value**
specifies an offset that follows the highest data value on the axis.

**OFFSETMIN= numeric-value**
specifies an offset that precedes the lowest data value on the axis.

**REFTICKS**
adds tick marks to axis that is opposite from the specified axis.

**REVERSE**
specifies that the tick values are displayed in reverse (descending) order.

**THRESHOLDMAX= numeric-value**
Specifies a threshold for displaying one more tick mark at the high end of the axis.

**THRESHOLDMIN= numeric-value**
Specifies a threshold for displaying one more tick mark at the low end of the axis.

**TICKVALUEFORMAT= DATA | SAS-format**
specifies the format for the axis tick values.

**TYPE= DISCRETE | LINEAR | LOG | TIME**
specifies the type of axis.

**VALUEATTRS= style-element *(options)* | *(options)*

specifies the appearance of the axis tick value labels.

**VALUES= *(values-list)***
specifies the values for the ticks on an axis.

**VALUESHINT**
specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option.

**Optional Arguments**

**DISCRETEORDER= DATA | FORMATTED | UNFORMATTED**
specifies the order in which discrete tick values are placed on the axis. Specify one of the following values:

**DATA**
places the values in the order in which they appear in the data.
FORMATTED
sorts the formatted values in ascending character order.

UNFORMATTED
sorts the unformatted values in ascending character order.

Default: UNFORMATTED
Restriction: This option affects only box plots, dot plots, bar charts, and line plots, or for any axis where TYPE=DISCRETE.

DISPLAY= ALL | NONE | (options)
specifies which features of the axis are displayed. ALL displays all of the features of the axis. NONE specifies that none of the features of the axis are displayed. You can also hide specific features:

NOLABEL
hides the axis label

NOLINE
hides the axis line

NOTICKS
hides the tick marks on the axis

NOVALUES
hides the tick mark values on the axis

Default: ALL

GRID
creates grid lines at each tick on the axis.

INTEGER
specifies that only integers are used for tick mark values. This option affects only linear axes.

INTERVAL= interval-value
specifies the tick interval for a time axis. Specify one of the following values:

AUTO
determines the tick interval automatically based on the data.

SECOND
places ticks one second apart. The default tick value format is TIME8.

MINUTE
places ticks one minute apart. The default tick value format is TIME8.

HOUR
places ticks one hour apart. The default tick value format is TIME8.

DAY
places ticks one day apart. The default tick value format is DATE9.

WEEK
places ticks one week apart. The default tick value format is DATE9.

TENDAY
places ticks ten days apart. The default tick value format is DATE9.

SEMIMONTH
places ticks at the first and sixteenth day of each month. The default tick value format is DATE9.

MONTH
places ticks one month apart. The default tick value format is MONYY7.
QUARTER
places ticks three months apart. The default tick value format is YYQC6.

SEMIYEAR
places ticks six months apart. The default tick value format is MONYY7.

YEAR
places ticks one year apart. The default tick value format is YEAR4.

**Default:** AUTO

**LABEL=** "text-string"
specifies a label for the axis.

**LABELATTRS=** style-element <(options)> | (options)
specifies the appearance of the axis labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR=** color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphLabelText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.

**FAMILY=** "font-family"
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of *SAS Language Reference: Concepts*.

**Default:** The default font family is specified by the FontFamily attribute of the GraphLabelText style element in the current style.

**Restriction:** You cannot specify a list of font family names.

**SIZE=** n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

**STYLE=** ITALIC | NORMAL
specifies whether the label characters are italic or normal.

**Default:** The default font style is specified by the FontStyle attribute of the GraphLabelText style element in the current style.

**WEIGHT=** BOLD | NORMAL
specifies whether the label characters are bold or normal.

**Default:** The default font weight is specified by the FontWeight attribute of the GraphLabelText style element in the current style.

**Interaction:** This option has no effect unless CURVELABEL is also specified.

**LOGBASE=** 2 | 10 | e
specifies the base value for the logarithmic scale.

**Default:** 10
Interaction: This option has no effect unless you also specify TYPE=LOG.

**LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT**

specifies how to scale and format the values for the major tick marks for logarithmic axes. Specify one of the following values:

LOGEXPAND
places the tick marks at integer powers of the base. For example, if you specified LOGBASE=2, the tick marks might be at 1, 2, 4, 8, 16. See Figure 7.5 on page 472.

**Figure 7.11  Graph Axes with LOGEXPAND**

LOGEXPONENT
places the tick marks at integer powers of the base, but identifies the values by the exponent. For example, if you specified LOGBASE=10, the tick marks might be at 1, 10, 100, 1000, but the tick values would read 0, 1, 2, 3. See Figure 7.6 on page 472.

**Figure 7.12  An Axis with LOGEXPONENT**

LINEAR
places the tick marks at uniform linear intervals, but spaces them logarithmically. In some cases an intermediate tick mark is placed between the first and second marks.

For example, if the data on this axis range from 14 to 1154, and you specify LOGBASE=10, then the tick marks might be at 10, 40, 200, 400, 600, 800, 1000, 1200. See Figure 7.7 on page 472.

**Figure 7.13  An Axis with LINEAR**

Default: LOGEXPAND

Interaction: This option has no effect unless you also specify TYPE=LOG.

**MAX= numeric-value**
specifies the maximum value for the axis.

Restriction: This option affects linear, log, and time axes only.

Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

**MIN= numeric-value**
specifies the minimum value for the axis.

Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MINOR
adds minor tick marks to a log or time axis.

Restriction: This option has no effect on linear or discrete axes.

Interaction: This option has no effect if you specify the VALUES= option.

NOTIMESPLIT
prevents a time axis from splitting the time, date, or datetime values into two rows.

Restriction: This option applies to time axes only.

OFFSETMAX= numeric-value
specifies an offset that follows the highest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset follows the highest data value or highest tick value, whichever is greater. For a discrete axis, the offset is applied to the end of the axis farther from the axis origin.

Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

Interaction: For HBOX, HBAR, HLINE, and DOT plot statements, the Y axis is reversed by default, so the axis origin is at the top. For these plots, OFFSETMAX= creates an offset at the end of the Y axis nearer to the origin.

OFFSETMIN= numeric-value
specifies an offset that precedes the lowest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset precedes the lowest data value or lowest tick value, whichever is less. For a discrete axis, the offset is applied to the end of the axis nearer to the axis origin.

Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

Interaction: For HBOX, HBAR, HLINE, and DOT plot statements, the Y axis is reversed by default, so the axis origin is at the top. For these plots, OFFSETMIN= creates an offset at the end of the Y axis farther from the origin.

REFTICKS
adds tick marks to axis that is opposite from the specified axis. For example, if you specify the REFTICKS option in the XAXIS statement, then tick marks are added to the X2 axis.

Note: This option has no effect if the target axis already contains data.

REVERSE
specifies that the tick values are displayed in reverse (descending) order.

THRESHOLDMAX= numeric-value
Specifies a threshold for displaying one more tick mark at the high end of the axis.

THRESHOLDMIN= numeric-value
Specifies a threshold for displaying one more tick mark at the low end of the axis.

TICKVALUEFORMAT= DATA | SAS-format
specifies the format for the axis tick values. You can either specify a SAS format or specify DATA, which indicates that the format from the axis variable is used.
TYPE= DISCRETE | LINEAR | LOG | TIME
specifies the type of axis. Specify one of the following values:

DISCRETE
specifies an axis with discrete values. If a character variable is assigned to an axis, then the default type for that axis is discrete. In addition, all categorization plots use a discrete axis for the category variable.

LINEAR
specifies a linear scale for the axis. This is the default axis type for numeric variables, except when the data is discrete or when the numeric variable has a date or time format.

LOG
specifies a logarithmic scale for the axis. This axis type is never a default.

Interaction: A logarithmic scale cannot be used with linear regression plots (REG statement where DEGREE=1).

TIME
specifies a time scale for the axis. If the variable assigned to an axis has a time, date, or datetime format associated with it, then time is the default axis type.

VALUEATTRS= style-element <(options)> | (options)
specifies the appearance of the axis tick value labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the Color attribute of the GraphValueText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData<index> style elements in the current style.

FAMILY= “font-family”
specifies the font family for the label characters. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

Default: The default font family is specified by the FontFamily attribute of the GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the GraphValueText style element in the current style.
WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphValueText style element in the current style.

VALUES= (values-list)
specifies the values for the ticks on an axis.

For values on a linear axis, the values list can be one of the following:

value <...value-n>
creates ticks for specific values. For example, VALUES= (0 50 100) places
tick marks at 0, 50, and 100.

value-1 TO value-2 BY increment-value
creates ticks for a range of values. The start of the value range is specified by
value-1 and the end of the range is specified by value-2. The increment-value
specifies the interval between the ticks. For example, VALUES= (0 to 100
by 50) creates tick marks at 0, 50, and 100.

<value ... value-n> value-1 TO value-2 BY increment-value <value ... value-n>
creates ticks for specific values, and also creates ticks for a range of values. The
start of the value range is specified by value-1 and the end of the range is
specified by value-2. The increment-value specifies the interval between the
ticks.

For example, VALUES= (-5 10 to 50 by 20 75) creates tick marks at -5,
10, 30, 50, and 75.

For values on a time axis, the values list can be one of the following:

value <...value-n>
creates ticks for specific values. For example, VALUES= ("25MAY08"d
"04JUL08"d "23AUG08"d) places tick marks at 25MAY08, 04JUL08, and
23AUG08.

value-1 TO value-2 BY increment-value
creates ticks for a range of values. The start of the value range is specified by
value-1 and the end of the range is specified by value-2. The increment-value
specifies the interval between the ticks. For example, VALUES= (*01JAN08"d
to "01MAY08"d by month) creates tick marks at 01JAN08, 01FEB08,
01MAR08, 01APR08, and 01MAY08.

For a list of the interval values that you can specify, see the INTERVAL= option.

Restrictions:
This option has no effect on discrete and logarithmic axes.

If your VALUES= option creates more than 1000 values, then the option has no
effect.

Interaction: If a custom format is applied to the value, the raw value is plotted first
and then formatted.

VALUESHINT
specifies that the minimum and maximum axis values are determined independently
of the values that you specify in the VALUES= option. The values from the
VALUES= option are displayed only if they are located between the minimum and
maximum values.

Interaction: This option has no effect unless you also specify the VALUES= option.
Y2AXIS Statement

Specifies the axis options for the Y2 axis. You can control the features of the axis (for example, the axis label, grid lines, and minor tick marks). You can also control the structure of the axis (for example, the data range, data type, and tick mark values).

Syntax

Y2AXIS option(s);

Summary of Optional Arguments

Axis options

DISCRETEORDER= DATA | FORMATTED | UNFORMATTED
specifies the order in which discrete tick values are placed on the axis.

DISPLAY= ALL | NONE | (options)
specifies which features of the axis are displayed.

GRID
creates grid lines at each tick on the axis.

INTEGER
specifies that only integers are used for tick mark values.

INTERVAL= interval-value
specifies the tick interval for a time axis.

LABEL= "text-string"
specifies a label for the axis.

LABELATTRS= style-element <(options)> | (options)
specifies the appearance of the axis labels.

LOGBASE= 2 | 10 | e
specifies the base value for the logarithmic scale.

LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT
specifies how to scale and format the values for the major tick marks for logarithmic axes.

MAX= numeric-value
specifies the maximum value for the axis.

MIN= numeric-value
specifies the minimum value for the axis.

MINOR
adds minor tick marks to a log or time axis.

NOTIMESPLIT
prevents a time axis from splitting the time, date, or datetime values into two rows.

OFFSETMAX= numeric-value
specifies an offset that follows the highest data value on the axis.

OFFSETMIN= numeric-value
specifies an offset that precedes the lowest data value on the axis.

REFTICKS
adds tick marks to axis that is opposite from the specified axis.

REVERSE
specifies that the tick values are displayed in reverse (descending) order.

**THRESHOLDMAX= numeric-value**
Specifies a threshold for displaying one more tick mark at the high end of the axis.

**THRESHOLDMIN= numeric-value**
Specifies a threshold for displaying one more tick mark at the low end of the axis.

**TICKVALUEFORMAT= DATA | SAS-format**
specifies the format for the axis tick values.

**TYPE= DISCRETE | LINEAR | LOG | TIME**
specifies the type of axis.

**VALUEATTRS= style-element <(options)> | (options)**
specifies the appearance of the axis tick value labels.

**VALUES= (values-list)**
specifies the values for the ticks on an axis.

**VALUESHINT**
specifies that the minimum and maximum axis values are determined independently of the values that you specify in the VALUES= option.

### Optional Arguments

**DISCRETEORDER= DATA | FORMATTED | UNFORMATTED**
specifies the order in which discrete tick values are placed on the axis. Specify one of the following values:

**DATA**
places the values in the order in which they appear in the data.

**FORMATTED**
sorts the formatted values in ascending character order.

**UNFORMATTED**
sorts the unformatted values in ascending character order.

**Default:** UNFORMATTED

**Restriction:** This option affects only box plots, dot plots, bar charts, and line plots, or for any axis where TYPE=DISCRETE.

**DISPLAY= ALL | NONE | (options)**
specifies which features of the axis are displayed. ALL displays all of the features of the axis. NONE specifies that none of the features of the axis are displayed. You can also hide specific features:

**NOLABEL**
hides the axis label

**NOLINE**
hides the axis line

**NOTICKS**
hides the tick marks on the axis

**NOVALUES**
hides the tick mark values on the axis

**Default:** ALL

**GRID**
creates grid lines at each tick on the axis.
INTEGER
specifies that only integers are used for tick mark values. This option affects only linear axes.

**INTERVAL=** interval-value
specifies the tick interval for a time axis. Specify one of the following values:

**AUTO**
determines the tick interval automatically based on the data.

**SECOND**
places ticks one second apart. The default tick value format is TIME8.

**MINUTE**
places ticks one minute apart. The default tick value format is TIME8.

**HOUR**
places ticks one hour apart. The default tick value format is TIME8.

**DAY**
places ticks one day apart. The default tick value format is DATE9.

**WEEK**
places ticks one week apart. The default tick value format is DATE9.

**TENDAY**
places ticks ten days apart. The default tick value format is DATE9.

**SEMIMONTH**
places ticks at the first and sixteenth day of each month. The default tick value format is DATE9.

**MONTH**
places ticks one month apart. The default tick value format is MONYY7.

**QUARTER**
places ticks three months apart. The default tick value format is YYQC6.

**SEMIYEAR**
places ticks six months apart. The default tick value format is MONYY7.

**YEAR**
places ticks one year apart. The default tick value format is YEAR4.

**Default:** AUTO

**LABEL=** “text-string”
specifies a label for the axis.

**LABELATTRS=** style-element <(options)> | (options)
specifies the appearance of the axis labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR=** color
specifies the color of the label characters. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the Color attribute of the GraphLabelText style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphDataN style elements in the current style.
FAMILY=“font-family”
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphLabelText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the
GraphLabelText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphLabelText style element in the current style.

Interaction: This option has no effect unless CURVELABEL is also specified.

LOGBASE= 2 | 10 | e
specifies the base value for the logarithmic scale.

Default: 10

Interaction: This option has no effect unless you also specify TYPE=LOG.

LOGSTYLE= LINEAR | LOGEXPAND | LOGEXponent
specifies how to scale and format the values for the major tick marks for logarithmic
axes. Specify one of the following values:

LOGEXPAND
places the tick marks at integer powers of the base. For example, if you specified
LOGBASE=2, the tick marks might be at 1, 2, 4, 8, 16. See Figure 7.5 on page
472.

Figure 7.14 Graph Axes with LOGEXPAND

[Diagram showing logarithmic scale with tick marks at integer powers of base 10, 2, and e]

LOGEXponent
places the tick marks at integer powers of the base, but identifies the values by
the exponent. For example, if you specified LOGBASE=10, the tick marks might
be at 1, 10, 100, 1000, but the tick values would read 0, 1, 2, 3. See Figure 7.6 on
page 472.
LINEAR
places the tick marks at uniform linear intervals, but spaces them logarithmically. In some cases an intermediate tick mark is placed between the first and second marks.
For example, if the data on this axis range from 14 to 1154, and you specify LOGBASE=10, then the tick marks might be at 10, 40, 200, 400, 600, 800, 1000, 1200. See Figure 7.7 on page 472.

Figure 7.15 An Axis with LOGEXPONENT

Figure 7.16 An Axis with LINEAR

Default: LOGEXPAND
Interaction: This option has no effect unless you also specify TYPE=LOG.

MAX= numeric-value
specifies the maximum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MIN= numeric-value
specifies the minimum value for the axis.
Restriction: This option affects linear, log, and time axes only.
Interaction: This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

MINOR
adds minor tick marks to a log or time axis.
Restriction: This option has no effect on linear or discrete axes.
Interaction: This option has no effect if you specify the VALUES= option.

NOTIMESPLIT
prevents a time axis from splitting the time, date, or datetime values into two rows.
Restriction: This option applies to time axes only.

OFFSETMAX= numeric-value
specifies an offset that follows the highest data value on the axis. Specify a value between 0 and 1.
The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset follows the highest data value or highest tick value, whichever is greater. For a discrete axis, the offset is applied to the end of the axis farther from the axis origin.
Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.
Interaction: For HBOX, HBAR, HLINE, and DOT plot statements, the Y axis is reversed by default, so the axis origin is at the top. For these plots, OFFSETMAX= creates an offset at the end of the Y axis nearer to the origin.
OFFSETMIN= numeric-value

specifies an offset that precedes the lowest data value on the axis. Specify a value between 0 and 1.

The value represents the offset as a proportion to the total length of the axis. For a continuous axis, the offset precedes the lowest data value or lowest tick value, whichever is less. For a discrete axis, the offset is applied to the end of the axis nearer to the axis origin.

Default: The offset space is determined automatically based on the data values, tick mark values, markers, and labels that are inside of the plot area.

Interaction: For HBOX, HBAR, HLINE, and DOT plot statements, the Y axis is reversed by default, so the axis origin is at the top. For these plots, OFFSETMIN= creates an offset at the end of the Y axis farther from the origin.

REFTICKS

adds tick marks to axis that is opposite from the specified axis. For example, if you specify the REFTICKS option in the XAXIS statement, then tick marks are added to the X2 axis.

Note: This option has no effect if the target axis already contains data.

REVERSE

specifies that the tick values are displayed in reverse (descending) order.

THRESHOLDMAX= numeric-value

Specifies a threshold for displaying one more tick mark at the high end of the axis.

THRESHOLDMIN= numeric-value

Specifies a threshold for displaying one more tick mark at the low end of the axis.

TICKVALUEFORMAT= DATA | SAS-format

specifies the format for the axis tick values. You can either specify a SAS format or specify DATA, which indicates that the format from the axis variable is used.

TYPE= DISCRETE | LINEAR | LOG | TIME

specifies the type of axis. Specify one of the following values:

DISCRETE

specifies an axis with discrete values. If a character variable is assigned to an axis, then the default type for that axis is discrete. In addition, all categorization plots use a discrete axis for the category variable.

LINEAR

specifies a linear scale for the axis. This is the default axis type for numeric variables, except when the data is discrete or when the numeric variable has a date or time format.

LOG

specifies a logarithmic scale for the axis. This axis type is never a default.

Interaction: A logarithmic scale cannot be used with linear regression plots (REG statement where DEGREE=1).

TIME

specifies a time scale for the axis. If the variable assigned to an axis has a time, date, or datetime format associated with it, then time is the default axis type.

VALUEATTRS= style-element <|options|>

specifies the appearance of the axis tick value labels. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:
COLOR= color
specifies the color of the label characters. You can specify colors using the same
color schemes that are supported by SAS/GRAPH software. For more
information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH:
Reference.

Default: For ungrouped data, the default color is specified by the Color attribute
of the GraphValueText style element in the current style. For grouped data,
the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData n style elements in the current style.

FAMILY= "font-family"
specifies the font family for the label characters. The SAS ODS styles use
TrueType system fonts. For more information, see “TrueType Fonts Supplied by

Default: The default font family is specified by the FontFamily attribute of the
GraphValueText style element in the current style.

Restriction: You cannot specify a list of font family names.

SIZE= n <units>
specifies the font size of the label characters. You can also specify the unit of
measurement. The default unit is pixels. For a list of measurement units that are
supported, see “Units of Measurement” on page 659.

Default: The default font size is specified by the FontSize attribute of the
GraphValueText style element in the current style.

STYLE= ITALIC | NORMAL
specifies whether the label characters are italic or normal.

Default: The default font style is specified by the FontStyle attribute of the
GraphValueText style element in the current style.

WEIGHT= BOLD | NORMAL
specifies whether the label characters are bold or normal.

Default: The default font weight is specified by the FontWeight attribute of the
GraphValueText style element in the current style.

VALUES= ( values-list )
specifies the values for the ticks on an axis.

For values on a linear axis, the values list can be one of the following:

value <...value-n>
creates ticks for specific values. For example, VALUES= (0 50 100) places
tick marks at 0, 50, and 100.

value-1 TO value-2 BY increment-value
creates ticks for a range of values. The start of the value range is specified by
value-1 and the end of the range is specified by value-2. The increment-value
specifies the interval between the ticks. For example, VALUES= (0 to 100
by 50) creates tick marks at 0, 50, and 100.

<value ... value-n>value-1 TO value-2 BY increment-value <value ... value-n>
creates ticks for specific values, and also creates ticks for a range of values. The
start of the value range is specified by value-1 and the end of the range is
specified by value-2. The increment-value specifies the interval between the
ticks.

For example, VALUES= (-5 10 to 50 by 20 75) creates tick marks at -5,
10, 30, 50, and 75.

For values on a time axis, the values list can be one of the following:
value <...value-n>
   creates ticks for specific values. For example, VALUES= ("25MAY08"d
   "04JUL08"d "23AUG08"d) places tick marks at 25MAY08, 04JUL08, and
   23AUG08.

value-1 TO value-2 BY increment-value
   creates ticks for a range of values. The start of the value range is specified by
   value-1 and the end of the range is specified by value-2. The increment-value
   specifies the interval between the ticks. For example, VALUES= ("01JAN08"d
   to "01MAY08"d by month) creates tick marks at 01JAN08, 01FEB08,
   01MAR08, 01APR08, and 01MAY08.

   For a list of the interval values that you can specify, see the INTERVAL= option.

   Restrictions:
   This option has no effect on discrete and logarithmic axes.
   If your VALUES= option creates more than 1000 values, then the option has no
   effect.

   Interaction: If a custom format is applied to the value, the raw value is plotted first
   and then formatted.

VALUESHINT
   specifies that the minimum and maximum axis values are determined independently
   of the values that you specify in the VALUES= option. The values from the
   VALUES= option are displayed only if they are located between the minimum and
   maximum values.

   Interaction: This option has no effect unless you also specify the VALUES= option.

Examples: SGLOT Procedure

Example 1: Grouping a Scatter Plot

   Features: SCATTER statement
   Sample library
   member: SGPLSCT

   This example shows a simple scatter plot with grouped data.
Program

```sas
proc sgplot data=sashelp.class;
   scatter x=height y=weight / group=sex;
run;
```

Program Description

**Create the scatter plot.** In the SCATTER statement, the GROUP= option groups the data by the SEX variable.

```sas
proc sgplot data=sashelp.class;
   scatter x=height y=weight / group=sex;
run;
```

### Example 2: Clustering a Grouped Scatter Plot

- **Features:**
  - SCATTER statement
  - GROUPDISPLAY option
  - CLUSTERWIDTH option

- **Sample library member:** SGPLCLU

This example shows a simple scatter plot with grouped data that is clustered.
Program

```sas
proc sgplot data=sashelp.revhub2;
  scatter x=hub y=revenue / group=type groupdisplay=cluster clusterwidth=0.5;
  xaxis type=discrete;
run;
```

Program Description

Create the scatter plot. In the SCATTER statement, the GROUP= option groups the data by the TYPE variable. The GROUPDISPLAY option specifies that the grouped markers are clustered. The CLUSTERWIDTH option specifies the width of the group clusters.

```sas
proc sgplot data=sashelp.revhub2;
  scatter x=hub y=revenue / group=type groupdisplay=cluster clusterwidth=0.5;
  xaxis type=discrete;
run;
```

Example 3: Plotting Three Series

Features: SERIES statement
Sample library member: SGPLSER

This example shows a series plot with three series on the Y axis.
Program

proc sgplot data=sashelp.stocks
  (where=(date >= "01jan2000"d and stock = "IBM");
  title "Stock Trend";
  series x=date y=close;
  series x=date y=low;
  series x=date y=high;
run;

Program Description

Specify the data set and the title.

proc sgplot data=sashelp.stocks
  (where=(date >= "01jan2000"d and stock = "IBM");
  title "Stock Trend";

Create the series plots.

  series x=date y=close;
  series x=date y=low;
  series x=date y=high;
run;

Cancel the title.

title;
Example 4: Adding Prediction and Confidence Bands to a Regression Plot

Features: REG statement
Sample library member: SGPLREG

This example shows a regression plot with prediction and confidence limits.

Output

![Regression Plot]

Program

```plaintext
proc sgplot data=sashelp.class;
  reg x=height y=weight / CLM CLI;
run;
```

Program Description

Create the regression plot. The CLM option adds confidence limits for the mean predicted values. The CLI option adds confidence limits for the individual predicted values.

```plaintext
proc sgplot data=sashelp.class;
  reg x=height y=weight / CLM CLI;
run;
```
Example 5: Adding a Prediction Ellipse to a Scatter Plot

Features:
- SCATTER statement
- ELLIPSE statement
- KEYLEGEND statement

Sample library member: SGPLELI

This example shows a scatter plot with a prediction ellipse.

Output

![Iris Petal Dimensions](image)

Program

```sas
proc sgplot data=sashelp.iris;
  title "Iris Petal Dimensions";
  scatter x=petallength y=petalwidth;
  ellipse x=petallength y=petalwidth;
  keylegend / location=inside position=bottomright;
run;
```

Program Description

Set the title and create the scatter plot.

```sas
proc sgplot data=sashelp.iris;
  title "Iris Petal Dimensions";
  scatter x=petallength y=petalwidth;
```
Create the ellipse.

 ellipse x=petallength y=petalwidth;

Position the Legend. The LOCATION= option places the legend inside of the plot area. The POSITION= option places the legend at the bottom right.

 keylegend / location=inside position=bottomright;
 run;

Cancel the title.

 title;

Example 6: Creating Lines and Bands from Pre-Computed Data

Features:
- BAND statement
- KEYLEGEND statement
- SCATTER statement
- SERIES statement

Sample library member:
- SGPLBND

This example shows how to use pre-computed data to create a scatter plot, fit line, and confidence bands. The data set was created by the REG procedure. This technique is useful for more complex fit models.

Output

Program

 proc sgplot data=sashelp.classfit;
   title "Fit and Confidence Band from Precomputed Data";
Example 6: Creating Lines and Bands from Pre-Computed Data

```
band x=height lower=lower upper=upper /
   legendlabel="95% CLI" name="band1";

band x=height lower=lowermean upper=uppermean /
   fillattrs=GraphConfidence2
   legendlabel="95% CLM" name="band2";
scatter x=height y=weight;
series x=height y=predict / lineattrs=GraphPrediction
   legendlabel="Predicted Fit" name="series";

keylegend "series" "band1" "band2" / location=inside
   position=bottomright;
run;
title;
```

**Program Description**

**Set the title and create the first band plot.** The LEGENDLABEL= option in the BAND statement specifies the label for the band plot in the legend.

```
proc sgplot data=sashelp.classfit;
   title "Fit and Confidence Band from Precomputed Data";
   band x=height lower=lower upper=upper /
      legendlabel="95% CLI" name="band1";
```

**Create the second band plot.** The LEGENDLABEL= option specifies the label for the band plot in the legend. The FILLATTRS= option specifies the style element for the fill.

```
band x=height lower=lowermean upper=uppermean /
   fillattrs=GraphConfidence2
   legendlabel="95% CLM" name="band2";
scatter x=height y=weight;
series x=height y=predict / lineattrs=GraphPrediction
   legendlabel="Predicted Fit" name="series";
```

**Create the scatter and series plots.** The LINEATTRS= option in the SERIES statement specifies the style attribute for the series plot. The LEGENDLABEL= option in the SERIES statement specifies the legend label for the series plot.

**Create a legend for the graph.** The quoted strings specify the names of the plots that you want to include in the legend. The LOCATION= option places the legend inside of the plot area. The POSITION= option places the legend in the bottom right corner of the graph.

```
   keylegend "series" "band1" "band2" / location=inside
      position=bottomright;
run;
```

**Cancel the title.**

```
title;
```
Example 7: Adding Statistical Limits to a Dot Plot

Features:
- DOT statement
- Sample library member: SGPLDT1

This example shows a dot plot with a response variable and statistical limits. Each dot represents the mean for each value of the category variable, and bands represent the standard deviation.

Output

![Dot plot with statistical limits]

Program

```sas
proc sgplot data=sashelp.class(where=(age<16));
dot age / response=height stat=mean
   limitstat=stddev numstd=1;
run;
```

Program Description

Create the dot plot. The `response=` option specifies the response variable. The `stat=` option specifies that the mean statistic is used to analyze the graph. The `limitstat=` option specifies that the limit statistic is the standard deviation. The `numstd=` option specifies that one standard deviation is used.

```sas
proc sgplot data=sashelp.class(where=(age<16));
dot age / response=height stat=mean
   limitstat=stddev numstd=1;
run;
```
Example 8: Combining Histograms with Density Plots

Features:
- HISTOGRAM statement
- DENSITY statement
- KEYLEGEND statement

Sample library member: SGPLHST

This example shows a histogram combined with two density plots. One density plot uses a normal density estimate and the other density plot uses a kernel density estimate.

**Output**

![Cholesterol Distribution](image)

**Program**

```sas
proc sgplot data=sashelp.heart;
title "Cholesterol Distribution";
histogram cholesterol;
density cholesterol;
density cholesterol / type=kernel;
keylegend / location=inside position=topright;
run;
title;
```

**Program Description**

Set the title, set a label for the X axis, and create the histogram.
proc sgplot data=sashelp.heart;
  title "Cholesterol Distribution";
  histogram cholesterol;

Create the density plots. The TYPE= option specifies which density equation is used.

density cholesterol;

density cholesterol / type=kernel;

Position the Legend The LOCATION= option places the legend inside of the plot area. The POSITION= option places the legend at the top right.

keylegend / location=inside position=topright;
run;

Cancel the title.

title;

Example 9: Creating a Horizontal Box Plot

Features: HBOX statement
Sample library member: SGPLBOX

This example shows a horizontal box plot.

Output

Program

proc sgplot data=sashelp.heart;
  title "Cholesterol Distribution by Weight Class";
  hbox cholesterol / category=weight_status;
Program Description

Create the box plot. The CATEGORY= option specifies the category variable.

```plaintext
proc sgplot data=sashelp.heart;
  title "Cholesterol Distribution by Weight Class";
  hbox cholesterol / category=weight_status;
run;
title;
```

Example 10: Creating a Bar-Line Chart

Features:
- VBAR statement
- VLINE statement

Sample library member: SGPLBAR

Note: You can also combine the HBAR and HLINE statements to create a horizontal bar-line chart.

This example creates a bar-line chart.

Output

![Stock Volume vs. Close](image)

Program

```plaintext
proc sgplot data=sashelp.stocks (where=(date >= "01jan2000"d 
  and date <= "01jan2001"d 
  and stock = "IBM"));
```
Program Description

Create the Bar-line Chart. The Y2AXIS option assigns the line plot to the Y2 axis.

```
proc sgplot data=sashelp.stocks (where=(date >= "01jan2000"d
and date <= "01jan2001"d
and stock = "IBM"));
  title "Stock Volume vs. Close";
  vbar date / response=volume;
  vline date / response=close y2axis;
run;
title;
```

Example 11: Creating a High-Low Chart

Features: HIGHLOW statement
Sample library member: SGPLHILO

This example shows the high, low, and closing stock prices for a company during the year 2005.

Output

![Stock High, Low, and Close](image)
Program

title "Stock High, Low, and Close";
proc sgplot data=sashelp.stocks;
  where Date >= '01JAN2005'd and stock='IBM';
  highlow x=date high=high low=low
   / close=close;
run;
title;

Program Description

Create the high-low chart. The HIGH, LOW, and CLOSE variables are used in the HIGHLOW statement. In addition, the plot subsets the data by year and by company.

title "Stock High, Low, and Close";
proc sgplot data=sashelp.stocks;
  where Date >= '01JAN2005'd and stock='IBM';
  highlow x=date high=high low=low
   / close=close;
run;
title;
Chapter 8
SGRENDER Procedure

Overview: SGRENDER Procedure
The SGRENDER procedure produces graphical output from templates that are created with the Graph Template Language (GTL). The GTL is a comprehensive language for creating statistical graphics, which can be used to create customized layouts and graphs that are beyond the scope of the ODS Graphics procedures. For more information about the GTL, see the SAS Graph Template Language: Reference and the SAS Graph Template Language: User's Guide.

The SGRENDER procedure can also produce graphical output from SAS ODS Graphics Editor files. For more information about the editor, see the SAS ODS Graphics Editor: User's Guide.

Syntax: SGRENDER Procedure

Global statements:
BY, FORMAT, LABEL, ODS GRAPHICS, WHERE

PROC SGRENDER < option(s)>;
  DYNAMIC variable-assignment(s);
PROC SGRENDER Statement

Identifies the data set that contains the plot variables and the StatGraph template. You can also render a graph from a SAS ODS Graphics Editor (SGE) file. The statement also gives you the option to specify the name of the output object and the label for the output object.

**Requirement:** Requires an input data set and a template, or an SGE file.

**Syntax**

```sas
PROC SGRENDER TEMPLATE= statgraph-template <DATA= input-data-set>
   <OBJECT= object-name>
   <OBJECTLABEL="text-string" > ;
PROC SGRENDER SGE= fileref | "file-name"
   <OBJECT= object-name>
   <OBJECTLABEL="text-string" > ;
```

**Summary of Optional Arguments**

**Render options**

- **DATA=** *input-data-set*
  
  Specifies the SAS data set that contains the variables to process.

- **OBJECT=** *object-name*
  
  Specifies a name for the ODS output object.

- **OBJECTLABEL=** "*text-string*"
  
  Specifies a description for the output image.

- **SGE=** *fileref | "file-name"*
  
  Specifies the SAS ODS Graphics Editor (SGE) file to render.

**Required Argument**

- **TEMPLATE=** *statgraph-template*
  
  Specifies a StatGraph template that defines one or more graphs. The SGRENDER procedure applies the StatGraph template to your data to create the output graphs.

  **Interaction:** This argument is required except when you use the SGE= option.

  **Note:** Specifying a template that is not a StatGraph template is not supported. If you specify a non-StatGraph template, then the SGRENDER procedure might produce unpredictable results.

**Optional Arguments**

- **DATA=** *input-data-set*
  
  Specifies the SAS data set that contains the variables to process. By default, the procedure uses the most recently created SAS data set.

- **OBJECT=** *object-name*
  
  Specifies a name for the ODS output object.

  **Alias:** NAME=

  **Default:** SGRender
Note: To specify the filename of the output image, use the IMAGENAME= option in the ODS GRAPHICS statement.

OBJECTLABEL= “text-string”
specifies a description for the output image. The description identifies the image in the following locations:

• the Results window
• the alternate text for the image in HTML output
• the table of contents that is created by the CONTENTS option in an ODS statement

The default description is “The SGRENDER Procedure”.

Alias: DES=, DESCRIPTION=

SGE= fileref | “file-name”
specifies the SAS ODS Graphics Editor (SGE) file to render. Specify a fileref or a filename for the SGE file. This option enables you to render an SGE file to any supported ODS destination. The output type depends on the OUTPUTFMT option of the ODS GRAPHICS statement and the open ODS destination.

When you use this option to render an input SGE file, ODS does not produce an output SGE file even if the SGE=ON option is specified in the ODS statement.

For information about generating SGE files, see the SAS ODS Graphics Editor: User's Guide.

Requirement: Although SGE rendering does not require a data set, the SGRENDER procedure requires a data reference. You might need to specify DATA=_NULL_ in the SGRENDER procedure if the _LAST_ data set variable has not been set by the SAS system. This typically happens at the beginning of a SAS session, before the creation of a data set.

DYNAMIC Statement
Defines the values for dynamic variables in your StatGraph template code.

See: “Example 2: Defining Dynamic Variables” on page 518

Syntax

DYNAMIC variable-assignment(s);

Required Argument

variable-assignment(s)
specifies the values for one or more dynamic variables. The variables that you assign must also be declared in a DYNAMIC statement within the StatGraph template.

You can specify either a numeric value or a quoted text string. For example, the following statement defines one string variable and one numeric variable: dynamic region="Europe" limit=3000;
Details

Description
The DYNAMIC statement defines values for dynamic variables that are used in your StatGraph template.

You can either specify variables on multiple DYNAMIC statements, or specify all of your variables on a single DYNAMIC statement.

Note: If your template uses a dynamic variable to specify a required attribute, such as a variable name, and the name is misspelled or not provided in the SGRENDER procedure, then a warning is issued and the respective plot statement drops out of the final graph. A graph is produced, but it might be a blank graph, or it might show the results of all statements except those that are in error.

Special Dynamic Variables
Some special dynamic variables can be declared and referenced in a StatGraph template and do not need to be assigned in the DYNAMIC statement of the SGRENDER procedure. The following table describes those dynamic variables.

Table 8.1 Special Dynamic Variables

<table>
<thead>
<tr>
<th>Dynamic Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>LIBNAME</em></td>
<td>Represents the name of the library that contains the data set.</td>
</tr>
<tr>
<td><em>MEMNAME</em></td>
<td>Represents the name of the library member that contains the data set.</td>
</tr>
<tr>
<td><em>BYLINE</em></td>
<td>Represents the complete BY line, when you specify a BY statement.</td>
</tr>
<tr>
<td><em>BYFOOTNOTE</em></td>
<td>When the BYLINE=FOOTNOTE option is specified in the ODS Graphics statement, the BY line information is set in this dynamic. Typically, you use this dynamic with the ENTRYFOOTNOTE statement in your template.</td>
</tr>
<tr>
<td><em>BYTITLE</em></td>
<td>When the BYLINE=TITLE option is specified in the ODS Graphics statement, the BY line information is set in this dynamic. Typically, you use this dynamic with the ENTRYTITLE statement in your template.</td>
</tr>
<tr>
<td><em>BYVAR</em></td>
<td>Represents the name of the first BY variable, when you specify a BY statement.</td>
</tr>
<tr>
<td><em>BYVARN</em></td>
<td>Represents the name of the nth BY variable, when you specify a BY statement with multiple variables.</td>
</tr>
<tr>
<td><em>BYVAL</em></td>
<td>Represents the first BY value, when you specify a BY statement.</td>
</tr>
</tbody>
</table>
**_BYVAL_n_**

Represents the value of the $n$th BY variable, when you specify a BY statement with multiple variables.

---

**Examples: SGRENDER Procedure**

**Example 1: Generating a Graph from a Simple GTL Template**

**Features:**
- GTL template

**Sample library member:**
- SGRENDR

This example creates a simple StatGraph template by using Graph Template Language and then generates a graph from the template by using the SGRENDER procedure.

**Output**

![Graph Example](image)

**Program**

```
proc template;
  define statgraph surface;
  begingraph;
    layout overlay3d;
    surfaceplotparm x=height y=weight z=density;
    endlayout;
  endgraph;
endproc;
```
Program Description

Create the Statgraph Template.

```sas
proc template;
   define statgraph surface;
   begingraph;
      layout overlay3d;
         surfaceplotparm x=height y=weight z=density;
      endlayout;
   endgraph;
end;
run;
```

Generate the graphics output from the template.

```sas
proc sgrender data=sashelp.gridded template=surface;
run;
```

Example 2: Defining Dynamic Variables

<table>
<thead>
<tr>
<th>Features:</th>
<th>DYNAMIC Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample library</td>
<td>SGREND1</td>
</tr>
<tr>
<td>member:</td>
<td></td>
</tr>
</tbody>
</table>

This example uses dynamic variables to set values within the StatGraph template. By using dynamic variables to set the variable names, variable labels, and other parameters, the StatGraph template can be used with different data sets.

The first PROC SGRENDER statement generates a graph for the SASHELP.HEART data set.

The second PROC SGRENDER statement generates multiple graph for the CARS data set by using BY grouping.
Program Template and Heart Data

```sas
proc template;
    define statgraph distribution;
        dynamic VAR VARLABEL TITLE NORMAL _BYLINE_;
        begingraph;
            entrytitle TITLE;
            entrytitle _BYLINE_;
            layout lattice / columns=1 rows=2 rowgutter=2px rowweights=(.9 .1) columndatarange=union;
                columnaxes;
                    columnaxis / label=VARLABEL;
                endcolumnaxes;
                layout overlay / yaxisopts=(offsetmin=.035);
                    layout gridded / columns=2 border=true autoalign=(topleft topright);
                        entry halign=left "Nobs";
                            entry halign=left eval(strip(put(n(VAR),8.)));
                        entry halign=left "Mean";
                            entry halign=left eval(strip(put(mean(VAR),8.2)));
                        entry halign=left "StdDev";
                            entry halign=left eval(strip(put(stddev(VAR),8.3)));
                    endlayout;
            histogram VAR / scale=percent;
            if (exists(NORMAL))
                densityplot VAR / normal( );
            endif;
            fringeplot VAR / datatransparency=.7;
            endlayout;
            boxplot y=VAR / orient=horizontal;
            endlayout;
        endgraph;
    end;
run;
```

Example 2: Defining Dynamic Variables
Program Description

Create the Statgraph template.

Generate the first graphics output from the template using the SASHELP.HEART data set. The DYNAMIC statement defines dynamic variables in the template.
Program for Grouped Cars Data

```sas
proc sort data=sashelp.cars out=cars;
    by origin;
run;

proc sgrender data=cars template=distribution;
    by origin;
    dynamic var="weight" varlabel="Weight in LBS"
    title="Distribution of Vehicle Weight";
run;
title;
```

Program Description

**Sort the SASHELP.CARS data set.** The data set must be sorted by the same variable that the following PROC SGRENDER block uses in its BY statement.

```sas
proc sort data=sashelp.cars out=cars;
    by origin;
run;
```

**Generate the second graphics output from the template using the WORK.CARS data set.** The BY statement generates multiple graphs for each value of the BY variable. The DYNAMIC statement defines dynamic variables in the template.

```sas
proc sgrender data=cars template=distribution;
    by origin;
    dynamic var="weight" varlabel="Weight in LBS"
    title="Distribution of Vehicle Weight";
run;
title;
```
The SGSCATTER procedure creates a paneled graph of scatter plots for multiple combinations of variables, depending on the plot statement that you use. You can use options to overlay fit plots and ellipses on your scatter plots.
Here are examples of some types of graphs that the SGSCATTER procedure can create.

### Table 9.1 Examples of Graphs that Can Be Generated by the SGSCATTER Procedure

The following code creates a paneled graph of scatter plots:

```sas
proc sgscatter data=sashelp.cars;
  plot mpg_highway*weight msrp*horsepower / group=type;
run;
```

The following code creates a paneled graph of scatter plots with shared axes:

```sas
proc sgscatter data=sashelp.cars;
  compare y=mpg_highway x=(weight enginesize horsepower ) / group=type;
run;
```

The following code creates a scatter plot matrix with prediction ellipses and a diagonal with histograms and density plots:

```sas
proc sgscatter data=sashelp.iris (where=(species eq "Virginica"));
  matrix petallength petalwidth sepallength / ellipse=(type=mean) diagonal=(histogram kernel);
run;
```

**Note:** The graphs that you create with the SGSCATTER procedure can have many individual graph cells. As the number of cells increases, the overall graph size does not automatically increase. To increase the graph size, use the HEIGHT= and WIDTH= options of the ODS GRAPHICS statement.
The SGSCATTER procedure contains three statements that you can use to create a paneled graph of scatter plots:

- PLOT
- COMPARE
- MATRIX

Each of the statements is specialized for creating a different type of paneled graph.

**PLOT Statement**

The PLOT statement is used to create a paneled graph of scatter plots where each graph cell has its own independent set of axes. Each variable pair that you specify in the PLOT statement creates an independent graph cell. You can also overlay fit plots and ellipses on each cell by using options.

For example, Figure 9.1 on page 525 shows a graph that contains two independent cells. Each cell contains a scatter plot and a loess curve.

*Figure 9.1  Example Graph from the PLOT Statement*

By default, the axis ranges of each cell are independent from the other cells. However, you can use the UNISCALE= option to specify that all of the cells use the same axis ranges for the X axis, the Y axis, or both axes.
Note: It is possible to create a single scatter cell with the PLOT statement, but the SGPLOT procedure is better suited to creating a single-celled graph.

**COMPARE Statement**
The COMPARE statement is used to create a shared axis panel, also called an MxN matrix. The list of X and Y variables are crossed to create each cell in the graph. All cells in a row share the same row axis range. All cells in a column share the same column axis range.

When using the COMPARE statement, you can add fit plots and confidence ellipses to each cell in the panel by using options.

The COMPARE statement can also be used to do simple X or Y axis sharing by specifying only one X or Y variable, as in the following example:

*Figure 9.2  Example Graph from the COMPARE Statement*

![Example Graph from the COMPARE Statement](image)

**MATRIX Statement**
The MATRIX statement is used to create a scatter plot matrix. Each of the variables that you specify are graphed against each other to create the graph. You can use the ELLIPSE option to overlay a confidence ellipse on each cell in the panel.

The MATRIX statement also has an option called DIAGONAL= that enables you to display the distribution of your variables in the diagonal cells of the matrix. You can place histograms in the diagonal cells, and overlay those histograms with normal density curves or kernel density estimates.
For example, the following example shows a graph with histograms and normal density curves in the diagonal cells.

**Figure 9.3  Example Graph from the MATRIX Statement**

---

**Legends in the SGSCATTER Procedure**

The SGSCATTER procedure creates a legend automatically when you specify a GROUP= variable. You can use the NOLEGEND option to disable the legend.

For all of the graph creation statements, you can use the LEGEND= option to specify the attributes of the legend.

---

**Syntax: SGSCATTER Procedure**

**Requirement:** One COMPARE, MATRIX, or PLOT statement is required.

**Global statements:**

```
PROC SGSCATTER < options >;
   COMPARE X= variable | (variable-1 ... variable-n) Y= variable |
              (variable-1 ... variable-n) <options>;
   MATRIX variable-1 variable-2 < ... variable-n> <options>;
   PLOT plot-request(s) <options>;
```
PROC SGSCATTER Statement

Identifies the data set that contains the plot variables. The statement also gives you the option to specify a description and write template code to a file.

**Requirement:** An input data set is required.

### Syntax

```sas
PROC SGSCATTER <DATA= input-data-set>
  < DATTRMAP= "attribute-map-data-set " >
  < DESCRIPTION= "text-string" >
  < PAD= dimension|units | (pad-options)>
  < SGANNO= "annotation-data-set " >
  <TMPLOUT= "filename">;
```

### Summary of Optional Arguments

- **DATA=** `input-data-set`
  specifies the SAS data set that contains the variables to process.

- **DATTRMAP=** `attribute-map-data-set`
  specifies the SG attribute map data set that you want to use with the SGSCATTER procedure.

- **DESCRIPTION=** `"text-string"`
  specifies a description for the output image.

- **PAD=** `dimension|units | (pad-options)`
  specifies the amount of extra space that is reserved inside the border of an annotated graph.

- **SGANNO=** `annotation-data-set`
  specifies the SG annotation data set that you want to use.

- **TMPLOUT=** `"filename"`
  specifies a file destination for the template code that is generated by the SGSCATTER procedure.

### Optional Arguments

- **DATA=** `input-data-set`
  specifies the SAS data set that contains the variables to process. By default, the procedure uses the most recently created SAS data set.

- **DATTRMAP=** `attribute-map-data-set`
  specifies the SG attribute map data set that you want to use with the SGSCATTER procedure. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

- **DESCRIPTION=** `"text-string"`
  specifies a description for the output image. The description identifies the image in the following locations:
    - the Results window
• the alternate text for the image in HTML output
• the table of contents that is created by the CONTENTS option in an ODS statement

The default description is “The SGSCATTER Procedure”.

**Alias:** DES

**Notes:**
You can disable the alternate text in HTML output by specifying an empty string. That is, DESCRIPTION="".

The name of the output image is specified by the IMAGENAME= option in the ODS GRAPHICS statement.

**PAD=** dimension<units> | (pad-options)

specifies the amount of extra space that is reserved inside the border of an annotated graph.

You specify this option only if you are using the SG annotation feature to annotate your graph. For more information, see Chapter 10, “Annotating ODS Graphics,” on page 557.

This option creates margins around the graph for company logos, annotated notes, and so on. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Use pad options to create non-uniform padding. Edges that are not assigned padding are padded with the default amount.

**pad-options** can be one or more of the following:

**LEFT=** dimension<units>

specifies the amount of extra space to add to the left edge.

**RIGHT=** dimension<units>

specifies the amount of extra space to add to the right edge.

**TOP=** dimension<units>

specifies the amount of extra space to add to the top edge.

**BOTTOM=** dimension<units>

specifies the amount of extra space to add to the bottom edge.

**SGANNO=** annotation-data-set

specifies the SG annotation data set that you want to use. You specify this option only if you are using the SG annotation feature to annotate your graph. For more information, see Chapter 10, “Annotating ODS Graphics,” on page 557.

**TMPLOUT=** "filename"

specifies a file destination for the template code that is generated by the SGSCATTER procedure.

---

**COMPARE Statement**

Creates a comparative panel of scatter plots with shared axes.

**Examples:**

“Example 3: Creating a Simple Comparative Panel” on page 551

“Example 4: Creating a Comparative Panel with Regression Fits and Confidence Ellipses” on page 552
Syntax

COMPARE X= variable | (variable-1 ... variable-n) Y= variable | (variable-1 ... variable-n) </options>;

Summary of Optional Arguments

DATALABEL <= variable>
- displays a label for each data point.

ELLIPSE <= (options)>
- Adds a confidence or prediction ellipse to the scatter plot.

GRID
- creates grid lines for each tick on both axes.

GROUP= variable
- specifies a classification variable to divide the values into groups.

JOIN <= (options)>
- specifies that line segments join all of the scatter points.

LEGEND= (options)
- specifies the appearance of the legend for the scatter plot.

LOESS <= (options)>
- Adds a loess fit to the scatter plot.

MARKERATTRS= style-element <(options)> | (options)
- specifies the appearance of the markers in the plot.

NOLEGEND
- removes the legend from the plot.

PBSPLINE <= (options)>
- adds a fitted, penalized B-spline curve to the scatter plot.

REFTICKS
- duplicates the tick marks from the X and Y axes on the opposite sides of the graph.

REG <= (options)>
- adds a regression fit to the scatter plot.

SPACING = n
- specifies the amount of spacing (in pixels) that is placed between the cells in the graph.

TRANSPARENCY= numeric-value
- specifies the degree of transparency for the plot components.

Required Arguments

X= variable | (variable-1) ... (variable-n)
- specifies one or more variables for the X axis. To specify more than one variable, enclose the list of variables in parentheses.

Y= variable | (variable-1) ... (variable-n)
- specifies the one or more variables for the Y axis. To specify more than one variable, enclose the list of variables in parentheses.

Optional Arguments

DATALABEL <= variable>
- displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, the value of the Y variable is used for the data label.
ELLIPSE \( \leq (\text{options}) \)

Adds a confidence or prediction ellipse to the scatter plot. \textit{options} can be one or more of the following:

\textbf{ALPHA= numeric-value}

specifies the confidence level for the ellipse. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

\textbf{Default:} .05

\textbf{TYPE= MEAN | PREDICTED}

specifies the type of ellipse. MEAN specifies a confidence ellipse for the population mean. PREDICTED specifies a prediction ellipse for a new observation. Both ellipse types assume bivariate normal distribution.

\textbf{Default:} PREDICTED

\textbf{Restriction:} To use this option, all of the X and Y variables must be numeric.

\textbf{Interaction:} The GROUP option does not affect the creation of ellipses. The SGSCATTER procedure always uses all of the data points to calculate the confidence or prediction ellipse.

\textbf{GRID}

creates grid lines for each tick on both axes.

\textbf{GROUP= variable}

specifies a classification variable to divide the values into groups. If a fit line is requested, then the GROUP= variable is also applied to the fit plot unless you specify the NOGROUP suboption in the option for the fit plot.

\textbf{JOIN \( \leq (\text{options}) \)}

specifies that line segments join all of the scatter points. The line segments connect the scatter points in increasing order along the X axis. The data order of the input data set has no effect on the order of the lines.

You can specify the following options:

\textbf{LINEATTRS= style-element \( \langle\text{options}\rangle\) | \(\text{options}\)}

specifies the appearance of the join lines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

\textit{options} can be one or more of the following:

\textbf{COLOR= color}

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of \textit{SAS/GRAPH: Reference}.

\textbf{Default:} For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\textit{n} style elements in the current style.

\textbf{PATTERN= line-pattern}

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

\textbf{Default:} For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData[n] style elements in the current style.

**THICKNESS=** *n* <units>

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData[n] style elements in the current style.

**LEGEND=** *(options)*

specifies the appearance of the legend for the scatter plot. *options* can be one or more of the following:

- **ACROSS=** *n*
  
specifies the number of columns in the legend.

- **DOWN=** *n*
  
specifies the number of rows in the legend.

  **Interaction:** If you specify both the ACROSS= and DOWN= suboptions, then the DOWN= suboption has no effect.

- **NOBORDER**
  
removes the border from the legend.

- **NOTITLE**
  
removes the label from the legend.

- **POSITION=** *position-value*
  
specifies the position of the legend within the graph. The positions are as follows:

  - **BOTTOM**
    
places the legend at the bottom of the graph.

  - **LEFT**
    
places the legend at the left side of the graph.

  - **RIGHT**
    
places the legend at the right side of the graph.

  - **TOP**
    
places the legend at the top of the graph.

  **Default:** BOTTOM

  **Note:** If you specify more than one legend with the same position, then all of your legends are placed at that position.

- **TITLE=** "*text-string"*
  
specifies the label for the legend. By default, the label of the group variable is used.

**LOESS <=** *(options)>*

Adds a loess fit to the scatter plot. You can specify the following options:
**ALPHA= numeric-value**
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

**Default:** .05

**Interaction:** This option has no effect if you do not specify the CLM option.

**CLM**
creates confidence limits for a mean predicted value for each observation.

**DEGREE= 1 | 2**
specifies the degree of the local polynomials to use for each local regression. 1 specifies a linear fit and 2 specifies a quadratic fit.

**Default:** 1

**INTERPOLATION= CUBIC | LINEAR**
specifies the degree of the interpolating polynomials that are used for blending local polynomial fits at the kd tree vertices.

**Default:** CUBIC

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the fit line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData<n> style elements in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData<n> style elements in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData<n> style elements in the current style.
NOGROUP
specifies that the fit does not use the group variable from the scatter plot.

SMOOTH= numeric-value
specifies a smoothing parameter value. If you do not specify a value, the value is
determined automatically.

Restriction: To use this option, all of the X and Y variables must be numeric.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot. You can specify the appearance
by using a style element or by using suboptions. If you specify a style element, you
can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
specifies the color of the markers. You can specify colors using the same color
schemes that are supported by SAS/GRAPH software. For more information, see

Default: For ungrouped data, the default color is specified by the ContrastColor
attribute of the GraphDataDefault style element in the current style. For
grouped data, the default color is specified by the ContrastColor attribute of the
GraphData1 ... GraphData\_n style elements in the current style.

SIZE= n <units>
specifies the size of the markers. You can also specify the unit of measurement.
The default unit is pixels. For a list of measurement units that are supported, see
“Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the
GraphDataDefault style element in the current style.

SYMBOL= symbol-name
specifies the symbol for the markers. For a list of valid marker symbols, see
“Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the
MarkerSymbol attribute of the GraphDataDefault style element in the current style. For
grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the
GraphData1 ... GraphData\_n style elements in the current style.

NOLEGEND
removes the legend from the plot.

PBSPLINE <= (options)>
adds a fitted, penalized B-spline curve to the scatter plot. options can be one or more
of the following:

ALPHA= numeric-value
specifies the confidence level for the confidence limits. Specify a number
between 0.00 (100% confidence) and 1.00 (0% confidence).

Default: .05

Interaction: This option has no effect if you do not specify either the CLI option
or the CLM option.

CLI
creates confidence limits for individual predicted values for each observation.

CLM
creates confidence limits for a mean predicted value for each observation.
DEGREE=\( n \)  
specifies the degree of the spline transformation.  

**Default:** 3

LINEATTRS= \text{style-element} (<\text{options}>) | (\text{options})  
specifies the appearance of the curve line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.  

\textit{options} can be one or more of the following:

\textbf{COLOR=} \textit{color}  
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of \textit{SAS/GRAPH: Reference}.  

**Default:** For ungrouped data, the default color is specified by the \text{ContrastColor} attribute of the \text{GraphFit} style element in the current style.  
For grouped data, the default color is specified by the \text{ContrastColor} attribute of the GraphData1 \ldots GraphData\textit{n} style elements in the current style.

\textbf{PATTERN=} \textit{line-pattern}  
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.  

**Default:** For ungrouped data, the default line pattern is specified by the \text{LineStyle} attribute of the \text{GraphFit} style element in the current style.  
For grouped data, the default line pattern is specified by the \text{LineStyle} attribute of the GraphData1 \ldots GraphData\textit{n} style elements in the current style.

\textbf{THICKNESS=} \textit{n} <\text{units}>  
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.  

**Default:** For ungrouped data, the default line thickness is specified by the \text{LineThickness} attribute of the \text{GraphFit} style element in the current style.  
For grouped data, the default line thickness is specified by the \text{LineThickness} attribute of the GraphData1 \ldots GraphData\textit{n} style elements in the current style.

NKNOTS= \textit{n}  
specifies the number of evenly spaced internal knots.  

**Default:** 100

NOGROUP  
specifies that the curve does not use the group variable from the scatter plot.

SMOOTH= \textit{numeric-value}  
specifies a smoothing parameter value. If you do not specify this option, then a smoothing value is determined automatically.  

**Restriction:** To use this option, all of the X and Y variables must be numeric.

REFTICKS  
duplicates the tick marks from the X and Y axes on the opposite sides of the graph.

REG <= (\text{options})>  
adds a regression fit to the scatter plot. \textit{options} can be one or more of the following:
ALPHA= numeric-value
   specifies the confidence level for the confidence limits. Specify a number
   between 0.00 (100% confidence) and 1.00 (0% confidence).
   Default: .05
   Interaction: This option has no effect if you do not specify either the CLI option
               or the CLM option.

CLI
   creates confidence limits for individual predicted values for each observation.

CLM
   creates confidence limits for a mean predicted value for each observation.

DEGREE= n
   specifies the degree of the polynomial fit. For example, 1 specifies a linear fit, 2
   specifies a quadratic fit, and 3 specifies a cubic fit.
   Default: 1

LINEATTRS= style-element <(options)> | (options)
   specifies the appearance of the fit line. You can specify the appearance by using
   a style element or by using suboptions. If you specify a style element, you can
   also specify suboptions to override specific appearance attributes.

   options can be one or more of the following:

COLOR= color
   specifies the color of the line. You can specify colors using the same color
   schemes that are supported by SAS/GRAPH software. For more information,
   see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
   Default: For ungrouped data, the default color is specified by the
            ContrastColor attribute of the GraphFit style element in the current style.
            For grouped data, the default color is specified by the ContrastColor
            attribute of the GraphData1 ... GraphData n style elements in the current
            style.

PATTERN= line-pattern
   specifies the line pattern for the line. You can reference SAS patterns by
   number or by name. For a list of line patterns, see “Line Patterns” on page
   663.
   Default: For ungrouped data, the default line pattern is specified by the
            LineStyle attribute of the GraphFit style element in the current style.
            For grouped data, the default line pattern is specified by the LineStyle
            attribute of the GraphData1 ... GraphData n style elements in the current
            style.

THICKNESS= n <units>
   specifies the thickness of the line. You can also specify the unit of measure.
   The default unit is pixels. For a list of measurement units that are supported,
   see “Units of Measurement” on page 659.
   Default: For ungrouped data, the default line thickness is specified by the
            LineThickness attribute of the GraphFit style element in the current style.
            For grouped data, the default line thickness is specified by the
            LineThickness attribute of the GraphData1 ... GraphData n style elements
            in the current style.

NOGROUP
   specifies that the fit does not use the group variable from the scatter plot.
**Restriction:** To use this option, all of the X and Y variables must be numeric.

**SPACING = n**

specifies the amount of spacing (in pixels) that is placed between the cells in the graph.

Default: 0

**TRANSPARENCY = numeric-value**

specifies the degree of transparency for the plot components. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

---

**MATRIX Statement**

Creates a scatter plot matrix.

**Example:** “Example 1: Creating a Scatter Plot Matrix” on page 548

**Syntax**

```
MATRIX numeric-variable-1 numeric-variable-2 < ... numeric-variable-n> </ options>;
```

**Summary of Optional Arguments**

- **DATALABEL = variable**  
  specifies a variable that is used to create data labels for each point in the plot.

- **DIAGONAL = (graph-list)**  
  adds graphs to the diagonal cells of the plot matrix.

- **ELLIPSE <= (options)>**  
  Adds a confidence or prediction ellipse to each cell that contains a scatter plot.

- **GROUP = variable**  
  specifies a classification variable to divide the values into groups.

- **LEGEND = (options)**  
  specifies the appearance of the legend for the scatter plot.

- **MARKERATTRS = style-element <(options)> | (options)**  
  specifies the appearance of the markers in the plot.

- **NOLEGEND**  
  removes the legend from the graph.

- **START = BOTTOMLEFT | TOLEFT**  
  specifies whether the diagonal starts in the top left corner or the bottom left corner.

- **TRANSPARENCY = numeric-value**  
  specifies the degree of transparency for the plot components.

**Required Argument**

```
numeric-variable-1 numeric-variable-2 < ... numeric-variable-n >
```

specifies two or more numeric variables for the matrix.
Optional Arguments

**DATALABEL=** variable
specifies a variable that is used to create data labels for each point in the plot.

**DIAGONAL=** (graph-list)
adds graphs to the diagonal cells of the plot matrix. If you do not specify the DIAGONAL option, the diagonal cells contain the variable names.

*graph-list* can be one or more of the following:

- HISTOGRAM
  specifies a histogram.

- KERNEL
  specifies a kernel density estimate.

- NORMAL
  specifies a normal density curve.

**ELLIPSE <= (options)>**
Adds a confidence or prediction ellipse to each cell that contains a scatter plot.

*options* can be one or more of the following:

- ALPHA= numeric-value
  specifies the confidence level for the ellipse. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).
  **Default:** .05

- TYPE= MEAN | PREDICTED
  specifies the type of ellipse. MEAN specifies a confidence ellipse for the population mean. PREDICTED specifies a prediction ellipse for a new observation. Both ellipse types assume bivariate normal distribution.
  **Default:** PREDICTED

**GROUP=** variable
specifies a classification variable to divide the values into groups. If a fit line is requested, then the GROUP= variable is also applied to the fit plot unless you specify the NOGROUP suboption in the option for the fit plot.

**LEGEND= (options)**
specifies the appearance of the legend for the scatter plot.

*options* can be one or more of the following:

- ACROSS= n
  specifies the number of columns in the legend.

- DOWN= n
  specifies the number of rows in the legend.

  **Interaction:** If you specify both the ACROSS= and DOWN= suboptions, then the DOWN= suboption has no effect.

- NOBORDER
  removes the border from the legend.

- NOTITLE
  removes the label from the legend.
POSITION= position-value
 specifies the position of the legend within the graph. The values are as follows:

BOTTOM
 places the legend at the bottom of the graph.

LEFT
 places the legend at the left side of the graph.

RIGHT
 places the legend at the right side of the graph.

TOP
 places the legend at the top of the graph.

Default: BOTTOM

Note: If you specify more than one legend with the same position, then all of your legends are placed at that position.

TITLE= "text-string"
 specifies the label for the legend. By default, the label of the group variable is used.

MARKERATTRS= style-element <(options)> | (options)
 specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
 specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

SIZE= n <units>
 specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
 specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData n style elements in the current style.

NOLEGEND
 removes the legend from the graph.

START= BOTTOMLEFT | TOPLEFT
 specifies whether the diagonal starts in the top left corner or the bottom left corner.

Default: TOPLEFT
TRANSPARENCY= numeric-value
specifies the degree of transparency for the plot components. Specify a value from
0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

PLOT Statement
Creates a paneled graph that contains multiple independent scatter plots.

Example: “Example 2: Creating a Graph with Multiple Independent Scatter Plots and Spline Curves” on page 549

Syntax
PLOT plot-request(s) </ options>;

Summary of Optional Arguments
ATTRID= variable
specifies the value of the ID variable in an attribute map data set.

COLUMNS= n
specifies the number of columns in the graph.

DATALABEL <= variable>
displays a label for each data point.

ELLIPSE <= (options)>
adds a confidence or prediction ellipse to the scatter plot.

GRID
creates grid lines for each tick on both axes.

GROUP= variable
specifies a classification variable to divide the values into groups.

JOIN <= (options)>
specifies that line segments join all of the scatter points.

LEGEND= (options)
specifies the appearance of the legend for the scatter plot.

LOESS <= (options)>
adds a loess fit to the scatter plot.

MARKERATTRS= style-element <(options)> | (options)
specifies the appearance of the markers in the plot.

NOLEGEND
removes the legend from the graph.

PBSPLINE <= (options)>
adds a fitted, penalized B-spline curve to the scatter plot.

REFTICKS
duplicates the tick marks from the X and Y axes on the opposite sides of each
cell.

REG <= (options)>
adds a regression fit to the scatter plot.

ROWS= n
specifies the number of rows in the graph.
SPACING = \( n \)
specifies the amount of spacing (in pixels) that is placed between the cells in the graph, if the PLOT statement creates multiple cells.

TRANSPARENCY= numeric-value
specifies the degree of transparency for the plot components.

UNISCALE= X | Y | ALL
specifies that the X axis, Y axis, or both axes are scaled uniformly for all of the cells in the graph.

Required Argument

\( \text{plot-request-1} < \ldots \text{plot-request-n} > \)
specifies one or more plot requests. Each plot request specifies the variables to plot and produces a separate cell. All variables must be in the input data set. Multiple plot requests are separated with blanks. You can plot character or numeric variables. A plot request can be either of these:

- \( y\text{-variable}\times x\text{-variable} \)
  plots the values of two variables.
  - \( y\text{-variable} \)
    variable plotted on the left vertical axis.
  - \( x\text{-variable} \)
    variable plotted on the horizontal axis.

- \( (y\text{-variable}(s))\times(x\text{-variable}(s)) \)
  plots the values of two or more variables and produces a separate cell for each combination of Y and X variables. That is, each Y*X pair is plotted on a separate set of axes.
  - \( y\text{-variable}(s) \)
    variables plotted on the left vertical axes.
  - \( x\text{-variable}(s) \)
    variables plotted on the horizontal axes.

If you use only one \( y\text{-variable} \) or only one \( x\text{-variable} \), omit the parentheses for that variable, for example,

\[ \text{plot (temp rain)}\times\text{month}; \]

This plot request produces two cells, one for TEMP and MONTH and one for RAIN and MONTH.

Optional Arguments

- ATTRID= variable
  specifies the value of the ID variable in an attribute map data set. You specify this option only if you are using an attribute map to control visual attributes of the graph. For more information, see “Using SG Attribute Maps to Control Visual Attributes” on page 605.

- COLUMNS= \( n \)
specifies the number of columns in the graph.

- DATALABEL <= variable>
displays a label for each data point. If you specify a variable, the values of that variable are used for the data labels. If you do not specify a variable, the value of the Y variable is used for the data label.
ELLIPSE <= (options)>
adds a confidence or prediction ellipse to the scatter plot. options can be one or more of the following:

**ALPHA=** *n*
specifies the confidence level for the ellipse. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

**Default:** .05

**TYPE= MEAN | PREDICTED**
specifies the type of ellipse. MEAN specifies a confidence ellipse for the population mean. PREDICTED specifies a prediction ellipse for a new observation. Both ellipse types assume bivariate normal distribution.

**Default:** PREDICTED

**Restriction:** To use this option, all of the X and Y variables must be numeric.

**Interaction:** The GROUP option does not affect the creation of ellipses. The SGSCATTER procedure always uses all of the data points to calculate the confidence or prediction ellipse.

**GRID**
creates grid lines for each tick on both axes.

**GROUP=** *variable*
specifies a classification variable to divide the values into groups. If a fit line is requested, then the GROUP= variable is also applied to the fit plot unless you specify the NOGROUP suboption in the option for the fit plot.

**JOIN <= (options)>
specifies that line segments join all of the scatter points. The line segments connect the scatter points in increasing order along the X axis. The data order of the input data set has no effect on the order of the lines.

You can specify the following options:

**LINEATTRS=** *style-element* *(options)* | *(options)*
specifies the appearance of the join lines. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR=** *color*
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**PATTERN=** *line-pattern*
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style.
For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData\textit{n} style elements in the current style.

\textbf{THICKNESS= }\textit{n <units>}

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

\textbf{Default:} For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style. For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\textit{n} style elements in the current style.

\textbf{LEGEND=} (\textit{options})

specifies the appearance of the legend for the scatter plot. \textit{options} can be one or more of the following:

\textbf{ACROSS=} \textit{n}

specifies the number of columns in the legend.

\textbf{DOWN=} \textit{n}

specifies the number of rows in the legend.

\textbf{Interaction:} This suboption has no effect if you also specify the ACROSS= suboption.

\textbf{LOCATION=} CELL | OUTSIDE

specifies whether the legend is placed inside an empty cell (CELL) in the plot area or outside of the plot area (OUTSIDE). The LOCATION=CELL suboption should be specified only when the graph contains an empty cell.

\textbf{NOBORDER}

removes the border from the legend.

\textbf{NOTITLE}

removes the label from the legend.

\textbf{POSITION=} \textit{position-value}

specifies the position of the legend within the graph. The positions are as follows:

\textbf{BOTTOM}

places the legend at the bottom of the graph.

\textbf{LEFT}

places the legend at the left side of the graph.

\textbf{RIGHT}

places the legend at the right side of the graph.

\textbf{TOP}

places the legend at the top of the graph.

\textbf{Default:} BOTTOM

\textbf{Interaction:} This suboption has no effect if you also specify LOCATION=CELL.

\textbf{Note:} If you specify more than one legend with the same position, then all of your legends are placed at that position.
TITLE="text-string"
specifies the label for the legend. By default, the label of the group variable is used.

**LOESS <= (options)>**
adds a loess fit to the scatter plot. You can specify the following options:

**ALPHA= numeric-value**
specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).
Default: .05

**Interaction:** This option has no effect if you do not specify the CLM option.

**CLM**
creates confidence limits for a mean predicted value for each observation.

**DEGREE= 1 | 2**
specifies the degree of the local polynomials to use for each local regression. 1 specifies a linear fit and 2 specifies a quadratic fit.
Default: 1

**INTERPOLATION= CUBIC | LINEAR**
specifies the degree of the interpolating polynomials that are used for blending local polynomial fits at the kd tree vertices.
Default: CUBIC

**LINEATTRS= style-element <(options)> | (options)**
specifies the appearance of the fit line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

**options** can be one or more of the following:

**COLOR= color**
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.
Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**PATTERN= line-pattern**
specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
Default: For ungrouped data, the default line pattern is specified by theLineStyle attribute of the GraphFit style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

**THICKNESS= n <units>**
specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style.
For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\n style elements in the current style.

NOGROUP
  specifies that the fit does not use the group variable from the scatter plot.

SMOOTH= numeric-value
  specifies a smoothing parameter value. If you do not specify a value, then a smoothing value is determined automatically.

Restriction: To use this option, all of the X and Y variables must be numeric.

MARKERATTRS= style-element \(<\{\text{options}\}\rangle\) | \((\text{options})\)
  specifies the appearance of the markers in the plot. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

options can be one or more of the following:

COLOR= color
  specifies the color of the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphDataDefault style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData\n style elements in the current style.

SIZE= \(n <\text{units}\rangle\)
  specifies the size of the markers. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Default: The default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

SYMBOL= symbol-name
  specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

Default: For ungrouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphDataDefault style element in the current style. For grouped data, the default marker symbol is specified by the MarkerSymbol attribute of the GraphData1 ... GraphData\n style elements in the current style.

NOLEGEND
  removes the legend from the graph.

PBSPLINE <= \((\text{options})\rangle\)
  adds a fitted, penalized B-spline curve to the scatter plot. options can be one or more of the following:

  ALPHA= numeric-value
    specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).

    Default: .05

Interaction: This option has no effect if you do not specify either the CLI option or the CLM option.
CLI creates confidence limits for individual predicted values for each observation.

CLM creates confidence limits for a mean predicted value for each observation.

**DEGREE= n**

specifies the degree of the spline transformation.

**Default:** 3

**LINEATTRS= style-element<(options)> | (options)**

specifies the appearance of the curve line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.

*options* can be one or more of the following:

**COLOR= color**

specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style.

For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

**PATTERN= line-pattern**

specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style.

For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

**THICKNESS= n <units>**

specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style.

For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData n style elements in the current style.

**NKNOTS= n**

specifies the number of evenly spaced internal knots.

**Default:** 100

**NOGROUP**

specifies that the curve does not use the group variable from the scatter plot.

**SMOOTH= numeric-value**

specifies a smoothing parameter value. If you do not specify this option, then a smoothing value is determined automatically.

**Restriction:** To use this option, all of the X and Y variables must be numeric.
REFTICKS
duplicates the tick marks from the X and Y axes on the opposite sides of each cell.

REG <= (options)>
adds a regression fit to the scatter plot. options can be one or more of the following:

ALPHA= numeric-value
  specifies the confidence level for the confidence limits. Specify a number between 0.00 (100% confidence) and 1.00 (0% confidence).
  Default: .05
  Interaction: This option has no effect if you do not specify either the CLI option or the CLM option.

CLI
  creates confidence limits for individual predicted values for each observation.

CLM
  creates confidence limits for a mean predicted value for each observation.

DEGREE= n
  specifies the degree of the polynomial fit. For example, 1 specifies a linear fit, 2 specifies a quadratic fit, and 3 specifies a cubic fit.
  Default: 1

LINEATTRS= style-element <(options)> | (options)
  specifies the appearance of the fit line. You can specify the appearance by using a style element or by using suboptions. If you specify a style element, you can also specify suboptions to override specific appearance attributes.
  options can be one or more of the following:

COLOR= color
  specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
  Default: For ungrouped data, the default color is specified by the ContrastColor attribute of the GraphFit style element in the current style. For grouped data, the default color is specified by the ContrastColor attribute of the GraphData1 ... GraphData n style elements in the current style.

PATTERN= line-pattern
  specifies the line pattern for the line. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
  Default: For ungrouped data, the default line pattern is specified by the LineStyle attribute of the GraphFit style element in the current style. For grouped data, the default line pattern is specified by the LineStyle attribute of the GraphData1 ... GraphData n style elements in the current style.

THICKNESS= n <units>
  specifies the thickness of the line. You can also specify the unit of measure. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.
  Default: For ungrouped data, the default line thickness is specified by the LineThickness attribute of the GraphFit style element in the current style.
For grouped data, the default line thickness is specified by the LineThickness attribute of the GraphData1 ... GraphData\text{n} style elements in the current style.

**NOGROUP**
specifies that the fit does not use the group variable from the scatter plot.

**Restriction:** To use this option, all of the X and Y variables must be numeric.

**ROWS= \( n \)**
specifies the number of rows in the graph.

**Interaction:** This option has no effect if you specify the COLUMNS= option.

**SPACING = \( n \)**
specifies the amount of spacing (in pixels) that is placed between the cells in the graph, if the PLOT statement creates multiple cells.

**Default:** 10

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the plot components. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**UNISCALE= X | Y | ALL**
specifies that the X axis, Y axis, or both axes are scaled uniformly for all of the cells in the graph. By default, no scaling is performed. If this option is used, then all variables on the specified axis must be of the same type (all numeric or all character).

---

**Examples: SGSCATTER Procedure**

**Example 1: Creating a Scatter Plot Matrix**

**Features:**
- MATRIX statement
- GROUP option

**Sample library member:** SGSCMAT

This example shows a scatter plot matrix with grouped data.
Set the title and footnote and create the scatter plot matrix. In the MATRIX statement, the GROUP = option groups the data by the SPECIES variable.

```
proc sgscatter data=sashelp.iris;
   title "Scatterplot Matrix for Iris Data";
   matrix sepallength petallength sepalwidth petalwidth
        / group=species;
run;
title;
```

**Example 2: Creating a Graph with Multiple Independent Scatter Plots and Spline Curves**

**Features:** PLOT statement
This example shows a graph with multiple independent scatter plots with fitted splines.

**Output**

![Multi-Celled Spline Curve for Species Virginica](image)

**Program**

```sas
proc sgscatter data=sashelp.iris(where=(species="Virginica"));
title "Multi-Celled Spline Curve for Species Virginica";
plot (sepallength sepalwidth)*(petallength petalwidth)
    / pbspline;
run;
title;
```

**Program Description**

Create the scatter plots. In the PLOT statement, the PBSPLINE option fits the spline curves to the scatter points.

```sas
proc sgscatter data=sashelp.iris(where=(species="Virginica"));
title "Multi-Celled Spline Curve for Species Virginica";
plot (sepallength sepalwidth)*(petallength petalwidth)
    / pbspline;
```
Example 3: Creating a Simple Comparative Panel

Features:
- COMPARE statement
- GROUP option

Sample library member: SGSCCMP

This example shows a comparative scatter plot with grouped data.

Output

Program

```sas
proc sgscatter data=sashelp.iris;
    title "Iris Data: Length and Width";
    compare x=(sepallength petallength)
        y=(sepalwidth petalwidth)
        / group=species;
run;
title;
```
Create the scatter plot. In the COMPARE statement, the GROUP= option groups the data by the SPECIES variable.

```sas
proc sgscatter data=sashelp.iris;
   title "Iris Data: Length and Width";
   compare x=(sepallength petallength)
         y=(sepalwidth petalwidth)
      / group=species;
run;
run;
title;
```

Example 4: Creating a Comparative Panel with Regression Fits and Confidence Ellipses

**Features:**
- COMPARE statement
- REG option
- ELLIPSE option
- SPACING option

**Sample library member:** SGSCCM1

This example shows a comparative panel of scatter plots with regression fits and confidence ellipses.
Program

```sas
proc sgscatter data=sashelp.iris(where=(species="Versicolor"));
  title "Versicolor Length and Width";
  compare y=(sepalwidth petalwidth)
    x=(sepallength petallength)
    / reg ellipse=(type=mean) spacing=4;
run;
```

Program Description

*Create the scatter plot.* In the COMPARE statement, the REG option fits the regression lines and the ELLIPSE option creates the confidence ellipses and sets the ellipse type to MEAN. The SPACING= option adds spacing between plots.

```sas
proc sgscatter data=sashelp.iris(where=(species="Versicolor"));
  title "Versicolor Length and Width";
  compare y=(sepalwidth petalwidth)
    x=(sepallength petallength)
    / reg ellipse=(type=mean) spacing=4;
run;
```
Part 3

SG Annotation

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Chapter 10
Annotating ODS Graphics

Overview of SG Annotation

The ODS Statistical Graphics (SG) procedures provide a mechanism for adding shapes, images, and other annotations to graph output.

You can add the following annotation elements to a graph:

- text labels
- lines and arrows
- ovals (including circles)
- rectangles (including squares)
- polygons
- images

There are two main tasks required to add annotation elements to a graph:

1. Create an SG annotation data set, which contains the commands for creating the annotation elements. For more information, see “About the SG Annotation Data Set” on page 558.

2. Modify the SG procedure to use the SG annotation data set. You can use annotation in the SGPLOT, SG PANEL, and SG SCATTER procedures. For more information, see “Modifying an SG Procedure to Use the SG Annotation Data Set” on page 561.
SG Annotation Data Sets

About the SG Annotation Data Set

Once you have determined which annotation you want and how you want it to appear in the output, you can create the SG annotation data set. This data set contains the commands for creating one or more annotation elements. The annotations drawn by these commands can be added to SG procedure output.

Each observation represents a command to draw an annotation element or to continue an element. Reserved keywords are used for functions that specify the drawing operation.

You create the data set using the same methods that you use to create any SAS data set. The main distinctions are that the SG annotation data set uses reserved keywords for its variable names, and each observation represents a command to draw an annotation element.

Note: The most commonly used method for creating data sets is with a DATA step. For more information about the DATA step, see SAS Language Reference: Concepts.

Here is an example of an SG annotation data set named LINE. The observations in this data set contain the commands that create a blue text label and a blue line.

Display 10.1  LINE SG Annotation Data Set

<table>
<thead>
<tr>
<th>Obs</th>
<th>function</th>
<th>x1</th>
<th>y1</th>
<th>label</th>
<th>x2</th>
<th>y2</th>
<th>textcolor</th>
<th>linecolor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>text</td>
<td>20</td>
<td>70</td>
<td>Average Height 62 Inches</td>
<td>.</td>
<td>.</td>
<td>blue</td>
<td>blue</td>
</tr>
<tr>
<td>2</td>
<td>line</td>
<td>10</td>
<td>60</td>
<td>99 60</td>
<td>blue</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A blank denotes a missing value for a character variable. A '.' denotes a missing value for a numeric variable.

Each observation in this data set contains complete instructions for drawing an annotation. The value of the FUNCTION variable determines what the observation does. Other variables control how the function is performed.

This list describes each observation in LINE and the task that it performs:

1. This instruction writes a blue text inset at position (20,70). The value of the FUNCTION variable (TEXT) tells the program what to do. The values of the coordinate variables X1 and Y1 tell where to do it. The value of the attribute variable TEXTCOLOR specifies the color of the text inset.
   Note: The default drawing space for both observations is the graph area. For more information about drawing spaces, see “Controlling the Drawing Space” on page 561.

2. This instruction draws a blue line that begins at position (10,60) and ends at (99,60). The value of the FUNCTION variable (LINE) tells the program what to do. The values of the coordinate variables X1, Y1, X2, and Y2 tell where to do it. The value of the attribute variable LINECOLOR specifies the color of the line.
The following figure shows the blue text and line annotations created by the LINE data set displayed with an SGPLOT procedure that specifies a scatter plot.

Display 10.2   LINE SG Annotation Output

Here is the SAS code step that creates the LINE data set and generates the graph.

```sas
data Line;
  infile datalines dlm='#';
  length label $ 27
    textcolor $ 9
    linecolor $ 9;
  input function $ x1 y1 label x2 y2 textcolor linecolor;
datalines;
text # 20 # 70 # Average Height 62 Inches # . # . # blue #
line # 10 # 60 # # 99 # 60 # # blue
;
run;
proc sgplot data=sashelp.class sganno=Line;
  scatter x=weight y=height;
run;
```

SG Annotation Variables

When an SG annotation data set is processed, the SG procedure looks at the values of specific variables in order to draw annotation elements. Variables in the SG annotation data set have predefined names. In each observation, the procedure looks only for variables with those names. Other variables can be present, but they are ignored.

The variables can be categorized into the following main types:

- A FUNCTION variable specifies which annotation element to draw. For more information, see “SG Annotation Functions” on page 560.
• Position variables specify the point or points at which to draw the graphics element.
• Coordinate system variables specify the drawing space to use for the annotation. For more information, see “Controlling the Drawing Space” on page 561.
• Attribute variables specify the characteristics of the graphics element (for example, color, size, line style, text font).

All variables are described in the context of the functions that support the variables. For more information about the functions, see Chapter 11, “SG Annotation Function Dictionary,” on page 565.

**SG Annotation Functions**

In an SG annotation data set, the FUNCTION variable accepts a set of predefined values (functions) that insert annotation elements into the graph. The value of the FUNCTION variable specifies what drawing action the observation performs. These functions act in conjunction with other variables that determine where and how to perform the action.

The following table summarizes the functions:

**Table 10.1 Summary of SG Annotation Functions**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARROW</td>
<td>Draws an arrow annotation. For more information, see “ARROW Function” on page 565.</td>
</tr>
<tr>
<td>IMAGE</td>
<td>Specifies a graphic file to use for an image annotation. For more information, see “IMAGE Function” on page 570.</td>
</tr>
<tr>
<td>LINE</td>
<td>Draws a line annotation. For more information, see “LINE Function” on page 573.</td>
</tr>
<tr>
<td>OVAL</td>
<td>Draws an oval or circle annotation. For more information, see “OVAL Function” on page 577.</td>
</tr>
<tr>
<td>POLYCONT</td>
<td>Continues drawing a polygon that was begun with the POLYGON function, or a line that was begun with the POLYLINE function. For more information, see “POLYCONT Function” on page 581.</td>
</tr>
<tr>
<td>POLYGON</td>
<td>Specifies the beginning point of a polygon. For more information, see “POLYGON Function” on page 582.</td>
</tr>
<tr>
<td>POLYLINE</td>
<td>Specifies the beginning point of a polyline, which is a connected series of line segments. For more information, see “POLYLINE Function” on page 585.</td>
</tr>
<tr>
<td>RECTANGLE</td>
<td>Draws a rectangle or square annotation. For more information, see “RECTANGLE Function” on page 588.</td>
</tr>
<tr>
<td>TEXT</td>
<td>Places text in the graph output. For more information, see “TEXT Function” on page 592.</td>
</tr>
</tbody>
</table>
### Modifying an SG Procedure to Use the SG Annotation Data Set

After you have created an SG annotation data set, you can modify the SG procedure to reference the annotation data. You can use annotation in the SGPLOT, SGPANEL, and SGSCATTER procedures.

To modify the procedure to use the SG annotation data set, add the following option to the procedure statement.

```
SGANNO= annotation-data-set
```

specifies the SG annotation data set that you want to use. For more information about SG annotation data sets, see “SG Annotation Data Sets” on page 558.

You can also create margins around the graph by using the PAD= option.

```
PAD= dimension<units> | (pad-options)
```

specifies the amount of extra space that is reserved along the edges of the graph. This option creates margins around the graph for company logos, annotated notes, and so on. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

Use pad options to create non-uniform padding. Edges that are not assigned padding are padded with the default amount.

`pad-options` can be one or more of the following:

- `LEFT= dimension<units>`
  specifies the amount of extra space to add to the left edge.

- `RIGHT= dimension<units>`
  specifies the amount of extra space to add to the right edge.

- `TOP= dimension<units>`
  specifies the amount of extra space to add to the top edge.

- `BOTTOM= dimension<units>`
  specifies the amount of extra space to add to the bottom edge.

### Controlling the Drawing Space

#### About the Drawing Space

You can control the position and scaling of your annotations by specifying the drawing space and units in the SG annotation data set. You have the option to specify the drawing space for the X or Y axes individually, or for both axes.
All annotations are rendered in one of four drawing areas:

graph area
the entire region of the graph image. The graph area contains the axes, titles, footnotes, legends, and one or more cells.

layout area
the area of the layout, not including any titles and footnotes.

wall area
the area within the axes, including offsets. (This area is not available when using the SGPANEL and SGSCATTER procedures.)

data area
the area within the axes, not including offsets. (This area is not available when using the SGPANEL and SGSCATTER procedures.)

Annotations can be rendered in the drawing areas using one of three units:

- percentage
- pixels
- data value (data area only)

**Drawing Space Variables**

You can specify the drawing space values for the following variables in the SG annotation data set:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Supported Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRAWSPACE</td>
<td>specifies the drawing space for the annotation</td>
<td>all except POLYCONT and TEXTCONT</td>
</tr>
<tr>
<td>X1SPACE</td>
<td>specifies the drawing space of the annotation’s X coordinate.</td>
<td>all except TEXTCONT</td>
</tr>
<tr>
<td>X2SPACE</td>
<td>specifies the drawing space of the annotation’s second X coordinate.</td>
<td>ARROW, LINE</td>
</tr>
<tr>
<td>Y1SPACE</td>
<td>specifies the drawing space of the annotation’s Y coordinate.</td>
<td>all except TEXTCONT</td>
</tr>
<tr>
<td>Y2SPACE</td>
<td>specifies the drawing space of the annotation’s second Y coordinate.</td>
<td>ARROW, LINE</td>
</tr>
</tbody>
</table>

**Drawing Space Values**

Here are the values that are used in the SG annotation data set to control the drawing space.

*Note:* For more information about the data, graph, layout, or wall areas, see “About the Drawing Space” on page 561.
DATAPERCENT
positioned and scaled as a percentage with respect to the data area.

DATAPIXEL
positioned and scaled as pixels with respect to the data area.

DATAVALUE
positioned and scaled with respect to the data values.

GRAPHPERCENT
positioned and scaled as a percentage of the graph area.

Note: GRAPHPERCENT is the default value.

GRAPHPIXEL
positioned and scaled as pixels with respect to the graph area.

LAYOUTPERCENT
positioned and scaled as a percentage of the layout area.

LAYOUTPIXEL
positioned and scaled as pixels with respect to the layout area.

WALLPERCENT
positioned and scaled as a percentage of the wall area.

WALLPIXEL
positioned and scaled as pixels with respect to the wall area.

Note: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT,
GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.
Chapter 11

SG Annotation Function

Dictionary

ARROW Function

Draws an arrow annotation from the specified (X1, Y1) coordinates to the specified (X2, Y2) coordinates.

Syntax

FUNCTION="ARROW";

Required Variables

X1= numeric-value
    specifies the first X coordinate of the annotation.
    Default: none

X2= numeric-value
    specifies the second X coordinate of the annotation.
    Default: none
Y1= numeric-value
    specifies the first Y coordinate of the annotation.
    Default: none

Y2= numeric-value
    specifies the second Y coordinate of the annotation.
    Default: none

Optional Variables

DIRECTION= “BOTH” | “IN” | “OUT”
    specifies the direction for arrows.
    “BOTH”
      Places the arrowhead at both ends of the line.
    “IN”
      Places the arrowhead at the source (X1 or Y1 coordinate) of the line.
    “OUT”
      Places the arrowhead at the tail end (X2 or Y2 coordinate) of the line.
    Default: OUT

DISCRETEOFFSET= numeric-value
    specifies an amount to offset the annotation from a discrete value in data space. Specify a value from -0.5 (left offset) to +0.5 (right offset).
    Default: 0.0 (no offset)

DRAWSPACE= “draw-space-value”
    specifies the drawing space and units for the annotation. DRAWSPACE can be used rather than specify individual values for X1SPACE, X2SPACE, Y1SPACE, and Y2SPACE.
    draw-space-value can be one of the following:
    • DATAPERCENT
    • DATAPIXEL
    • DATAVALUE
    • GRAPHPERCENT
    • GRAPHPIXEL
    • LAYOUTPERCENT
    • LAYOUTPIXEL
    • WALLPERCENT
    • WALLPIXEL
    Default: GRAPHPERCENT (unless overridden by a coordinate draw space, such as X1SPACE)

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.
LAYER= "BACK" | "FRONT"
specifies whether the annotation is drawn in front of (FRONT) or behind (BACK) the graph.
Default: FRONT

LINECOLOR= "color" | "style-attribute"
specifies a line color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute:

GraphData2:Color
You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
Default: COLOR attribute in the graph’s current style

LINEPATTERN= "line-pattern"
specifies a line pattern for the annotation. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
Default: LineStyle attribute in the graph’s current style

LINETHICKNESS= n
specifies the thickness of the line. You cannot specify the unit of measure. The default unit of pixels is always used.
Default: LineThickness attribute in the graph’s current style

SCALE= numeric-value
specifies a scale factor for the arrowheads. Specify a positive number.
Default: determined by the procedure

SHAPE= BARBED | CLOSED | FILLED | OPEN
specifies the shape of the arrowheads. Specify one of the following:

BARBED
a solid triangle with an indent at the base.

CLOSED
an outline of a triangle.

FILLED
a solid triangle.

OPEN
a triangle that resembles the letter "V".
Default: OPEN

TRANSPARENCY= numeric-value
specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

X1SPACE= "draw-space-value"
specifies the drawing space of the annotation’s first X coordinate.
draw-space-value can be one of the following:

• DATAPERCENT
• DATAPIXEL
• DATAVALUE
• GRAPHPERCENT
• GRAPHPIXEL
• LAYOUTPERCENT
• LAYOUTPIXEL
• WALLPERCENT
• WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

Note: If you do not also specify the X2SPACE= value, then the second X coordinate uses the default drawing space.

See: For more information about these values, see “Drawing Space Values” on page 562.

X2SPACE= “draw-space-value”
specifies the drawing space of the annotation’s second X coordinate.

draw-space-value can be one of the following:
• DATAPERCENT
• DATAPIXEL
• DATAVALUE
• GRAPHPERCENT
• GRAPHPIXEL
• LAYOUTPERCENT
• LAYOUTPIXEL
• WALLPERCENT
• WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

Note: If you do not also specify the X1SPACE= value, then the first X coordinate uses the default drawing space.

See: For more information about these values, see “Drawing Space Values” on page 562.

XAXIS= “X” | “X2”
specifies which X axis to use for data space annotations.

Default: X

XC1= “text-string”
specifies the character X coordinate of an annotation.

Default: none

XC2= “text-string”
specifies the second character X coordinate of an annotation.
Y1SPACE= "draw-space-value"

specifies the drawing space of the annotation’s second Y coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: none

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

Note: If you do not also specify the Y1SPACE= value, then the second Y coordinate uses the default drawing space.

See: For more information about these values, see “Drawing Space Values” on page 562.

Y2SPACE= "draw-space-value"

specifies the drawing space of the annotation’s second Y coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

Note: If you do not also specify the Y2SPACE= value, then the second Y coordinate uses the default drawing space.

See: For more information about these values, see “Drawing Space Values” on page 562.
YAXIS= “Y” | “Y2”  
specifies which Y axis to use for data space annotations.  
Default: Y

YC1= “text-string”  
specifies the character Y coordinate of an annotation.  
Default: none

YC2= “text-string”  
specifies the second character Y coordinate of an annotation.  
Default: none

**IMAGE Function**

Specifies a graphic file to use for an image annotation. If no (X1, Y1) coordinates are provided, the image appears in the center of the graph.

**Syntax**

FUNCTION= “IMAGE”; 

**Required Variable**

IMAGE= “file-name”  
specifies the image file to be displayed in the graphics output. 
Include the complete path and filename. The syntax of external file specifications varies across operating environments.

If you do not specify the full path, then the procedure looks for the file in the SAS current working directory. The SAS current directory is the same directory in which you start your SAS session. If you are running SAS with the windowing environment in the Windows operating system, then the current directory is displayed in the status bar at the bottom of the main SAS window.

For a list of image formats that can be used, see “Supported File Types for Output Destinations” in Chapter 6 of *SAS Output Delivery System: User’s Guide*.

**Optional Variables**

ANCHOR= “TOPLEFT” | “TOP” | “TOPRIGHT” | “RIGHT” | “BOTTOMRIGHT” | “BOTTOM” | “BOTTOMLEFT” | “LEFT” | “CENTER”  
specifies the anchor position of the annotation. This point is placed on the specified X1 and Y1 positions. 
Default: CENTER

BORDER= “TRUE” | “FALSE”  
turns the border on and off.  
Default: FALSE

DISCRETEOFFSET= numeric-value  
specifies an amount to offset the annotation from a discrete value in data space. 
Specify a value from -0.5 (left offset) to +0.5 (right offset).  
Default: 0.0 (no offset)
**DRAWSPACE=** "draw-space-value"
specifies the drawing space and units for the annotation. DRAWSPACE can be used rather than specify X1SPACE and Y1SPACE individually.

`draw-space-value` can be one of the following:
- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

**Default:** GRAPHPERCENT (unless overridden by a coordinate draw space, such as X1SPACE)

**Restriction:** For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

**HEIGHT= numeric-value**
specifies the height of the annotation. Specify a positive number greater than zero. You can use the HEIGHTUNIT variable to specify the unit of measurement.

**Default:** Determined by the system

**HEIGHTUNIT=** "DATA" | "PERCENT" | "PIXEL"
specifies the dimension unit to use for the HEIGHT value.

**Default:** PERCENT

**IMAGESCALE=** "FIT" | "FITHEIGHT" | "FITWIDTH" | "TILE"
specifies how the image is scaled within the width and height. You can specify the WIDTH and HEIGHT variables.

**Default:** FITWIDTH or FITHEIGHT if no size or if one size (either the width or the height) is specified (to preserve aspect)

FIT if width and height are both specified

**LAYER=** "BACK" | "FRONT"
specifies whether the annotation is drawn in front of (FRONT) or behind (BACK) the graph.

**Default:** FRONT

**LINECOLOR=** "color" | "style-attribute"
specifies a color of the border around the image, if displayed. You can specify a color or a style element attribute. Here is an example of a style attribute:

GraphData2:Color
You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** COLOR attribute in the graph’s current style
LINEPATTERN= “line-pattern” specifies a line pattern of the border around the image, if displayed. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: LineStyle attribute in the graph’s current style

LINETHICKNESS= n specifies the thickness of the border around the image, if displayed. You cannot specify the unit of measure. The default unit of pixels is always used.

Default: LineThickness attribute in the graph’s current style

ROTATE= degrees rotates the annotation. Specify a number between 0 and 360.

Default: 0

TRANSPARENCY= numeric-value specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

WIDTH= numeric-value specifies the width of the annotation. Specify a positive number greater than zero. You can use the WIDTHUNIT variable to specify the unit of measurement.

Default: Determined by the system

WIDTHUNIT= “DATA” | “PERCENT” | “PIXEL” specifies the dimension unit to use for the WIDTH value.

Default: PERCENT

X1= numeric-value specifies the X coordinate of the annotation.

Default: none

X1SPACE= “draw-space-value” specifies the drawing space of the annotation’s X coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.
XAXIS= “X” | “X2”  
specifies which X axis to use for data space annotations.  
**Default:**  X

XC1= “text-string”  
specifies the character X coordinate of an annotation.  
**Default:**  none

Y1= numeric-value  
specifies the Y coordinate of the annotation.  
**Default:**  none

Y1SPACE= “draw-space-value”  
specifies the drawing space of the annotation’s Y coordinate.  

*draw-space-value* can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

**Default:**  GRAPHPERCENT

**Restriction:**  For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

**See:**  For more information about these values, see “Drawing Space Values” on page 562.

YAXIS= “Y” | “Y2”  
specifies which Y axis to use for data space annotations.  
**Default:**  Y

YC1= “text-string”  
specifies the character Y coordinate of an annotation.  
**Default:**  none

---

**LINE Function**

Draws a line annotation from the specified (X1, Y1) coordinates to the specified (X2, Y2) coordinates.

**Syntax**

FUNCTION= “LINE”;
**Required Variable**

X1= numeric-value  
specifies the first X coordinate of the annotation.  
**Default:** none

X2= numeric-value  
specifies the second X coordinate of the annotation.  
**Default:** none

Y1= numeric-value  
specifies the first Y coordinate of the annotation.  
**Default:** none

Y2= numeric-value  
specifies the second Y coordinate of the annotation.  
**Default:** none

**Optional Variables**

DISCRETEOFFSET= numeric-value  
specifies an amount to offset the annotation from a discrete value in data space.  
Specify a value from -0.5 (left offset) to +0.5 (right offset).  
**Default:** 0.0 (no offset)

DRAWSPACE= “draw-space-value”  
specifies the drawing space and units for the annotation. DRAWSPACE can be used rather than specify individual values for X1SPACE, X2SPACE, Y1SPACE, and Y2SPACE.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

**Default:** GRAPHPERCENT (unless overridden by a coordinate draw space, such as X1SPACE)

**Restriction:** For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

LAYER= “BACK” | “FRONT”  
specifies whether the annotation is drawn in front of (FRONT) or behind (BACK) the graph.  
**Default:** FRONT
LINECOLOR= “color” | “style-attribute”  
specifies a line color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute:

GraphData2::Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: COLOR attribute in the graph’s current style

LINEPATTERN= “line-pattern”  
specifies a line pattern for the annotation. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: LineStyle attribute in the graph’s current style

LINETHICKNESS= n  
specifies the thickness of the line. You cannot specify the unit of measure. The default unit of pixels is always used.

Default: LineThickness attribute in the graph’s current style

TRANSPARENCY= numeric-value  
specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

X1SPACE= “draw-space-value”  
specifies the drawing space of the annotation’s first X coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

Note: If you do not also specify the X2SPACE= value, then the second X coordinate uses the default drawing space.

See: For more information about these values, see “Drawing Space Values” on page 562.

X2SPACE= “draw-space-value”  
specifies the drawing space of the annotation’s second X coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
• DATAPIXEL
• DATAVALUE
• GRAPHPERCENT
• GRAPHPIXEL
• LAYOUTPERCENT
• LAYOUTPIXEL
• WALLPERCENT
• WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

Note: If you do not also specify the X1SPACE= value, then the first X coordinate uses the default drawing space.

See: For more information about these values, see “Drawing Space Values” on page 562.

XAXIS= “X” | “X2”
specifies which X axis to use for data space annotations.

Default: X

XC1= “text-string”
specifies the character X coordinate of an annotation.

Default: none

XC2= “text-string”
specifies the second character X coordinate of an annotation.

Default: none

Y1SPACE= “draw-space-value”
specifies the drawing space of the annotation’s second Y coordinate.

draw-space-value can be one of the following:

• DATAPERCENT
• DATAPIXEL
• DATAVALUE
• GRAPHPERCENT
• GRAPHPIXEL
• LAYOUTPERCENT
• LAYOUTPIXEL
• WALLPERCENT
• WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.
**Note:** If you do not also specify the Y2SPACE= value, then the second Y coordinate uses the default drawing space.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

Y2SPACE= “draw-space-value”
specifies the drawing space of the annotation’s second Y coordinate.

*draw-space-value* can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

**Default:** GRAPHPERCENT

**Restriction:** For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

**Note:** If you do not also specify the Y1SPACE= value, then the first Y coordinate uses the default drawing space.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

YAXIS= “Y” | “Y2”
specifies which Y axis to use for data space annotations.

**Default:** Y

YC1= “text-string”
specifies the character Y coordinate of an annotation.

**Default:** none

YC2= “text-string”
specifies the second character Y coordinate of an annotation.

**Default:** none

---

**OVAL Function**

Draws an oval annotation around the specified (X1, Y1) coordinates using the specified height and width.

**Tip:** An easy way to draw a circle is to specify PIXEL for the HEIGHTUNIT and WIDTHUNIT variables and then provide the same value for the HEIGHT and WIDTH.
Syntax

FUNCTION= “OVAL”;

Required Variables

HEIGHT= numeric-value
specifies the height of the annotation. Specify a positive number greater than zero. You can use the HEIGHTUNIT variable to specify the unit of measurement.

Default: none

WIDTH= numeric-value
specifies the width of the annotation. Specify a positive number greater than zero. You can use the WIDTHUNIT variable to specify the unit of measurement.

Default: none

X1= numeric-value
specifies the X coordinate of the annotation.

Default: none

Y1= numeric-value
specifies the Y coordinate of the annotation.

Default: none

Optional Variables

DISCRETEOFFSET= numeric-value
specifies an amount to offset the annotation from a discrete value in data space. Specify a value from -0.5 (left offset) to +0.5 (right offset).

Default: 0.0 (no offset)

DISPLAY= “ALL” | “FILLED” | “OUTLINE”
specifies the fill and outline properties. You can specify that the annotation be filled (FILLED), have an outline (OUTLINE), or both (ALL).

Default: OUTLINE

DRAWSPACE= “draw-space-value”
specifies the drawing space and units for the annotation. DRAWSPACE can be used rather than specify X1SPACE and Y1SPACE individually.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT (unless overridden by a coordinate draw space, such as X1SPACE)
Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

**FILLCOLOR= “color” | “style-attribute”**
specifies a fill color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute: GraphData2:Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: COLOR attribute in the graph’s current style

Interaction: This option takes effect only if the DISPLAY option is specified as FILLED or ALL.

**FILLTRANSPARENCY= numeric-value**
specifies the transparency for the fill portion of an annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

**HEIGHTUNIT= “DATA” | “PERCENT” | “PIXEL”**
specifies the dimension unit to use for the HEIGHT value.

Default: PERCENT

**LAYER= “BACK” | “FRONT”**
specifies whether the annotation is drawn in front of (FRONT) or behind (BACK) the graph.

Default: FRONT

**LINECOLOR= “color” | “style-attribute”**
specifies a line color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute:

GraphData2:Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: COLOR attribute in the graph’s current style

**LINEPATTERN= “line-pattern”**
specifies a line pattern for the annotation. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: LineStyle attribute in the graph’s current style

**LINETHICKNESS= n**
specifies the thickness of the line. You cannot specify the unit of measure. The default unit of pixels is always used.

Default: LineThickness attribute in the graph’s current style

**ROTATE= degrees**
rotates the annotation. Specify a number between 0 and 360.

Default: 0

**TRANSPARENCY= numeric-value**
specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
WIDTHUNIT= "DATA" | "PERCENT" | "PIXEL"
  specifies the dimension unit to use for the WIDTH value.
  Default: PERCENT

X1SPACE= "draw-space-value"
  specifies the drawing space of the annotation’s X coordinate.

draw-space-value can be one of the following:
  • DATAPERCENT
  • DATAPIXEL
  • DATAVALUE
  • GRAPHPERCENT
  • GRAPHPIXEL
  • LAYOUTPERCENT
  • LAYOUTPIXEL
  • WALLPERCENT
  • WALLPIXEL
  Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only
  GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and
  LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

XAXIS= "X" | "X2"
  specifies which X axis to use for data space annotations.
  Default: X

XC1= "text-string"
  specifies the character X coordinate of an annotation.
  Default: none

Y1SPACE= "draw-space-value"
  specifies the drawing space of the annotation’s Y coordinate.

draw-space-value can be one of the following:
  • DATAPERCENT
  • DATAPIXEL
  • DATAVALUE
  • GRAPHPERCENT
  • GRAPHPIXEL
  • LAYOUTPERCENT
  • LAYOUTPIXEL
  • WALLPERCENT
  • WALLPIXEL
  Default: GRAPHPERCENT
Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

YAXIS= “Y” | “Y2” specifies which Y axis to use for data space annotations.
   Default: Y

YC1= “text-string” specifies the character Y coordinate of an annotation.
   Default: none

POLYCONT Function

Continues drawing a polygon that was begun with the POLYGON function, or a line that was begun with the POLYLINE function. POLYCONT specifies each successive point in the polygon or polyline.

Syntax

FUNCTION= “POLYCONT”;

Required Variables

X1= numeric-value specifies the X coordinate of the annotation.
   Default: none

Y1= numeric-value specifies the Y coordinate of the annotation.
   Default: none

Optional Variables

X1SPACE= “draw-space-value” specifies the drawing space of the annotation’s X coordinate.

draw-space-value can be one of the following:

• DATAPERCENT
• DATAPIXEL
• DATAVALUE
• GRAPHPERCENT
• GRAPHPIXEL
• LAYOUTPERCENT
• LAYOUTPIXEL
• WALLPERCENT
• WALLPIXEL

Default: GRAPHPERCENT
Restriction: For the SGPANEL and SGSCATTER procedures, only
GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and
LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page
562.

XCl= “text-string”
specifies the character X coordinate of an annotation.
Default: none

Y1SPACE= “draw-space-value”
specifies the drawing space of the annotation’s Y coordinate.

draw-space-value can be one of the following:

• DATAPERCENT
• DATAPIXEL
• DATAVALUE
• GRAPHPERCENT
• GRAPHPIXEL
• LAYOUTPERCENT
• LAYOUTPIXEL
• WALLPERCENT
• WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only
GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and
LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page
562.

YC1= “text-string”
specifies the character Y coordinate of an annotation.
Default: none

POLYGON Function

Specifies the beginning point of a polygon, which is a connected series of lines that form a closed shape.
This function is used in conjunction with two or more POLYCONT functions to define vertex points for the
polygon. Associated variables can define the fill pattern and color, as well as the line type that outlines the
polygon.

Requirement: The SG annotation data set must also specify at least two instances of the
POLYCONT function immediately after the POLYGON function.

Syntax

FUNCTION= “POLYGON”;
**Required Variable**

**X1= numeric-value**
specifies the X coordinate of the annotation.

**Default:** none

**Y1= numeric-value**
specifies the Y coordinate of the annotation.

**Default:** none

**Optional Variables**

**DISCRETEOFFSET= numeric-value**
specifies an amount to offset the annotation from a discrete value in data space. Specify a value from -0.5 (left offset) to +0.5 (right offset).

**Default:** 0.0 (no offset)

**DISPLAY= “ALL” | “FILLED” | “OUTLINE”**
specifies the fill and outline properties. You can specify that the annotation be filled (FILLED), have an outline (OUTLINE), or both (ALL).

**Default:** OUTLINE

**DRAWSPACE= “draw-space-value”**
specifies the drawing space and units for the annotation. DRAWSPACE can be used rather than specify X1SPACE and Y1SPACE individually.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPixel
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

**Default:** GRAPHPERCENT (unless overridden by a coordinate draw space, such as X1SPACE)

**Restriction:** For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPixel, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

**FILLCOLOR= “color” | “style-attribute”**
specifies a fill color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute: GraphData2:Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**Default:** COLOR attribute in the graph’s current style
Interaction:  This option takes effect only if the DISPLAY option is specified as FILLED or ALL.

FILLTRANSPARENCY= numeric-value
specifies the transparency for the fill portion of an annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

LAYER= “BACK” | “FRONT”
specifies whether the annotation is drawn in front of (FRONT) or behind (BACK) the graph.
Default: FRONT

LINECOLOR= “color” | “style-attribute”
specifies a line color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute:

GraphData2:Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.
Default: COLOR attribute in the graph’s current style

LINEPATTERN= “line-pattern”
specifies a line pattern for the annotation. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.
Default: LineStyle attribute in the graph’s current style

LINETHICKNESS= n
specifies the thickness of the line. You cannot specify the unit of measure. The default unit of pixels is always used.
Default: LineThickness attribute in the graph’s current style

TRANSPARENCY= numeric-value
specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

X1SPACE= “draw-space-value”
specifies the drawing space of the annotation’s X coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPixel
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL
Default: GRAPHPERCENT
**Restriction:** For the SGPANEL and SGSCATTER procedures, only
      GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and
      LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

**XAXIS= “X” | “X2”**
  specifies which X axis to use for data space annotations.
  **Default:** X

**XC1= “text-string”**
  specifies the character X coordinate of an annotation.
  **Default:** none

**Y1SPACE= “draw-space-value”**
  specifies the drawing space of the annotation’s Y coordinate.

*draw-space-value* can be one of the following:
  - DATAPERCENT
  - DATAPIXEL
  - DATAVALUE
  - GRAPHPERCENT
  - GRAPHPIXEL
  - LAYOUTPERCENT
  - LAYOUTPIXEL
  - WALLPERCENT
  - WALLPIXEL
  **Default:** GRAPHPERCENT

**Restriction:** For the SGPANEL and SGSCATTER procedures, only
      GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and
      LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

**YAXIS= “Y” | “Y2”**
  specifies which Y axis to use for data space annotations.
  **Default:** Y

**YC1= “text-string”**
  specifies the character Y coordinate of an annotation.
  **Default:** none

---

**POLYLINE Function**

Specifies the beginning point of a polyline, which is a connected series of line segments. This function is used in conjunction with one or more POLYCONT functions to draw a series of connected straight lines.

**Requirement:** The SG annotation data set must also specify at least one instance of the POLYCONT function immediately after the POLYLINE function.
Note: The POLYLINE object is similar to a POLYGON, except that the POLYLINE object does not need to be a closed shape.

Syntax

FUNCTION= "POLYLINE";

Required Variables

X1= numeric-value
   specifies the X coordinate of the annotation.
   Default: none

Y1= numeric-value
   specifies the Y coordinate of the annotation.
   Default: none

Optional Variables

DISCRETEOFFSET= numeric-value
   specifies an amount to offset the annotation from a discrete value in data space.
   Specify a value from -0.5 (left offset) to +0.5 (right offset).
   Default: 0.0 (no offset)

DRAWSPACE= "draw-space-value"
   specifies the drawing space and units for the annotation. DRAWSPACE can be used rather than specify X1SPACE and Y1SPACE individually.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPixel
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT (unless overridden by a coordinate draw space, such as X1SPACE)

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPixel, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

LAYER= "BACK" | "FRONT"
   specifies whether the annotation is drawn in front of (FRONT) or behind (BACK) the graph.
   Default: FRONT
LINECOLOR= “color” | “style-attribute”
specifies a line color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute:

\[ \text{GraphData2:Color} \]

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: COLOR attribute in the graph’s current style

LINEPATTERN= “line-pattern”
specifies a line pattern for the annotation. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: LineStyle attribute in the graph’s current style

LINETHICKNESS= \( n \)
specifies the thickness of the line. You cannot specify the unit of measure. The default unit of pixels is always used.

Default: LineThickness attribute in the graph’s current style

TRANSPARENCY= numeric-value
specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

X1SPACE= “draw-space-value”
specifies the drawing space of the annotation’s X coordinate.

\( \text{draw-space-value} \) can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

XAXIS= “X” | “X2”
specifies which X axis to use for data space annotations.

Default: X

XC1= “text-string”
specifies the character X coordinate of an annotation.

Default: none
Y1SPACE= “draw-space-value”
specifies the drawing space of the annotation’s Y coordinate.

draw-space-value can be one of the following:
- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only
GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and
LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

YAXIS= “Y” | “Y2”
specifies which Y axis to use for data space annotations.

Default: Y

YC1= “text-string”
specifies the character Y coordinate of an annotation.

Default: none

---

**RECTANGLE Function**

Draws a rectangle annotation around the specified (X1, Y1) coordinates using the specified height and width. By default, the (X1, Y1) coordinates constitute the center of the rectangle, though you can change this behavior using the ANCHOR option.

Tip: An easy way to draw a square is to specify PIXEL for the HEIGHTUNIT and WIDTHUNIT variables and then provide the same value for the HEIGHT and WIDTH.

**Syntax**

FUNCTION= “RECTANGLE”; 

**Required Variables**

HEIGHT= numeric-value
specifies the height of the annotation. Specify a positive number greater than zero.
You can use the HEIGHTUNIT variable to specify the unit of measurement.

Default: none
WIDTH= numeric-value
    specifies the width of the annotation. Specify a positive number greater than zero.
    You can use the WIDTHUNIT variable to specify the unit of measurement.
    Default: none

X1= numeric-value
    specifies the X coordinate of the annotation.
    Default: none

Y1= numeric-value
    specifies the Y coordinate of the annotation.
    Default: none

Optional Variables

ANCHOR= “TOPLEFT” | “TOP” | “TOPRIGHT” | “RIGHT” | “BOTTOMRIGHT” | “BOTTOM” | “BOTTOMLEFT” | “LEFT” | “CENTER”
    specifies the anchor position of the annotation. This point is placed on the specified
    X1 and Y1 positions.
    Default: CENTER

CORNERRADIUS= numeric-value
    specifies the roundness of the corners of rectangles. Specify a value from 0.0
    (completely rectangular) to 1.0 (oval).
    Default: 0.0

DISCRETEOFFSET= numeric-value
    specifies an amount to offset the annotation from a discrete value in data space.
    Specify a value from -0.5 (left offset) to +0.5 (right offset).
    Default: 0.0 (no offset)

DISPLAY= “ALL” | “FILLED” | “OUTLINE”
    specifies the fill and outline properties. You can specify that the annotation be filled
    (FILLED), have an outline (OUTLINE), or both (ALL).
    Default: OUTLINE

DRAWSPACE= “draw-space-value”
    specifies the drawing space and units for the annotation. DRAWSPACE can be used
    rather than specify X1SPACE and Y1SPACE individually.

    draw-space-value can be one of the following:
    • DATAPERCENT
    • DATAPIXEL
    • DATAVALUE
    • GRAPHPERCENT
    • GRAPHPIXEL
    • LAYOUTPERCENT
    • LAYOUTPIXEL
    • WALLPERCENT
    • WALLPIXEL
    Default: GRAPHPERCENT (unless overridden by a coordinate draw space, such as
       X1SPACE)
Restriction: For the SG PANEL and SG SCATTER procedures, only GRAPHPERCENT, GRAPHPixel, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

FILLCOLOR= “color” | “style-attribute”
specifies a fill color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute: GraphData2:Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: COLOR attribute in the graph’s current style

Interaction: This option takes effect only if the DISPLAY option is specified as FILLED or ALL.

FILLTRANSPARENCY= numeric-value
specifies the transparency for the fill portion of an annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).

Default: 0.0

HEIGHTUNIT= “DATA” | “PERCENT” | “PIXEL”
specifies the dimension unit to use for the HEIGHT value.

Default: PERCENT

LAYER= “BACK” | “FRONT”
specifies whether the annotation is drawn in front of (FRONT) or behind (BACK) the graph.

Default: FRONT

LINECOLOR= “color” | “style-attribute”
specifies a line color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute:

GraphData2:Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

Default: COLOR attribute in the graph’s current style

LINEPATTERN= “line-pattern”
specifies a line pattern for the annotation. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

Default: LineStyle attribute in the graph’s current style

LINETHICKNESS= n
specifies the thickness of the line. You cannot specify the unit of measure. The default unit of pixels is always used.

Default: LineThickness attribute in the graph’s current style

ROTATE= degrees
rotates the annotation. Specify a number between 0 and 360.

Default: 0

TRANSPARENCY= numeric-value
specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

**WIDTHUNIT= “DATA” | “PERCENT” | “PIXEL”**

specifies the dimension unit to use for the WIDTH value.

Default: PERCENT

**X1SPACE= “draw-space-value”**

specifies the drawing space of the annotation’s X coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT

**Restriction:** For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPICXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

**XAXIS= “X” | “X2”**

specifies which X axis to use for data space annotations.

Default: X

**XC1= “text-string”**

specifies the character X coordinate of an annotation.

Default: none

**Y1SPACE= “draw-space-value”**

specifies the drawing space of the annotation’s Y coordinate.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

Default: GRAPHPERCENT
Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

YAXIS= “Y” | “Y2”
specifies which Y axis to use for data space annotations.
Default: Y

YC1= “text-string”
specifies the character Y coordinate of an annotation.
Default: none

TEXT Function
Places text in the graph output. Associated variables can control the color, size, font, base angle, and rotation of the characters displayed. If you do not supply the (X1, Y1) coordinates, the text is placed in the center of the graph.

Syntax
FUNCTION= “TEXT”;

Required Variable

LABEL= “text-string”
specifies the text label. The text-string can contain superscripts, subscripts, and Unicode characters by using ODS escapement notation. Here is a simple example:

data anno;
  input function $ label $7-40;
  datalines;
  text This label is rich(*ESC*){sup '2'}
  ;
run;
proc sgplot data=sashelp.class sganno=anno;
  scatter x=weight y=height;
run;

Default: none

Optional Variables

ANCHOR= “TOPLEFT” | “TOP” | “TOPRIGHT” | “RIGHT” | “BOTTOMRIGHT” | “BOTTOM” | “BOTTOMLEFT” | “LEFT” | “CENTER”
specifies the anchor position of the annotation. This point is placed on the specified X1 and Y1 positions.
Default: CENTER

BORDER= “TRUE” | “FALSE”
turns the border on and off.
Default: FALSE
**DISCRETEOFFSET=** numeric-value
specifies an amount to offset the annotation from a discrete value in data space.
Specify a value from -0.5 (left offset) to +0.5 (right offset).
**Default:** 0.0 (no offset)

**DRAWSPACE=** “draw-space-value”
specifies the drawing space and units for the annotation. DRAWSPACE can be used
rather than specify X1SPACE and Y1SPACE individually.

draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALE
- GRAPHPERCENT
- GRAPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

**Default:** GRAPHPERCENT (unless overridden by a coordinate draw space, such as X1SPACE)

**Restriction:** For the SGPANEL and SGSCATTER procedures, only
GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and
LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

**FILLCOLOR=** “color” | “style-attribute”
specifies the background color for the text annotation. You can specify a color or a
style element attribute. Here is an example of a style attribute: GraphData2:Color

You can specify colors using the same color schemes that are supported by
SAS/GRAPH software. For more information, see “Color-Naming Schemes” in
Chapter 14 of *SAS/GRAPH: Reference.*

**Default:** COLOR attribute in the graph’s current style

**FILLTRANSPARENCY=** numeric-value
specifies the transparency for the fill portion of an annotation. Specify a value from
0.0 (completely opaque) to 1.0 (completely transparent).

**Default:** 0.0

**JUSTIFY=** “CENTER” | “LEFT” | “RIGHT”
specifies the text justification.

**Default:** LEFT

**LAYER=** “BACK” | “FRONT”
specifies whether the annotation is drawn in front of (FRONT) or behind (BACK)
the graph.

**Default:** FRONT

**LINECOLOR=** “color” | “style-attribute”
specifies a line color for the border of the text annotation. You can specify a color or
a style element attribute. Here is an example of a style attribute: GraphData2:Color
You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** COLOR attribute in the graph’s current style

**Interaction:** This option takes effect only if BORDER= “TRUE”.

**LINEPATTERN= “line-pattern”**
specifies a line pattern for the border of the text annotation. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**Default:** LineStyle attribute in the graph’s current style

**Interaction:** This option takes effect only if BORDER= “TRUE”.

**LINETHICKNESS= n**
specifies the line thickness of the border of the text annotation. You cannot specify the unit of measure. The default unit of pixels is always used.

**Default:** LineThickness attribute in the graph’s current style

**Interaction:** This option takes effect only if BORDER= “TRUE”.

**ROTATE= degrees**
rotates the annotation. Specify a number between 0 and 360.

**Default:** 0

**TEXTCOLOR= “color” | “style-attribute”**
specifies the text color for the annotation. You can specify a color or a style element attribute. Here is an example of a style attribute: GraphData2:Color

You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

**Default:** COLOR attribute of the GraphAnnoText style element in the current style

**TEXTFONT= “font-family”**
specifies the font family for the annotation. The SAS ODS styles use TrueType system fonts. For more information, see “TrueType Fonts Supplied by SAS” in Chapter 15 of SAS Language Reference: Concepts.

**Default:** FontFamily attribute of the GraphAnnoText style element in the current style.

**TEXTSIZE= n <units>**
specifies the font size of the annotation. You can also specify the unit of measurement. The default unit is pixels. For a list of measurement units that are supported, see “Units of Measurement” on page 659.

**Default:** FontSize attribute of the GraphAnnoText style element in the current style.

**TEXTSTYLE= “ITALIC” | “NORMAL”**
specifies whether the annotation characters are italic (ITALIC) or normal (NORMAL).

**Default:** FontStyle attribute of the GraphAnnoText style element in the current style.

**TEXTWEIGHT= BOLD | NORMAL**
specifies whether the annotation characters are bold (BOLD) or normal (NORMAL).

**Default:** FontWeight attribute of the GraphAnnoText style element in the current style.
TRANSPARENCY= numeric-value
specifies the degree of transparency for the annotation. Specify a value from 0.0 (completely opaque) to 1.0 (completely transparent).
Default: 0.0

WIDTH= numeric-value
specifies the width of the annotation. Specify a positive number greater than zero. You can use the WIDTHUNIT variable to specify the unit of measurement.
Default: Determined by the system

WIDTHUNIT= “DATA” | “PERCENT” | “PIXEL”
specifies the dimension unit to use for the WIDTH value.
Default: PERCENT

X1= numeric-value
specifies the X coordinate of the annotation.
Default: none

X1SPACE= “draw-space-value”
specifies the drawing space of the annotation’s X coordinate.
draw-space-value can be one of the following:

• DATAPERCENT
• DATAPIXEL
• DATAVALE
• GRAPHPERCENT
• GRAPHPIXEL
• LAYOUTPERCENT
• LAYOUTPIXEL
• WALLPERCENT
• WALLPIXEL
Default: GRAPHPERCENT

Restriction: For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

See: For more information about these values, see “Drawing Space Values” on page 562.

XAXIS= “X” | “X2”
specifies which X axis to use for data space annotations.
Default: X

XC1= “text-string”
specifies the character X coordinate of an annotation.
Default: none

Y1= numeric-value
specifies the Y coordinate of the annotation.
Default: none

Y1SPACE= “draw-space-value”
specifies the drawing space of the annotation’s Y coordinate.
draw-space-value can be one of the following:

- DATAPERCENT
- DATAPIXEL
- DATAVALUE
- GRAPHPERCENT
- GRAPHPHPIXEL
- LAYOUTPERCENT
- LAYOUTPIXEL
- WALLPERCENT
- WALLPIXEL

**Default:** GRAPHPERCENT

**Restriction:** For the SGPANEL and SGSCATTER procedures, only GRAPHPERCENT, GRAPHPIXEL, LAYOUTPERCENT, and LAYOUTPIXEL values are valid.

**See:** For more information about these values, see “Drawing Space Values” on page 562.

**YAXIS= “Y” | “Y2”**

specifies which Y axis to use for data space annotations.

**Default:** Y

**YC1= “text-string”**

specifies the character Y coordinate of an annotation.

**Default:** none

---

**TEXTCONT Function**

Continues a text string. You can set the continued text apart from the main text by specifying different text attributes.

**Syntax**

FUNCTION= “TEXTCONT”; 

**Required Variable**

**LABEL= “text-string”**

specifies the text label. The text-string can contain superscripts, subscripts, and Unicode characters by using ODS escapement notation. Here is a simple example:

```plaintext
data anno;
infile datalines dlm='#';
length function $8 label $35;
input function $ label $ textcolor $;
datalines;
text # This label is rich(*ESC*){sup '2'} # black
textcont # and this text is green # green
 ;
run;
```
Example 1: Create an Arrow in a Paneled Graph

Features: ARROW

This example uses the SGPANEL procedure to create an arrow near the middle data point for the height variable in each panel.
Program

data annoArrow;
retain drawspace "layoutpercent" linecolor "blue";
input function $ x1 y1 x2 y2 shape $ direction $;
datalines;
arrow 30 50 40 50 barbed in
arrow 65 63 75 63 barbed out
; run;

proc sgpanel data=sashelp.class sganno=annoArrow;
panelby sex;
scatter x=weight y=height;
run;

Program Description

Create an SG annotation data set.

data annoArrow;
retain drawspace "layoutpercent" linecolor "blue";
input function $ x1 y1 x2 y2 shape $ direction $;
datalines;
arrow 30 50 40 50 barbed in
arrow 65 63 75 63 barbed out
; run;

Create the panel with the annotation.
Example 2: Create a Tabular Text Annotation

**Features:** TEXT annotation
PAD option

This example uses the SGPLOT procedure to create an axis-aligned table to the right of a horizontal bar chart.

### Output

**Class Statistics**

<table>
<thead>
<tr>
<th>Name</th>
<th>Weight</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philip</td>
<td>72</td>
<td>150.0</td>
</tr>
<tr>
<td>Arnold</td>
<td>67</td>
<td>112.5</td>
</tr>
<tr>
<td>Ronald</td>
<td>56.6</td>
<td>133.0</td>
</tr>
<tr>
<td>Mary</td>
<td>86.5</td>
<td>112.0</td>
</tr>
<tr>
<td>William</td>
<td>90.5</td>
<td>112.0</td>
</tr>
<tr>
<td>Barbara</td>
<td>89.9</td>
<td>98.0</td>
</tr>
<tr>
<td>Robert</td>
<td>64.8</td>
<td>128.0</td>
</tr>
<tr>
<td>Judy</td>
<td>84.0</td>
<td>120.0</td>
</tr>
<tr>
<td>Henry</td>
<td>83.6</td>
<td>102.5</td>
</tr>
<tr>
<td>Carol</td>
<td>82.8</td>
<td>102.6</td>
</tr>
<tr>
<td>Janet</td>
<td>82.5</td>
<td>112.5</td>
</tr>
<tr>
<td>Jeffrey</td>
<td>99.6</td>
<td>84.0</td>
</tr>
<tr>
<td>John</td>
<td>78</td>
<td>99.6</td>
</tr>
<tr>
<td>Thomas</td>
<td>56.6</td>
<td>85.0</td>
</tr>
<tr>
<td>James</td>
<td>57.0</td>
<td>83.0</td>
</tr>
<tr>
<td>Alice</td>
<td>56.5</td>
<td>84.0</td>
</tr>
<tr>
<td>Louise</td>
<td>56.3</td>
<td>77.0</td>
</tr>
<tr>
<td>Joyce</td>
<td>51.3</td>
<td>50.5</td>
</tr>
</tbody>
</table>

**Program**

```sas
data anno;
length y1space $12 label $ 6;
set sashelp.class (keep=name weight);
rename name=yc1;
retain y1space "datavalue" x1space "graphpercent" x1 90 function "text"
textcolor "black" textweight "normal" y1 . anchor "right";
label=put(weight, F5.1);
run;

data temp;
length y1space $12 label $ 6;
set sashelp.class (keep=name age);
rename name=yc1;
retain y1space "datavalue" x1space "graphpercent" x1 95 function "text"
textcolor "black" textweight "normal";
```
label=put(age, F2.0);  
run;  
data headers;  
length textweight $ 6;  
retain y1space "graphpercent" x1space "graphpercent" function "text" y1 90  
   textcolor "black" textweight "bold";  
x1=87;  
label="WEIGHT";  
output;  
x1=95;  
label="AGE";  
output;  
run;  
proc append base=anno (drop=weight) data=temp (drop=age) force nowarn;  
run;  
proc append base=anno (drop=weight) data=headers force nowarn;  
run;  
title1 "Class Statistics";  
title2 "   ";  
proc sgplot data=sashelp.class sganno=anno pad=(right=25%);  
hbar name / response=height datalabel nostatlabel  
   categoryorder=respdesc;  
run;  
title1;  

Program Description

Create a data set with the Weight column. Use annotation variables to define attributes for the weight text.

data anno;  
length y1space $ 12 label $ 6;  
set sashelp.class (keep=name weight);  
rename name=yc1;  
retain y1space "datavalue" x1space "graphpercent" x1 90 function "text"  
   textcolor "black" textweight "normal" y1 . anchor "right";  
label=put(weight, F5.1);  
run;

Create a data set with the Age column. Use annotation variables to define attributes for the age text.

data temp;  
length y1space $ 12 label $ 6;  
set sashelp.class (keep=name age);  
rename name=yc1;  
retain y1space "datavalue" x1space "graphpercent" x1 95 function "text"  
   textcolor "black" textweight "normal";  
label=put(age, F2.0);  
run;

Create the positions for the two columns of the table in the graph area.
data headers;
length textweight $ 6;
retain y1space "graphpercent" x1space "graphpercent" function "text" y1 90
   textcolor "black" textweight "bold";
x1=87;
label="WEIGHT";
output;
x1=95;
label="AGE";
output;
run;

Append the observations of TEMP to ANNO, and then append the observations of HEADERS.

proc append base=anno (drop=weight) data=temp (drop=age) force nowarn;
run;
proc append base=anno (drop=weight) data=headers force nowarn;
run;

Create the plot with the annotation.

title1 "Class Statistics";
title2 " ";
proc sgplot data=sashelp.class sganno=anno pad=(right=25%);
  hbar name / response=height datalabel nostatlabel
  categoryorder=respdesc;
run;
title1;
Part 4

SG Attribute Maps

Chapter 12
Using SG Attribute Maps to Control Visual Attributes ............... 605
Chapter 12
Using SG Attribute Maps to Control Visual Attributes

Overview of SG Attribute Maps

The SG attribute map feature provides a mechanism for controlling the visual attributes that are applied to specific data values in your graphs.

For example, if you create a graph that plots items sold in different countries, you can specify the display attributes for the sales data of each country by name. Attribute maps apply only to group data. Attribute maps enable you to ensure that particular visual attributes are applied based on the value of the data instead of the position of the data in the data set.

Two main tasks are required for attribute mapping:

1. Create an SG attribute map data set, which associates data values with particular visual attributes. Each observation defines the attributes for a group value. For more information, see “SG Attribute Map Data Sets” on page 606.

2. Modify the SG procedure and its plot statements to use the data in the SG attribute map. You can use attribute maps in the SGPLOT, SG PANEL, and SGSCATTER procedures (not all plot statements support attribute maps). For more information, see “Modify the Procedure to Use the SG Attribute Map Data Set” on page 610.
SG Attribute Map Data Sets

About the SG Attribute Map Data Set

Attribute map data sets are used in the SG procedures to associate data values with visual attributes.

When you have determined which attributes you want to apply to the group data in a graph, you can create an SG attribute map data set. Each observation defines the attributes for a particular data group. An observation uses reserved variable names for the attribute map identifier (ID), the group value (VALUE), and the attributes.

You create the data set using the same methods that you use to create any SAS data set. The main distinctions are that the SG attribute map data set uses reserved keywords for its variable names, and each observation represents the attributes for a particular data group. The most commonly used method for creating data sets is with a DATA step. For more information about the DATA step, see SAS Language Reference: Concepts.

Note: Incorrect data in the attribute map data set can cause the graph to fail. For example, truncated variable values caused by the incorrect variable length being specified results in incorrect data.

Here is an example of an SG attribute map data set called MYATTRMAP. The observations in this data set contain the attribute map identifier (ID), the group value (VALUE), and the attributes (LINECOLOR, FILLCOLOR).

Display 12.1 Listing of the SG Attribute Map Data Set MYATTRMAP

<table>
<thead>
<tr>
<th>Obs</th>
<th>linecolor</th>
<th>fillcolor</th>
<th>ID</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pink</td>
<td>pink</td>
<td>myid</td>
<td>F</td>
</tr>
<tr>
<td>2</td>
<td>lightblue</td>
<td>lightblue</td>
<td>myid</td>
<td>M</td>
</tr>
</tbody>
</table>

The data set has these characteristics:

- All variables listed are CHAR variables.
- The value of the ID variable, MYID in this case, is referenced in one or more plot statements within the procedure. You can use attribute maps in the SGPLOT, SGPANEL, and SGSCATTER procedures.
- The values of the VALUE variable are valid data group values. These values are case sensitive. The data group is assigned in the plot statement with the GROUP= option.
- The values for LINECOLOR= and FILLCOLOR= are valid SAS colors. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of SAS/GRAPH: Reference.

The following output shows a bar chart that uses the MYATTRMAP data set for its pink and blue bar colors. The FILLCOLOR= values determine the color of the bars, and the LINECOLOR= values determine the color of the border edges around the bars.

The chart was produced with the SGPLOT procedure. The name of the data set is referenced in the procedure statement.
This DATA step creates the SG attribute map data set MYATTRMAP. The ID values for the attribute map are MYID.

```sas
data myattrmap;
  length linecolor $ 9 fillcolor $ 9;
  input ID $ value $ linecolor $ fillcolor $;
  datalines;
  myid  F pink pink
  myid  M lightblue lightblue
  ;
run;
```

This procedure generates the graph. The SGPLOT statement references the SASHELP.CLASS data set and the ATTRMAP attribute map data set. The plot statement references the attribute map ID (MYID). The options that reference the attribute map (data set and ID) are highlighted.

```sas
proc sgplot data=sashelp.class
dattrmap=myattrmap
  ;
vbar age / response=height group=sex groupdisplay=cluster attrid=myid;
run;
```

For more information about the highlighted options that are used in the procedure, see “Modify the Procedure to Use the SG Attribute Map Data Set” on page 610.

You use a standard syntax to specify colors, line thickness, line patterns, and marker symbols. For more information about this syntax, see the following topics:

- “Specifying Colors in SAS/GRAPH Programs” in Chapter 14 of *SAS/GRAPH: Reference*
- “Units of Measurement” on page 659
- “Line Patterns” on page 663
- “Marker Symbols” on page 661
Data Sets That Contain Multiple SG Attribute Maps

An SG attribute map data set can contain more than one attribute map. This capability enables you to apply different attribute maps to different group variables in a graph.

When an SG attribute data set contains multiple attribute maps:

- The ID variable has more than one value.
- The VALUE variable has different values that correspond to different data groups.

In the procedure that generates the graph, the plot statements can specify different attribute map ID values.

Note: Plots that specify different ID values must also specify different groups. A group variable can be associated with only one attribute map ID. If a group is associated with more than one attribute map ID value, the graph produces incorrect attribute mapping and a warning is written to the SAS log.

For an example, see “Example: Combine Multiple SG Attribute Maps in a Graph” on page 612.

Reserved SG Attribute Map Variables

About the Reserved SG Attribute Map Variables

When an SG attribute map data set is processed, the SG procedure looks at the values of specific variables in the SG attribute map data set. The procedure uses these values to associate visual attributes with group data. Variables in the SG attribute map data set have predefined names. In each observation, the procedure looks only for variables with those names. Other variables can be present, but they are ignored.

Variables That Have Style Values

For some variables, you can specify a style element or a style attribute as the value. Here are examples:

- GraphData2 is an example of a style element.
- GraphData2:Color is an example of a style attribute.

For more information about style elements, see “Style Elements for Use with ODS Graphics” on page 640.

For a table of the style elements and attributes that you can use with ODS Statistical Graphics, see Appendix 5, “Style Elements Affecting Template-Based Graphics,” in SAS Output Delivery System: User's Guide. This table contains each style element, the portion of the graph that it affects, and the default attribute values.

Required Reserved Variables

The ID and VALUE variables are required for every SG attribute map data set. If they are not found, a warning is written to the SAS log, and the data set is ignored. The remaining attribute variables are used as applicable to the plot type.

Descriptions of the Reserved Variables

The following list describes each reserved variable.
All variables are of type CHAR, including variables that might contain numeric values.

**FILLCOLOR=**  
"color" | "style-attribute"  
specifies the fill color. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**FILLSTYLE=**  
"style-element"  
specifies the style element for fill attributes. If you specify the style element, you can also specify the FILLCOLOR variable to override the color.

**ID=**  
"text-string"  
(required) specifies the ID of the attribute map. This value is referenced from the ATTRID option on one or more plot statements.

Though every observation must have an ID value, different observations can have different values. You might use different values in the data set if you want plots to have different attributes.

**LINECOLOR=**  
"color" | "style-attribute"  
specifies the color of the line. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**LINEPATTERN=**  
"line-pattern" | "style-attribute"  
specifies a line pattern for lines and outlines. You can reference SAS patterns by number or by name. For a list of line patterns, see “Line Patterns” on page 663.

**LINESTYLE=**  
"style-element"  
specifies the style element for line attributes. If you specify the style element, you can also specify the LINEPATTERN and LINECOLOR variables to override specific appearance attributes.

**MARKERCOLOR=**  
"color" | "style-attribute"  
specifies the color for the markers. You can specify colors using the same color schemes that are supported by SAS/GRAPH software. For more information, see “Color-Naming Schemes” in Chapter 14 of *SAS/GRAPH: Reference*.

**MARKERSTYLE=**  
"style-element"  
specifies the style element for marker attributes. If you specify the style element, you can also specify the MARKERSYMBOL and MARKERCOLOR variables to override specific appearance attributes.

**MARKERSYMBOL=**  
"symbol-name" | "style-attribute"  
specifies the symbol for the markers. For a list of valid marker symbols, see “Marker Symbols” on page 661.

**VALUE=**  
"text-string"  
(required) specifies the group data value that is assigned to the attributes. The value must be valid for the data group that is assigned in the plot statement with the GROUP= option. You can provide different values in the data set if your plots specify different group variables.

**Note:** The value is case sensitive. Each instance of the value must have the exact same capitalization.
Modify the Procedure to Use the SG Attribute Map Data Set

After you have created an SG attribute map data set, you can modify the SG procedure and its plot statements to reference the SG attribute map data. You can use attribute maps in the SGPLOT, SGPANEL, and SGSCATTER procedures.

To reference attribute map data in a procedure:

1. Add the DATTRMAP= option to the procedure statement and specify the name of the SG attribute map data set.

2. For each plot statement that maps attributes, perform these steps:
   • Specify the GROUP= option. The group’s values must correspond to the values in the VALUE variable in the attribute map data set.
   • Specify the ATTRID= option. This option specifies the value of the ID variable in the SG attribute map data set.

   If the SG attribute map data set contains more than one ID value, then the plot statements can specify different ATTRID values. However, plots that specify different ATTRID values must also specify different groups. A group variable can be associated with only one attribute map ID. For more information, see “Data Sets That Contain Multiple SG Attribute Maps” on page 608.

   If the ATTRID value that you specify does not match a value for the ID variable in the attribute map data set, a warning is written to the SAS log and the ATTRID is ignored.

Attribute mapping is supported in the PLOT statement of the SGSCATTER procedure.

In the SGPLOT and SGPANEL procedures, any plot statement that supports GROUP variables supports attribute mapping. In these procedures, all plot statements support attribute mapping except the following:

<table>
<thead>
<tr>
<th>SGPANEL</th>
<th>SGPLOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DENSITY</td>
<td>DENSITY</td>
</tr>
<tr>
<td>HISTOGRAM</td>
<td>ELLIPSE</td>
</tr>
<tr>
<td>KEYLEGEND</td>
<td>HISTOGRAM</td>
</tr>
<tr>
<td>REFLINE</td>
<td>INSET</td>
</tr>
<tr>
<td></td>
<td>KEYLEGEND</td>
</tr>
<tr>
<td></td>
<td>REFLINE</td>
</tr>
</tbody>
</table>

Table 12.1 SGPANEL and SGPLOT Statements That Do Not Support Attribute Mapping
Here is an example of an SG PLOT procedure that references the SG attribute map data set shown in the example Display 12.1 on page 606. The options that reference the attribute map (data set and ID) are highlighted.

```sas
proc sgplot data=sashelp.class dattrmap=myattrmap;
  vbar age / response=height group=sex groupdisplay=cluster attrid=myid;
run;
```

Example: Create a Plot That Uses a Single SG Attribute Map

This example creates a simple bar chart that uses an SG attribute map.

**Display 12.3  Bar Chart That Uses an SG Attribute Map**

Here is the SAS code that creates the input data set, the attribute map data set, and the SGPLOT procedure output.

This DATA step creates the data that is used for the graph. The FRUIT variable is used in the procedure to group the data.

```sas
data fruit_sales;
  input Fruit $ Sales;
datalines;
  Apples 40
  Pears 25
  Oranges 50
  Grapes 30
  Bananas 60
run;
```
This DATA step creates the SG attribute map data set. The data set contains one attribute map, which is specified by the ID variable. All ID values for the attribute map are FRUIT.

```plaintext
data attrmapfruit;
retain linecolor "black";
input id $ value $ fillcolor $;
datalines;
fruit Apples   red
fruit Pears    green
fruit Oranges orange
fruit Grapes   purple
fruit Bananas yellow
;
run;
```

This PROC step generates the graph. The SGPLOT statement references the FRUIT_SALES data set and the ATTRMAPFRUIT attribute map data set. The plot statement references the attribute map ID (FRUIT).

```plaintext
title  "Fruit Sales";
proc sgplot data=fruit_sales dattrmap=attrmapfruit;
  vbar Fruit / response=Sales group=Fruit attrid=fruit;
run;
title;
```

---

**Example: Combine Multiple SG Attribute Maps in a Graph**

This example uses an SG attribute map data set that contains two attribute maps. Here are the noteworthy characteristics of the attribute map data set and the procedure:

- The attribute map data set has these features:
  - The ID variable has two values.
  - The VALUE variable has different values that correspond to two different data groups.

- In the procedure, the plot statements specify different ATTRID= values in order to use the different attribute maps. The plot statements also specify different GROUP= values. (A group variable can be associated with only one attribute map ID. For more information, see “Data Sets That Contain Multiple SG Attribute Maps” on page 608.)
Here is the SAS code that creates the attribute map data set and uses the SGPLOT procedure to generate the graph.

This DATA step creates the data that is used for the graph. The STATE and the TYPE variables are used in the procedure to group the data.

```sas
data finances;
  format income dollar8. expense dollar8.;
  length expensetype $ 9;
  input Year incometype $ income expensetype $ expense;
  datalines;
  2000 Salary 20000 Utilities 4000
  2000 Bonus   2000 Rent      7000
  2000 Gifts    500 Food      8000
  2001 Salary 25000 Utilities 5000
  2001 Bonus    1000 Rent      8000
  2001 Gifts    200 Food      6000
  2002 Salary 23000 Utilities 4500
  2002 Bonus    500 Rent      9000
  2002 Gifts    500 Food      7000
  ;
run;
```

This DATA step creates the SG attribute map data set. The data set contains two attribute maps. Each attribute map is specified by an ID value: INCOME or EXPENSE.

```sas
data attrmap;
  length value $ 9 fillcolor $ 9;
  retain linecolor "black";
  input id $ value $ fillcolor $;
  datalines;
  income Salary blue
  income Bonus gray
```
Example: Create a Panel That Uses an Attribute Map

This example uses the SG PANEL procedure to generate SG attribute map output.

Display 12.5  Panel That Uses an SG Attribute Map
Here is the SAS code that creates the attribute map data set and runs the SGPANEL procedure.

This DATA step creates the SG attribute map data set. The data set contains one attribute map, which is specified by the ID variable. All ID values for the attribute map are MYID.

```
data attrmap;
  retain ID "myid";
  retain markersymbol "circlefilled";
  input value $ markercolor $ linecolor $ linepattern $;
  datalines;
  F orange orange solid
  M blue blue solid
 ;
run;
```

This PROC step generates the graph. The SGPANEL statement references the SASHELP.CLASS data set and the ATTRMAP attribute map data set. The plot statement references the attribute map ID (MYID).

```
title "Height and Weight by Age";
proc sgpanel data=sashelp.class dattrmap=attrmap;
  panelby age;
  reg x=weight y=height / group=sex attrid=myid;
run;
title;
```
Part 5

Customizing ODS Graphics

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Chapter 13

Controlling the Appearance of Your Graphs

Overview

Along with table and page attributes, ODS styles contain a collection of graphical attributes such as color, marker shape, line pattern, fonts, and so on. Many carefully designed styles are shipped with SAS that enhance the visual impact of the graphics.

In addition to creating visually appealing graphics, many key elements of effective graphics are built into the various elements of the styles, such as the following:

- provide maximum contrast between backgrounds and data
- provide for ease of discrimination among different groups
- provide equal emphasis for data with equal importance
The ODS styles are used to produce professional looking graphics without the need for further modification. However, you have several options for modifying the appearance of your graphs if you choose to do so.

You can customize your graphical output at three levels. The following table shows the three levels of customization.

**Table 13.1 Levels of Customization**

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Level of Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the style. See “Specifying Styles” on page 624.</td>
<td>Specify a style with the STYLE= option on the ODS destination statement to change the appearance of the entire graph. Requires no further modification. The active style affects all SAS output and remains in effect until the ODS style or destination is changed.</td>
<td>low</td>
</tr>
<tr>
<td>Use Appearance options. See “Using Procedure Options to Control Graph Appearance” on page 625.</td>
<td>Specify an appearance option in the procedure to change various aspects of your graph. Appearance options override the corresponding defaults from the current style. <em>Note:</em> Not all appearance attributes can be specified in this way. Appearance options affect only the procedure in which they are specified.</td>
<td>low</td>
</tr>
<tr>
<td>Modify individual style elements. See “Modifying Style Templates” on page 635.</td>
<td>Specify or change style attributes in order to modify a style element. This requires the use of PROC TEMPLATE style statements. The active style affects all SAS output and remains in effect until the ODS style or destination is changed.</td>
<td>high</td>
</tr>
</tbody>
</table>

---

**Understanding Styles**

**About Styles and Style Elements**

ODS styles are produced from compiled STYLE templates written in PROC TEMPLATE style syntax. An ODS style template is a collection of style elements that provides specific visual attributes for your SAS output.

The style elements of a style are designed to ensure the goals of effective graphics. Each style element is a named collection of style attributes such as color, marker symbol, line style, font face, as well as many others. Each graphical element of a plot, such as a marker, a bar, a line or a title, derives its visual attributes from a specific style element from the active style.
Changing the style for an ODS destination is the easiest way to change a graph's appearance. Changing the current style requires only the use of the STYLE= option on an ODS destination statement. For more information, see “Specify a Style for an ODS Destination” on page 624.

*Note:* The style that a destination uses is applied to tabular output as well as graphical output.

**About the Default Styles**

Every ODS output destination has a default style associated with it. These default styles are different for each destination. Therefore, your output might look different depending on which destination you use. For example, the default style for the PRINTER destination is “Printer” while the default style for the RTF destination is “RTF”.

*Note:* Starting with SAS 9.3, the default style for the HTML destination is HTMLBlue.

For a table that lists the default styles for ODS destinations, see “Working with Styles” in Chapter 13 of *SAS Output Delivery System: User's Guide*.

You can display a list of the available styles by submitting the following PROC TEMPLATE statements:

```sas
proc template;
  list styles;
run;
```

You can change the default style for a destination by modifying the SAS Preferences or the SAS Registry.

**See Also**

- “Change the Default Style for the HTML Destination” on page 625
- “Changing a Default Style in the SAS Registry” on page 625

**Recommended Styles**

SAS ships a set of styles that have been designed by GUI experts to address the needs of different situations, while ensuring the principles of effective graphics.
The following is a subset of the styles shipped with SAS that are particularly suited for statistical graphics:

**Table 13.2 Recommended Styles**

<table>
<thead>
<tr>
<th>Desired Output</th>
<th>Recommended Styles</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full color</td>
<td>HTMLBLUE*</td>
<td>white background, optimized for HTML output</td>
</tr>
<tr>
<td></td>
<td>DEFAULT</td>
<td>gray background, optimized for HTML output</td>
</tr>
<tr>
<td></td>
<td>ANALYSIS</td>
<td>yellow background</td>
</tr>
<tr>
<td></td>
<td>STATISTICAL</td>
<td>white background, colored fills</td>
</tr>
<tr>
<td></td>
<td>LISTING</td>
<td>white background, optimized for color format on white paper</td>
</tr>
<tr>
<td></td>
<td>PRINTER</td>
<td>optimized for PS and PDF output</td>
</tr>
<tr>
<td>Gray scale</td>
<td>JOURNAL</td>
<td>interior filled areas are gray scale</td>
</tr>
<tr>
<td></td>
<td>JOURNAL2**</td>
<td>interior filled areas are gray scale</td>
</tr>
<tr>
<td>Black and white</td>
<td>JOURNAL2**</td>
<td>interior filled areas have no color</td>
</tr>
</tbody>
</table>

* HTMLBlue is the default style for the ODS HTML destination.
** Journal2 and Journal3 by default render grouped bars with fill patterns. For more information, see “Using Fill Patterns to Distinguish Grouped Bar Charts” on page 636.

**Viewing a Style Template**

You can view the styles that SAS provides by using the command line or the SAS Windowing Environment.

To use the SAS Windowing Environment, follow these steps:

1. In the Results window, select the Results folder. Right-click and select Templates to open the Templates window.
2. Double-click Sashelp.Tmplmst to view the contents of that directory.
3. Double-click Styles to view the contents of that directory.
4. Double-click the style definition that you want to view. For example, the HTMLBlue style definition is the template store for HTML output. Similarly, the RTF style definition is the template store for RTF output.

To use the command line, follow these steps:

1. To view the Templates window, submit this command in the command line: odstemplates
   The Templates window contains the item stores Sasuser.Templat and Sashelp.Tmplmst.
2. Double-click `Sashelp.Tmplmst` to expand the list of directories where ODS templates are stored.

3. To view the style definitions that SAS provides, double-click the Styles item store.

4. Right-click the style definition that you want to view and select `Open`. The style definition is displayed in the Template Browser window.

**Examples of Styles**

SAS provides styles that are recommended for use with statistical graphics. Each of the following graphs was created using the HTML destination with a different style.

**Display 13.1  HTML Output Using the HTMLBlue Style**

![Display 13.1 HTML Output Using the HTMLBlue Style](image)

**Display 13.2  HTML Output Using the Analysis Style**

![Display 13.2 HTML Output Using the Analysis Style](image)
Specifying Styles

Specify a Style for an ODS Destination

Each ODS destination has a default style that is set by SAS. By specifying \texttt{STYLE=style-definition} in your ODS destination statement, you can create an entirely different appearance for your graphs.
For example, you can specify that ODS apply the Styles.Journal style to all HTML output with one of the following statements:

```
ods html style=styles.journal;
ods html style=journal;
```

This style is applied to all output for that destination until you change the style or start a new SAS session.

*Note:* In Windows and UNIX operating environments, when the ODS Graphics procedures are executed in the SAS Windowing environment, HTML is the default destination. If you close this destination and do not open another destination, then no destinations are open. (In batch mode, the default destination is LISTING.)

**Change the Default Style for the HTML Destination**

The default style for the HTML destination is HTMLBlue.

To change the default style:

1. Select **Tools** ➔ **Options** ➔ **Preferences**.
2. Select the **Results** tab.
3. Select a new default style from the **Style** list box.
4. Click **OK**.

**Changing a Default Style in the SAS Registry**

By default, the SAS registry is configured to apply a default style to the output for each ODS destination. To permanently change the default style for a destination, you can change the setting of **Selected Style** in the SAS registry.


**Using Procedure Options to Control Graph Appearance**

**Overview of the Appearance Options**

ODS styles enable you to control the overall appearance of the graphs. The ODS Graphics procedures also enable you to control the appearance of particular graphics elements in a graph. Graphics elements include lines, bars, markers, text, and so on.

Many ODS Graphics procedure statements have options and suboptions that control the appearance of different parts of a graph. Default visual attributes of various graphics elements are derived from the specific style elements of the active style. By using appearance options in your procedure statements, you can change the appearance of one or more aspects of your graph without changing the overall style.
For example, the following statement specifies that the mean value confidence limits (for a regression plot) use the GraphConfidence2 style element instead of the default GraphConfidence style element:

```plaintext
reg x=height y=weight / clmattrs=GraphConfidence2;
```

You can specify values for appearance options by using three different methods:

- specify a style element.
  ```plaintext
density height / lineattrs=graphfit2;
  Note: This is the preferred method.
```

See “Specifying a Style Element” on page 626.

- specify hardcoded values.
  ```plaintext
density height / lineattrs=(pattern=dashdashdot color=red);
  This method overrides one or more attributes of the style element. See “Specifying Hardcoded Values” on page 627.
```

- specify a style element, but override one or more attributes with hardcoded values.
  This method combines the first two methods.
  ```plaintext
density height / lineattrs=graphfit2 {pattern=dashdashdot};
  See “Specifying a Style Element with Hardcoded Values” on page 629.
```

The appearance options and their values are specific to each statement. For complete documentation about the statements and their options, see the syntax section for the appropriate procedure and statement.

**See Also**

“About Styles and Style Elements” on page 620

### Specifying a Style Element

You can change the visual attributes that are used for a graphics element by specifying a particular style element for any appearance option. Graphics elements include lines, bars, markers, text, and so on.

For example, the graph shown here is a histogram with a normal density curve. By default, the visual attributes of the density curve are specified by the style attributes within the style element GraphFit.

**Table 13.3 Histogram with Density Curve That Uses the Default Style Element**

```plaintext
ods graphics / width=4in;
proc sgplot data=sashelp.class
   noautolegend;
   histogram height;
   density height;
   run;
```
You can use the LINEATTRS= option in the DENSITY statement to change the style element that is used for the line attributes. For example, when you are using the HTMLBlue style, specifying the GraphFit2 style element changes the density curve line to an orange color.

```
density height / lineattrs=graphfit2;
```

The full code is below.

Table 13.4 Histogram with Density Curve That Specifies a Style Element

```
proc sgplot data=sashelp.class noautolegend;
histogram height;
density height / lineattrs=graphfit2;
run;
```

Specifying a style element is the preferred way to change the appearance of a graphics element. Visual attributes that are referenced by the style element are chosen to provide consistency and appropriate emphasis based on display principles for statistical graphics. If you later change the style for the graph, the graphics element is compatible with the new style.

See Also

- “About Styles and Style Elements” on page 620
- “Style Elements for Use with ODS Graphics” on page 640

**Specifying Hardcoded Values**

In some cases it is important to have a specific visual effect, but it is not necessary for the plot to be reused with different styles. In such a case, you can specify hardcoded values for the visual attributes in the appearance option.

For example, you could use the following statement to set the density curve attributes:

```
density height / lineattrs=(pattern=dashdashdot color=red);
```
Table 13.5 Using Hardcoded Values

The result is a red density curve with a DashDashDot pattern.

In general, it is recommended that you specify the style element rather than hardcoded values. Style elements are designed to derive all of the relevant visual attributes from the applied style. When you specify a hardcoded value for the line color, as in this example, the color is no longer derived from the specified style element. If you later change the style that is applied to the graph, the hardcoded attribute might conflict with the new style. Also, a hardcoded color could be exactly the same color as the wall color of another style, and become indistinguishable from the wall.

For example, if you change the overall style to Journal, which only uses gray-scale colors, the color for the curve is still red. This result might not be desirable.

Table 13.6 Hardcoded Attributes When the Journal Style Is Applied to the Graph

You use a standard syntax to hardcode colors, line thickness, line patterns, and marker symbols.

For more information about this syntax, see the following topics:

- “Specifying Colors in SAS/GRAPH Programs” in Chapter 14 of SAS/GRAPH: Reference
- “Units of Measurement” on page 659
- “Line Patterns” on page 663
- “Marker Symbols” on page 661
**Specifying a Style Element with Hardcoded Values**

You can specify a style element, but override one or more attributes of that style element with hardcoded values.

This example modifies a density curve. The example specifies the GraphFit2 style element for line attributes, but also specifies a particular line pattern with a hardcoded value.

```
density height / lineattrs=graphfit2 (pattern=dashdashdot);
```

**Table 13.7 Using a Hardcoded Value with a Style Element, Default Style**

```
ods graphics / width=4in noautolegend;
proc sgplot data=sashelp.class;
  histogram height;
  density height / lineattrs=graphfit2 (pattern=dashdashdot);
run;
```

If you change the overall style to Journal, the color for this curve changes as well. However, the pattern remains DashDashDot because it was hardcoded.

**Table 13.8 Using a Hardcoded Value with a Style Element, Journal Style**

```
ods html style=journal noautolegend;
proc sgplot data=sashelp.class;
  histogram height;
  density height / lineattrs=graphfit2 (pattern=dashdashdot);
run;
ods html style=htmlblue;
```

Always be careful when you hardcode a value. When you specify a hardcoded value for the line pattern, as in this example, the pattern is no longer derived from the specified style element. If you later change the style that is applied to the graph, the hardcoded attribute might conflict with the new style.
Output for Grouped versus Non-Grouped Data

Non-Grouped Data

The Default Appearance of Non-Grouped Output
For the SGPLOT and SGPANEL procedures, many plots use the same style element, GraphDataDefault, for graphics elements such as lines, bars, and markers. These plots have the same default appearance.

In the graph that is produced by the following code, the bar chart and line chart use visual attributes from the GraphDataDefault element. The visual attributes for the line (and markers if specified) are designed to coordinate with the bar fill areas.

Table 13.9  Default Appearance of Non-Grouped Bars and Lines

```
ods graphics on / width=4.5in;
proc sgplot data=sashelp.stocks
(where=(date >= "01jun2005"d
 and stock = "IBM"));
title "Stock Volume vs. Close";
vbar date / response=volume;
vline date / response=close y2axis;
run;
title;
```

However, when identical plot types are overlaid, the procedures instead use style elements named GraphData1 to GraphData_ (where n=12 for most styles).

In the following graph, the series lines have different colors and are easy to distinguish. The plots use the GraphData1, GraphData2, and GraphData3 style elements.

Table 13.10  Default Appearance When Three Series Plots Are Overlaid

```
ods graphics on / width=4.5in;
proc sgplot data=sashelp.stocks
(where=(date >= "01jan2004"d
 and stock = "IBM"));
title "Stock Trend";
series x=date y=close;
series x=date y=low;
series x=date y=high;
run;
title;
```

The GraphData_ style elements use different marker symbols and fill colors to ensure that the plots differ in appearance. All line and marker colors are of different hues but with the same brightness, which means that all 12 colors can be distinguished but none
stands out more than another. Fill colors are based on the same hue but have less saturation, making them similar but more muted than the corresponding contrast colors.

Line patterns can also vary depending on the style that is used for the graph. Some styles vary line patterns so that elements in color plots can be distinguished even when the plot is sent to a black-and-white printer. Line patterns do not vary for the HTMLBlue style or any style that is defined with the ATTRPRIORITY="Color" option.

**Note:** If you have a bar-line overlay with multiple lines, the lines cycle through GraphData\n, whereas the bar remains GraphDataDefault.

Other plots use more specialized style elements for their appearance. For example, the line attributes for density, loess, PBSpline, and regression curves are determined by the GraphFit style element.

Here are some interactions for plots with specialized style elements:

- If you have a histogram with multiple density curves, the curve style pattern changes with the number of curves. For one curve, GraphFit is used. For two curves, GraphFit and GraphFit2 are used. For three or more, all curves switch over to GraphData\n. The histogram uses GraphDataDefault.

- If you have multiple fit plots (loess, regression, or PBSpline), the behavior is like the density curves. For one fit, GraphFit is used. For two fits, GraphFit and GraphFit2 are used. For three or more, all fits switch to GraphData\n. (This behavior also applies to the SGSCATTER procedure when multiple fits are specified.)

- If you have multiple ellipses overlaid on another plot (such as a scatter), the ellipses cycle through GraphData\n, whereas the plot uses GraphDataDefault.

In general, if all of the plots have the same statement name (all scatter, all series, and so on), then the plots automatically cycle.

The CYCLEATTRS | NOCYCLEATTRS options in the SGPLOT and SGPANEL procedure statements can be used to manually control whether the plots have unique attributes. CYCLEATTRS forces cycling in situations where cycling is not automatic. The NOCYCLEATTRS option forces cycling to be off. These options are described in the next section.

**Changing the Appearance of Non-Grouped Output**

You can use plot options to specify particular GraphData\n style elements for your plots in order to achieve a different appearance.

In the following graph, the style elements GraphData3, GraphData4, and GraphData5 are used to change the default appearance of the series lines in the graph.

**Table 13.11** Overlaid Series Plots with Particular GraphData\n Elements Specified

```plaintext
ods graphics on / width=4.5in;
proc sgplot data=sashelp.stocks
(where=(date >= "01jan2004"d
and stock = "IBM");
title "Stock Trend";
series x=date y=close
 / lineattrs= GraphData3;
series x=date y=low
 / lineattrs= GraphData4;
series x=date y=high
 / lineattrs= GraphData5;
run;
title;
```
Note: To achieve a different appearance for the series lines, you can use any style element that has line properties. However, the GraphData$n$ style elements are ideally suited for this purpose. The GraphData$n$ style elements have been carefully constructed with different hues but with the same brightness, which means that all 12 colors can be distinguished but none stands out more than another.

For more information, see “Specifying a Style Element” on page 626.

Sometimes, you might want to control one or more attributes of a style element. You can use plot options to override, or hardcode, an attribute in the style element.

The following two graphs show the same plots before and after the PATTERN= option is used. The PATTERN= option is used with two series lines to force a different line pattern.

Table 13.12  The Effect of Specifying a Hardcoded Line Pattern

```
ods html style=journal;
proc sgplot data=sashelp.stocks
  (where=(date >= "01jan2004"d
  and stock = "IBM"));
title "Default Journal Style";
series x=date y=close;
series x=date y=low;
series x=date y=high;
run;
title;
```

```
proc sgplot data=sashelp.stocks
  (where=(date >= "01jan2004"d
  and stock = "IBM"));
title "Line Patterns Specified";
series x=date y=close;
series x=date y=low
  / lineattrs= (pattern=2);
series x=date y=high
  / lineattrs= (pattern=4);
run;
title;
```

```
ods html style=htmlblue;
```

For more information, see “Specifying Hardcoded Values” on page 627 and “Specifying a Style Element with Hardcoded Values” on page 629.

You can also use the CYCLEATTRS | NOCYCLEATTRS options in the SGPLOT and SGPROC procedure statements to control whether the plots have unique attributes. CYCLEATTRS forces cycling in situations where cycling is not automatic. If the plots do not have unique attributes by default, then you can specify the CYCLEATTRS option to force unique attributes for each plot in the graph. The NOCYCLEATTRS option prevents the procedure from assigning unique attributes.
The following two graphs show the same plots before and after the CYCLEATTRS option is used.

Table 13.13  The Effect of Specifying the CYCLEATTRS Option

In the second graph, the procedure retrieves the attributes from GraphData1 and GraphData2. The first graph retrieves all of its data attributes from GraphDataDefault.

**Grouped Data**

**The Appearance of Grouped Output**

The GROUP= option is used to plot data when a classification or grouping variable is available. By default, this option automatically uses the GraphData style elements for the presentation of each unique group value. In general, you cannot specify the line or marker properties for specific group values directly, as you can for non-grouped data.

Consider the following option specification for a line: LINEATTRS=(PATTERN=2). When this line option is used, the line pattern is set as a style override. However, this override applies equally to all group values. The same is true for overrides of color or line thickness. This means that you can set one or more fixed appearance attributes for all group values, but you cannot directly assign unique visual properties to an individual group value. For example, you cannot specify LINEATTRS=(PATTERN=2 4) because this statement is not valid.

You can, however, use attribute maps to specify particular visual attributes for group values of the data. Attribute mapping is explained in the following section.

**Making the Appearance of Grouped Data Independent of Data Order**

When unique group values are gathered, they are internally recorded in the order in which they appear in the data. They are not subsequently sorted. This means that if an
input data source is modified, sorted, or filtered, the order of the group values and their associations with GraphData might change.

The following two graphs show the same plots before and after the data is sorted.

Table 13.14  The Effect That Sorting Has on Grouped Plot Attributes

Because the position of the data in the sorted data set has changed, the sorted graph uses different GraphData style elements for the group values.

In many cases, this might not be a problem if you do not care which line pattern, marker symbols, or colors are associated with particular group values. However, in some cases you might care. For example, if you create many plots grouped by gender, you might want a consistent set of visual properties for females and males across plots, regardless of the input data order.

SG attribute maps enable you to ensure that particular visual attributes are applied based on the GROUP= value of the data instead of the position of the data in the data set.

Two main tasks are required for attribute mapping. They are summarized here:

1. Create an SG attribute map data set, which associates data values with particular visual attributes. Each observation defines the attributes for a group value.

2. Modify the SG procedure and its plot statements to use the data in the SG attribute map. You can use attribute maps in the SGPLOT, SGPANEL, and SGSCATTER procedures.

Attribute mapping is supported in the PLOT statement of the SGSCATTER procedure. In the SGPLOT and SGPANEL procedures, any plot statement that supports GROUP variables supports attribute mapping. For more information, see Table 12.1 on page 610.
Here is an example of an SG attribute map data set called MYATTRMAP. The observations in this data set contain the group value (VALUE) and the attributes (LINECOLOR, FILLCOLOR).

### Display 13.5  Listing of the SG Attribute Map Data Set MYATTRMAP

<table>
<thead>
<tr>
<th>Obs</th>
<th>linecolor</th>
<th>fillcolor</th>
<th>ID</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pink</td>
<td>pink</td>
<td>myid</td>
<td>F</td>
</tr>
<tr>
<td>2</td>
<td>lightblue</td>
<td>lightblue</td>
<td>myid</td>
<td>M</td>
</tr>
</tbody>
</table>

The following output shows a bar chart that uses the MYATTRMAP data set for its pink and blue bar colors. The FILLCOLOR= values determine the color of the bars, and the LINECOLOR= values determine the color of the border edges around the bars.

```sas
data myattrmap;
length linecolor $ 9 fillcolor $ 9;
input ID $ value $ linecolor $ fillcolor $;
datalines;
myid  F pink pink
myid  M lightblue lightblue
; run;
proc sgplot data=sashelp.class
dattrmap=myattrmap;
vbar age / response=height group=sex
groupdisplay=cluster attrid=myid;
run;
```

You use a standard syntax to specify colors, line thickness, line patterns, and marker symbols. For more information about this syntax, see the following topics:

- “Specifying Colors in SAS/GRAPH Programs” in Chapter 14 of SAS/GRAPH: Reference
- “Units of Measurement” on page 659
- “Line Patterns” on page 663
- “Marker Symbols” on page 661

For complete information about attribute maps, see Chapter 12, “Using SG Attribute Maps to Control Visual Attributes,” on page 605.

### Modifying Style Templates

Style templates are created and modified with the TEMPLATE procedure. You can use the DEFINE STYLE statement to create your own style from scratch or from an existing style. When you create styles from existing styles, you can modify the individual style elements.
For example, the following program shows the style element GraphDataDefault, as defined in the Default style:

```sas
proc template;
  define style Styles.Default;
  ... more style elements ...

class GraphDataDefault /
  endcolor = GraphColors("gramp3cend")
  neutralcolor = GraphColors("gramp3cneutral")
  startcolor = GraphColors("gramp3cstart")
  markersize = 7px
  markersymbol = "circle"
  linethickness = 1px
  linestyle = 1
  contrastcolor = GraphColors("gcdata")
  color = GraphColors("gdata");
```

You can use the DEFINE STYLE statement to create a new style from the Default style and modify the GraphDataDefault style element.

The following program creates the new style MyStyleDefault, which inherits all of its style elements and style attributes from the Default style, and customizes the GraphDataDefault style element:

```sas
proc template;
  define style MyStyleDefault;
  parent=Styles.Default;
  style GraphDataDefault from GraphDataDefault /
    markersize = 10px
    markersymbol = "square";
  end;
run;
```

For complete documentation on using PROC TEMPLATE to modify and create styles, see the SAS Output Delivery System: User's Guide.

---

**Using Fill Patterns to Distinguish Grouped Bar Charts**

Some SAS styles display fill patterns for grouped bars. Fill patterns help distinguish between different categories when you are producing or printing black and white output.

The fill patterns appear for grouped data in the following types of plots, whether generated using the SGPLOT or the SGPANEL procedure:

- HBAR and VBAR
- HBARParm and VBARParm
Here is example output that was generated using the JOURNAL2 style.

Display 13.6 Fill Pattern for Grouped Bars

The following code was used to produce the example output.

```sas
ods listing style=journal2;
proc sgplot data=sashelp.class;
hbar age / group= sex;
run;
ods listing close;
```

Here are the SAS styles that by default render grouped bars with fill patterns:

- JOURNAL2
- JOURNAL3 (uses gray and the fill pattern)
- MONOCHROMEPINTER

These styles use the GRAPHBAR style element for the fill pattern. If you customize a style in the GTL, then you can add the GRAPHBAR style element to your custom style.

The following example shows a graph that uses a custom style. The style, based on the Journal2 style (which uses the GRAPHBAR element), adds color style elements. The result combines patterns, colors, and skins.
The following code was used to produce the output.

```sas
proc template;
  define style Styles.MyJournal2;
    parent = styles.journal2;
    style GraphColors from GraphColors /
      'gdata'=cffffff
      'gdata1'=cffffff
      'gdata2'=cx000c0c0
      'gdata3'=cxe0e0e0
      'gdata4'=cxa0a0a0
      'gdata5'=cx909090
      'gdata6'=cffffff
      'gdata7'=cx000c0c0
      'gdata8'=cxe0e0e0
      'gdata9'=cxa0a0a0
      'gdata10'=cx909090
      'gdata11'=cffffff
      'gdata12'=cx000c0c0
      'gdata13'=cxe0e0e0
      'gdata14'=cxa0a0a0
      'gdata15'=cx909090;
    style GraphHistogram from GraphComponent /
      displayopts = "outline";
    style GraphEllipse from GraphComponent /
      displayopts = "outline";
    style GraphBand from GraphComponent /
      displayopts = "outline";
    style GraphBox from GraphComponent /
```

Display 13.7  Fill Pattern with Color
displayopts = "caps median mean outliers"
connect = "mean"
capstyle = "serif";
style GraphBar from GraphComponent /
displayopts = "outline fillpattern";
style GraphData1 from GraphData1 /
fillpattern = "L1";
style GraphData2 from GraphData2 /
fillpattern = "X1";
style GraphData3 from GraphData3 /
fillpattern = "R1";
style GraphData4 from GraphData4 /
fillpattern = "L2";
style GraphData5 from GraphData5 /
fillpattern = "X2";
style GraphData6 from GraphData6 /
fillpattern = "R2";
style GraphData7 from GraphData7 /
fillpattern = "L3";
style GraphData8 from GraphData8 /
fillpattern = "X3";
style GraphData9 from GraphData9 /
fillpattern = "R3";
style GraphData10 from GraphData10 /
fillpattern = "L4";
style GraphData11 from GraphData11 /
fillpattern = "X4";
style GraphData12 from GraphData12 /
fillpattern = "R4";
style GraphData13 from GraphComponent /
fillpattern = "L5";
style GraphData14 from GraphComponent /
fillpattern = "X5";
style GraphData15 from GraphComponent /
fillpattern = "R5";
end;

define style Styles.MyJournal3;
parent = styles.MyJournal2;
style GraphBar from GraphComponent /
displayopts = "fill outline fillpattern";
style GraphColors from GraphColors /
'gdata'=cffffff
'gdata1'=cxa0c0f0
'gdata2'=cxf0c0a0
'gdata3'=cxa0f0c0;
end;
run;
ods listing style=MyJournal3;
ods graphics / reset imagename='MyBarPatterns';
proc sgplot data=sashelp.cars;
vbar type / group= origin dataskin= pressed;
run;
ods listing close;
Style Elements for Use with ODS Graphics

Style elements affect ODS graphics and can be specified by GTL appearance options or used in styles. Attribute values can be changed with the TEMPLATE procedure.

In the ODS Graphics procedures, you can specify style elements to override the default appearance of particular graphics elements, such as data labels. Certain style elements were created to be used with specific plots. For example, the style element GraphFit2 is best used to modify secondary fit lines. The style element GraphConfidence2 was created to modify secondary confidence bands. However, many plots provide the option to override the style element with a different style element, or to specify particular attributes for a style element.

Here are examples that specify a style element and an attribute of a style element:
- GraphData2 is an example of a style element.
- GraphData2:Color is an example of a style attribute.

The tables below list each style element, the portion of the graph that it affects, and the applicable attributes.

<table>
<thead>
<tr>
<th>Style Element</th>
<th>Portion of Graph Affected</th>
<th>Recognized Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graph</td>
<td>Graph size and outer border appearance</td>
<td>OutputWidth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OutputHeight</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BorderColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BorderWidth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CellPadding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CellSpacing</td>
</tr>
<tr>
<td>GraphAnnoLine</td>
<td>Annotation lines</td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td>GraphAnnoShape</td>
<td>Annotation closed shapes such as circles, and squares</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transparency</td>
</tr>
<tr>
<td>GraphAnnoText</td>
<td>Annotation text</td>
<td>Font</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or font-attributes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td>Style Element</td>
<td>Portion of Graph Affected</td>
<td>Recognized Attributes</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>GraphAxisLines</td>
<td>X, Y and Z axis lines</td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TickDisplay</td>
</tr>
<tr>
<td>GraphBackground</td>
<td>Background of the graph</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transparency</td>
</tr>
<tr>
<td>GraphBorderLines</td>
<td>Border around graph wall, legend border, borders to complete axis frame</td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphDataText</td>
<td>Text font and color for point and line labels</td>
<td>Font</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or font-attributes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td>GraphFootnoteText</td>
<td>Text font and color for footnote(s)</td>
<td>Font</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or font-attributes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td>GraphLabelText</td>
<td>Text font and color for axis labels and legend titles</td>
<td>Font</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or font-attributes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td>GraphOutlines</td>
<td>Outline properties for fill areas such as bars, pie slices, box plots, ellipses, and histograms</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td>GraphReference</td>
<td>Horizontal and vertical reference lines and drop lines</td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td>GraphTitleText</td>
<td>Text font and color for title(s)</td>
<td>Font</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or font-attributes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td>GraphUnicodeText</td>
<td>Text font for unicode values</td>
<td>Font</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or font-attributes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
</tbody>
</table>
### Table 13.16 Style Elements Affecting Graphical Data Representation

<table>
<thead>
<tr>
<th>Style Element</th>
<th>Portion of Graph Affected</th>
<th>Recognized Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GraphValueText</td>
<td>Text font and color for axis tick values and legend values</td>
<td>Font or font-attributes, Color</td>
</tr>
<tr>
<td>GraphBoxMean</td>
<td>Marker for mean</td>
<td>ContrastColor, MarkerSize, MarkerSymbol</td>
</tr>
<tr>
<td>GraphBoxMedian</td>
<td>Line for median</td>
<td>ContrastColor, LineStyle, LineThickness</td>
</tr>
<tr>
<td>GraphBoxWhisker</td>
<td>Box whiskers and serifs</td>
<td>ContrastColor, LineStyle, LineThickness</td>
</tr>
<tr>
<td>GraphConfidence</td>
<td>Primary confidence lines and bands, colors for bands and lines</td>
<td>ContrastColor, Color, MarkerSize, MarkerSymbol, LineStyle, LineThickness</td>
</tr>
<tr>
<td>GraphConfidence2</td>
<td>Secondary confidence lines and bands, color for bands and contrast color for lines</td>
<td>ContrastColor, Color, MarkerSize, MarkerSymbol, LineStyle, LineThickness</td>
</tr>
<tr>
<td>GraphConnectLine</td>
<td>Line for connecting boxes or bars</td>
<td>ContrastColor, LineStyle, LineThickness</td>
</tr>
<tr>
<td>GraphCutLine</td>
<td>Cutline attributes for a dendogram</td>
<td>Color, LineStyle</td>
</tr>
<tr>
<td>Style Element</td>
<td>Portion of Graph Affected</td>
<td>Recognized Attributes</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>GraphDataDefault</td>
<td>Primitives related to non-grouped data items, colors for filled areas, markers, and lines</td>
<td>Color, ContrastColor, MarkerSymbol, MarkerSize, LineStyle, LineThickness, StartColor, NeutralColor, EndColor</td>
</tr>
<tr>
<td>GraphError</td>
<td>Error line or error bar fill, ContrastColor for lines, Color for bar fill</td>
<td>ContrastColor, Color, LineStyle, Transparency</td>
</tr>
<tr>
<td>GraphFit</td>
<td>Primary fit lines such as a normal density curve</td>
<td>ContrastColor, Color, MarkerSize, MarkerSymbol, LineStyle, LineThickness</td>
</tr>
<tr>
<td>GraphFit2</td>
<td>Secondary fit lines such as a kernel density curve</td>
<td>ContrastColor, Color, MarkerSize, MarkerSymbol, LineStyle, LineThickness</td>
</tr>
<tr>
<td>GraphFinal</td>
<td>Final data for the waterfall chart. Color applies to filled areas.</td>
<td>Color, ContrastColor, LineStyle, LineThickness, MarkerSize, MarkerSymbol, TextColor</td>
</tr>
<tr>
<td>Style Element</td>
<td>Portion of Graph Affected</td>
<td>Recognized Attributes</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>GraphInitial</td>
<td>Initial data for the waterfall chart. Color applies to filled areas.</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TextColor</td>
</tr>
<tr>
<td>GraphMissing</td>
<td>Properties for graph items representing missing values</td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transparency</td>
</tr>
<tr>
<td>GraphOther</td>
<td>Other data for the graph. Color applies to filled areas.</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TextColor</td>
</tr>
<tr>
<td>GraphOverflow</td>
<td>Overflow data for the graph. Color applies to filled areas. ContrastColor applies to</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td>markers and lines.</td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TextColor</td>
</tr>
<tr>
<td>GraphOutlier</td>
<td>Outlier data for the graph</td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineThickness</td>
</tr>
<tr>
<td>Style Element</td>
<td>Portion of Graph Affected</td>
<td>Recognized Attributes</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>GraphPrediction</td>
<td>Prediction lines</td>
<td>ContrastColor, Color, LineStyle, LineThickness, MarkerSize, MarkerSymbol</td>
</tr>
<tr>
<td>GraphPredictionLimits</td>
<td>Fills for prediction limits</td>
<td>ContrastColor, Color, MarkerSize, MarkerSymbol</td>
</tr>
<tr>
<td>GraphUnderflow</td>
<td>Underflow data for the graph. Color applies to filled areas. ContrastColor applies to markers and lines.</td>
<td>Color, ContrastColor, LineStyle, LineThickness, MarkerSize, MarkerSymbol, TextColor</td>
</tr>
<tr>
<td>GraphSelection</td>
<td>For interactive graphs, visual properties of selected item. Color for selected fill area, ContrastColor for selected marker or line.</td>
<td>ContrastColor, Color, MarkerSymbol, MarkerSize, LineStyle, LineThickness</td>
</tr>
<tr>
<td>ThreeColorAltRamp</td>
<td>Line contours, markers, and data labels with segmented range color response</td>
<td>StartColor, NeutralColor, EndColor</td>
</tr>
<tr>
<td>ThreeColorRamp</td>
<td>Gradient contours, surfaces, markers, and data labels with continuous color response</td>
<td>StartColor, NeutralColor, EndColor</td>
</tr>
<tr>
<td>TwoColorAltRamp</td>
<td>Line contours, markers, and data labels with segmented range color response</td>
<td>StartColor, EndColor</td>
</tr>
<tr>
<td>TwoColorRamp</td>
<td>Gradient contours, surfaces, markers, and data labels with continuous color response</td>
<td>StartColor, EndColor</td>
</tr>
</tbody>
</table>
### Table 13.17  Graphical Style Elements: Data Related (Grouped)

<table>
<thead>
<tr>
<th>Style Element</th>
<th>Portion of Graph Affected</th>
<th>Recognized Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>GraphData1</td>
<td>Primitives related to 1st grouped data items. Color applies to filled areas. ContrastColor applies to markers and lines.</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData2</td>
<td>Primitives related to 2nd grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData3</td>
<td>Primitives related to 3rd grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData4</td>
<td>Primitives related to 4th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData5</td>
<td>Primitives related to 5th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData6</td>
<td>Primitives related to 6th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData7</td>
<td>Primitives related to 7th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MarkerSymbol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData8</td>
<td>Primitives related to 8th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData9</td>
<td>Primitives related to 9th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>Style Element</td>
<td>Portion of Graph Affected</td>
<td>Recognized Attributes</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>GraphData10</td>
<td>Primitives related to 10th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData11</td>
<td>Primitives related to 11th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LineStyle</td>
</tr>
<tr>
<td>GraphData12</td>
<td>Primitives related to 12th grouped data items</td>
<td>Color</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ContrastColor</td>
</tr>
</tbody>
</table>

### Table 13.18  Display Style Elements

<table>
<thead>
<tr>
<th>Style Element</th>
<th>Portion of Graph Affected</th>
<th>Recognized Attributes</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>GraphAltBlock</td>
<td>Alternate fill color for block plots</td>
<td>Color</td>
<td>GraphColors(&quot;gablock&quot;)</td>
</tr>
<tr>
<td>GraphBand</td>
<td>Display options for confidence bands</td>
<td>DisplayOpts</td>
<td>“Fill ”</td>
</tr>
<tr>
<td>GraphBar</td>
<td>Display options for bar charts</td>
<td>DisplayOpts</td>
<td>“Fill outline”</td>
</tr>
<tr>
<td>GraphBox</td>
<td>Display options for box plots</td>
<td>DisplayOpts</td>
<td>“Fill caps mean Median outliers ”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&quot;Serif&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&quot;Mean&quot;</td>
</tr>
<tr>
<td>GraphBlock</td>
<td>Fill color for block plots</td>
<td>Color</td>
<td>GraphColors(&quot;gblock&quot;)</td>
</tr>
<tr>
<td>GraphEllipse</td>
<td>Display options for confidence ellipses</td>
<td>DisplayOpts</td>
<td>“Outline”</td>
</tr>
<tr>
<td>GraphHistogram</td>
<td>Display options for histograms</td>
<td>DisplayOpts</td>
<td>“Fill outline”</td>
</tr>
</tbody>
</table>
Chapter 14
Managing Your Graphics with ODS

Introduction

The Output Delivery System (ODS) manages all output created by procedures and enables you to display the output in a variety of forms, such as HTML, PDF, and RTF. SAS ODS Graphics procedures and many SAS Analytical procedures use ODS Graphics for creation of their graphs. The ODS destination statements and the ODS GRAPHICS statement provide options for control of many relevant features.

Note: Some default ODS output settings have changed for SAS 9.3. For more information, see “What's New in SAS ODS Graphics Procedures 9.3” on page vii.

The following sections describe techniques for managing this graphical output:

- “Specifying a Destination” on page 649
- “Using the ODS GRAPHICS Statement” on page 651

Specifying a Destination

For creation of ODS graphs, a valid ODS destination must be active. In Windows and UNIX operating environments, when the ODS Graphics procedures are executed in the SAS Windowing environment, HTML is the default destination. The default destination for batch mode is LISTING.

CAUTION:

Take care when closing the HTML destination. If you close this destination and do not open another destination, then no destinations are open.
You can use ODS destination statement options to specify where you want your output to be displayed and where you want your image files to be stored.

These options are specified on ODS destination statements, using the following form:

```
ODS destination <option(s)>;
```

The ODS HTML statement below specifies the following:

- the name of the output file
- the folder where images are stored
- the style to be used

For the complete program, see Example Code 14.1 on page 651.

```
ods html file="BoxPlot-Body.html"
gpath="C:\myfiles\images" style=journal;
```

... SAS statements ...

The output is written to the file `BoxPlot-Body.html`. Images created by the output are stored in the folder `"C:\myfiles\images"`. The `STYLE=` option changes the style from `HTMLBlue.Styles` to `Journal.Styles`. For more information about changing the appearance of your graphics, see “Controlling the Appearance of Your Graphs” on page 619.

If you do not specify a filename for your output, then SAS provides a default file that is determined by the ODS destination. You can check the SAS log to verify the name of the file in which your output is saved.

When the procedures are executed in the SAS Windowing environment, if you do not specify a directory for the file, the file is saved in the directory that corresponds to your SAS Work library. The default directory for batch mode is the SAS current directory.

**TIP** You can verify the location of the current SAS Work library by opening the Libraries folder in the SAS Explorer window. Right-click **Work** and select **Properties** from the pop-up menu.

For a table that lists ODS destinations and the formatted output that results from each destination, see “Understanding ODS Destinations” in Chapter 3 of *SAS Output Delivery System: User's Guide*.

Graphs rendered to the LISTING destination are not automatically displayed in the output window. To view these graphs, go to the Results window and select the desired graph to view.

You can also specify some appearance options for the graphics output such as image DPI, width, height, and style. For more information, see “Using the ODS GRAPHICS Statement” on page 651.

**See Also**

- “Understanding ODS Destinations” in Chapter 3 of *SAS Output Delivery System: User's Guide*
Using the ODS GRAPHICS Statement

**Introduction**

You can use the ODS GRAPHICS statement options to control many aspects of your graphics. The settings that you specify remain in effect for all graphics until you change or reset these settings with another ODS GRAPHICS statement.

When you use the GTL language or SAS ODS Graphics procedures in the SAS Windowing environment, ODS GRAPHICS is ON by default. In batch mode, ODS GRAPHICS is OFF by default.

You can use the ODS GRAPHICS statement to control many features, including the following:

- the size of the image
- the type and name of the image created
- whether features such as data tips, scaling, and anti-aliasing are used

The basic syntax for the ODS GRAPHICS statement is as follows:

```
ODS GRAPHICS < OFF | ON> </option(s)>;
```

*Note:* For the complete statement syntax, see “ODS GRAPHICS Statement” in *SAS Output Delivery System: User’s Guide.*

The following program uses the ODS GRAPHICS statement to illustrate several techniques for controlling your graphics.

These techniques are discussed in the following sections:

- “Controlling the Size of Your Graph” on page 652
- “Adding Data Tips and Other Features” on page 654
- “Accessing Graphs as Separate Files” on page 654

*Note:* The following sections provide only summary information. For the complete information, see “ODS GRAPHICS Statement” in *SAS Output Delivery System: User’s Guide.*

**Example Code 14.1  Controlling Graphics with the ODS GRAPHICS Statement**

```plaintext
ods graphics on /
   width=3.25in
   outputfmt=gif
   imagemap=on
   imagename="MyBoxplot"
   border=off;
ods html file="Boxplot-Body.html" style=journal
gpath="C:\myfiles\images";
proc sgplot data=sashelp.heart;
   title "Cholesterol Distribution by Weight Class";
   hbox cholesterol / category=weight_status;
run;
```
Controlling the Size of Your Graph

Overview
The output size of a graph is determined by the following:

- For SGRENDER output, the design size for the graph is specified in the
  STATGRAPH template.

  The default sizes defined in the registry are:
  - Default design width=640px
  - Default design height=480px
  - Default aspect ratio is 4/3

  For SGPLOT, SGPANEL, or SGSCATTER output, the preceding default sizes are
  used.

- DPI settings for the output destinations are specified by the IMAGE_DPI= or DPI=
  options

- Settings for width and height are specified by the WIDTH= option and the
  HEIGHT= option for the ODS GRAPHICS statement.

When modifying the size of your graph, it is important to take into consideration the
image scaling and aspect ratio, as well as the width and height of the graph. For
example, rendering a graph to the LISTING destination at the default design size and
default DPI of 100, produces a graph that is 640 by 480 pixels. If the same graph is
rendered to the RTF destination, which has a default DPI of 200, the graph size is closer
to 1280 by 960 pixels. The graph is scaled using 96 DPI as a baseline (640 * 200 / 96).
In both cases, when this image is embedded into an RTF document, its size in the
document is 6.4 in. by 4.8 in, since DPI data is included in the image. The aspect ratio of
the graph is retained.

Display 14.1 3.25 Inch Graph with Data Tips and No Border

Cholesterol Distribution by Weight Class

Weight Status

Normal

Overweight

Underweight

Weight Status = Overweight
Minimum Whisker = 115
First Quartile = 200
Median = 228
Third Quartile = 259
Maximum Whisker = 347
Mean = 232.11
Standard Deviation = 45.376
N = 3445

100 200
Graph Scaling for DPI

When the DPI of a graph is changed due to a change in output destination or user specification, the graph is scaled using a baseline DPI of 96 pixels. All graphical elements such as marker size, line thickness, font sizes, and gutters are also scaled linearly.

Specifying Output Size with the ODS GRAPHICS statement

You can control the output size of a graph by specifying the WIDTH= or HEIGHT= options in the ODS GRAPHICS statement. In the ODS GRAPHICS statement below, taken from Example Code 14.1 on page 651, the WIDTH= option changes the width of the graph to 3.25 inches:

```ods graphics on /
   width=3.25in
   outputfmt=gif
   imagemap=on
   imagename="MyBoxplot"
   border=off;
```

Retaining Aspect Ratio

Although you can use the ODS GRAPHICS statement to specify both the width and height, it is highly recommended that only one of these options be specified at a time. Using one option at a time ensures that the design aspect ratio of the graph is maintained.

When only width is specified, SAS uses the design aspect ratio of the graph to compute the appropriate height. Retaining the design aspect ratio of the graph is important in many cases as the graph might have a specific layout. For example, a plot that has multiple columns, or that has a statistics table on the side needs a wide aspect ratio. Changing the aspect ratio for this plot by specifying both width and height might produce unpredictable results.

Graph Scaling For User Specified Image Size

When you use the WIDTH= option in the ODS GRAPHICS statement, the output size of the graph is computed based on the new size and the active DPI, using a baseline DPI of 96. All graphical elements such as marker size, line thickness, font size, and gutters are scaled using a non-linear scale. This is done to prevent rapid shrinking or growth of the fonts and markers.

Scaling of graph elements for change in graph size can be disabled by the ODS GRAPHICS statement options NOSCALE or SCALE=OFF. By default, scaling is on. Specifying NOSCALE or SCALE=OFF prevents the scaling of the graph elements. If you want to shrink your graph and keep the default sizes for fonts, use the NOSCALE or SCALE=OFF option in the ODS GRAPHICS statement.

Tip For Embedding Graph Images in Documents

It is often useful to produce a graph that fits in one column of a two column page. In this case, the column size might be 3.25 inches wide. You can place a default output image, which is 640 by 480 pixels, in this space, but then all graphical elements scale down. This results in small markers and unreadable small fonts.

In this case, it is useful to render the graph to the exact size required, and specify the correct DPI. In the situation above, you would specify a width of 3.25 inches and use the IMAGE_DPI= destination statement option to specify a DPI of 200. Then, the graph produced can be placed in the 3.25" wide column and the fonts and markers are readable.
Note: To get exactly the specified font sizes, use the NOSCALE option in the ODS GRAPHICS statement.

Adding Data Tips and Other Features

With ODS GRAPHICS statement options, you can control different features of your graphs, such as borders and data tips. In the ODS GRAPHICS statement below, taken from Example Code 14.1 on page 651, the BORDER=OFF option specifies that there be no border around the graph. The IMAGEMAP=ON option enables the generation of data tips and any drill downs:

```
ods graphics on /
  width=3.25in
  outputfmt=gif
  imagemap=on
  imagename="MyBoxplot"
  border=off;
```

When viewing HTML output, data tips appear when you move a mouse over certain features of the graph. Data tips and URL drill down functionality are available only for the HTML destination. You can also specify the maximum number of distinct mouse over areas allowed before data tips are disabled by using the TOOLTIPMAX= option. There are many other ODS GRAPHICS options that you can use to control other aspects of your graphics. For more information, see “ODS GRAPHICS Statement” in SAS Output Delivery System: User's Guide.

Resetting ODS GRAPHICS Options

You can specify the RESET option to change the values for these options back to their defaults. In Example Code 14.1 on page 651, the second ODS GRAPHICS statement uses the RESET=ALL option to set all options back to their defaults for a new graph:

```
ods graphics on / reset=all;
```

You can also reset ODS GRAPHICS options individually.

Accessing Graphs as Separate Files

ODS enables you to change the ODS destination where you are sending your output to result in different output formats such as RTF or PDF. There might also be times when you want to access your graphs as individual image files.

The default image file type is determined by the ODS destination. You can use the OUTPUTFMT= option to specify a different image file format. The type of image allowed is dependent on the destination that you have specified.

You can also specify names for your graphics image files and the directory in which you want to save them. The IMAGENAME= option specifies the base image filename and the GPATH= option specifies a directory for your images.

In the ODS GRAPHICS statement below, taken from Example Code 14.1 on page 651, the OUTPUTFMT= option specifies that the file type is a GIF, and the IMAGENAME= option specifies that the name of the image is “MyBoxplot”:

```
ods graphics on /
  width=3.25in
  outputfmt=gif
  imagemap=on
```
The resulting filename for the image created is `MyBoxplot.GIF`. If there is more than one image, they are named `MyBoxplot1.GIF`, `MyBoxplot2.GIF`, and so on.

The following ODS GRAPHICS statement specifies the `RESET=ALL` option, which changes the image filename and format to the defaults:

```plaintext
ods graphics on / reset=all;
```

You can use the `GPATH=` option to specify a directory for saving your graphics image files. For example, in Example Code 14.1 on page 651 the `GPATH=` option on both of the ODS HTML statements specifies that all images be saved in the directory `C:\myfiles\images`.

**See Also**

- “Supported File Types for Output Destinations” in Chapter 6 of *SAS Output Delivery System: User's Guide*
- “Description of Supported File Types” in Chapter 6 of *SAS Output Delivery System: User's Guide*

**See Also**

Part 6

Appendix

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Appendix 1

Units of Measurement

Some options such as the LINEATTRS= option enable you specify the unit of measurement as part of the value.

The following table contains the units that are available:

*Table A1.1  Measurement Units*

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM</td>
<td>centimeters</td>
</tr>
<tr>
<td>IN</td>
<td>inches</td>
</tr>
<tr>
<td>MM</td>
<td>millimeters</td>
</tr>
<tr>
<td>PCT or %</td>
<td>percentage</td>
</tr>
<tr>
<td>PT</td>
<td>point size, calculated at 100 dots per inch</td>
</tr>
<tr>
<td>PX</td>
<td>pixels</td>
</tr>
</tbody>
</table>
Appendix 2
Marker Symbols

The MARKERATTRS= option in some of the plot statements enables you to specify the marker symbol that is used to represent your data.

The following list shows the marker symbols that you can use:

*Figure A2.1  List of Marker Symbols*
Appendix 3
Line Patterns

The LINEATTRS= option in some plot statements enables you to specify the line pattern that is used for the lines in your plot.

The following list shows the line patterns that you can use:

Figure A3.1 List of Line Patterns

<table>
<thead>
<tr>
<th>Line Pattern</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>1</td>
</tr>
<tr>
<td>ShortDash</td>
<td>2</td>
</tr>
<tr>
<td>MediumDash</td>
<td>4</td>
</tr>
<tr>
<td>LongDash</td>
<td>5</td>
</tr>
<tr>
<td>MediumDashShortDash</td>
<td>8</td>
</tr>
<tr>
<td>DashDashDot</td>
<td>14</td>
</tr>
<tr>
<td>DashDotDot</td>
<td>15</td>
</tr>
<tr>
<td>Dash</td>
<td>20</td>
</tr>
<tr>
<td>LongDashShortDash</td>
<td>26</td>
</tr>
<tr>
<td>Dot</td>
<td>34</td>
</tr>
<tr>
<td>ThinDot</td>
<td>35</td>
</tr>
<tr>
<td>ShortDashDot</td>
<td>41</td>
</tr>
<tr>
<td>MediumDashDotDot</td>
<td>42</td>
</tr>
</tbody>
</table>
Appendix 4

ODS Graphics Software

SAS ODS Graphics is an extension of the SAS Output Delivery System (ODS). ODS manages all output created by procedures and enables you to display the output in a variety of forms, such as HTML, PDF, and others.

For graphical output, ODS Graphics use the Graph Template Language (GTL) syntax, which provides the power and flexibility to create many complex graphs. The GTL is a comprehensive language for defining statistical graphics.

The ODS Graphics system contains the following software:

SAS ODS Graphics procedures
provide a concise syntax for creating effective statistical graphs. The procedures provide a traditional SAS procedure interface for the most commonly used features of the SAS Graph Template Language.

ODS GRAPHICS statement
adds graphics capabilities to many SAS analytical and Base procedures. The statement enables or disables ODS graphics processing and sets graphics environment options. By default, the ODS GRAPHICS statement is set to ON for SAS procedures that support ODS Graphics when the procedures are executed in the SAS windowing environment on Windows and UNIX operating systems. In batch mode, the ODS GRAPHICS statement is set to OFF by default.

You can use the ODS GRAPHICS statement options to control many aspects of your graphics. For example, you can use options to specify the size and format of your output images. The settings that you specify remain in effect for all graphics until you change or reset these settings with another ODS GRAPHICS statement.

SAS Graph Template Language (GTL)
provides a comprehensive language for creating statistical graphics. You can use the Graph Template Language to create customized layouts and graphs that are beyond the scope of the ODS Graphics procedures.

SAS ODS Graphics Editor
enables you to edit and enhance graphs that are produced by the ODS Graphics procedures or by the Graph Template Language.

The ODS graphics editor is an interactive editor that enables you to modify the elements of a graph or to add new features, such as titles, arrows, and text boxes.

SAS ODS Graphics Designer
enables you to create and design custom graphs. The ODS Graphics Designer provides a graphical user interface for designing graphs easily without having to know the details of the Graph Template Language.
See Also

- *SAS Graph Template Language: User's Guide*
- *SAS Graph Template Language: Reference*
Appendix 5
Comparisons with the SAS/GRAPH Procedures

SAS/GRAPH Output versus ODS Graphics

SAS produces graphics using two very distinct systems. SAS/GRAPH produces graphics using a device-based system. Base SAS produces graphics through the Output Delivery System (ODS) using a template-based system.

device-based graphics (SAS/GRAPH output)
output that is produced by SAS/GRAPH, which uses devices to generate output. Devices determine the type of output. Examples of device drivers are GIF, PNG, JPEG, ACTIVEX, SVG, and SASPRTC. Device drivers supplied by SAS are stored in the SASHELP.DEVICES catalog. Most procedures that produce device-based graphics also produce GRSEG catalog entries in addition to any image files, vector files, or displayed output that are produced. SAS/GRAPH procedures that produce device-based graphics and GRSEG catalog entries include the GCHART, GPLOT, GMAP, GBARLINE, GCONTOUR, and G3D procedures. The device-based procedures that do not produce GRSEG catalog entries are the GAREABAR, GKPI, and GTILE procedures. For device-based graphics, you can use the GOPTIONS statement to control the graphical environment. For example, you can specify which device is used to generate SAS/GRAPH output by specifying the DEVICE= option in the GOPTIONS statement. Information about device-based graphics is in this document, SAS/GRAPH: Reference.

template-based graphics (ODS Graphics)
output that is produced from a compiled ODS template of type STATGRAPH. Templates supplied by SAS are stored in SASHELP.TMPLMST. Device drivers and most SAS/GRAPH global statements (such as AXIS, LEGEND, PATTERN, and SYMBOL) have no effect on template-based graphics. The Base SAS procedures that produce template-based graphics are the SGPLOT, SGPANEL, SGSCATTER, SGDESIGN, and SGRENDER procedures. Many SAS/STAT, SAS/ETS, and SAS/QC procedures also produce template-based graphics automatically by default. Template-based graphics are always produced as image files and never as GRSEG catalog entries. For template-based graphics, you must use the ODS GRAPHICS statement to control the graphical environment. For example, you can specify the type of image file (GIF, PNG, JPEG, SVG, and so on) that is produced by specifying the OUTPUTFMT= option in the ODS GRAPHICS statement. Template-based

---

**Differences between the ODS Graphics Procedures and SAS/GRAPH Procedures**

SAS produces graphics using two very distinct systems. SAS/GRAPH produces graphics using a device-based system. The Graph Template Language and ODS Graphics produce graphics through the Output Delivery System (ODS) using a template-based system.

Though the ODS Graphics procedures do not require SAS/GRAPH, you might have SAS/GRAPH installed. For more information about SAS/GRAPH, see *SAS/GRAPH: Reference*.

The following table lists some of the differences between the ODS Graphics procedures and SAS/GRAPH:

<table>
<thead>
<tr>
<th>ODS Graphics Procedures</th>
<th>SAS/GRAPH Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creates image files. GRSEGs and device drivers are not used.</td>
<td>Most SAS/GRAPH procedures produce a GRSEG entry in a SAS catalog. Other output formats, such as an image or metagraphics file, can be created by selecting an appropriate device driver.</td>
</tr>
<tr>
<td>You can select your image format by using the OUTPUTFMT= option in the ODS GRAPHICS statement.</td>
<td></td>
</tr>
<tr>
<td>User control over visual properties is set with statements or options within the procedure.</td>
<td>Properties for text, markers, and lines can be set with global statements such as GOPTIONS, AXIS, LEGEND, PATTERN, SYMBOL, and NOTE.</td>
</tr>
<tr>
<td>The plot type is determined by the plot statement only.</td>
<td>For some graphs, the plot type is determined by global options. For example, the INTERPOL= option in the SYMBOL statement might determine whether a graph is a scatter plot or a box plot.</td>
</tr>
<tr>
<td>The size, format, and name of output images can be controlled with the HEIGHT=, WIDTH=, OUTPUTFMT=, and IMAGENAME= options in the ODS GRAPHICS statement. The ODS GRAPHICS statement is similar in purpose to the GOPTIONS statement, but it is used with the ODS Graphics procedures only.</td>
<td>The size and format of graphical output is controlled with options such as the HSIZE=, VSIZE=, and DEVICE= options in the GOPTIONS statement.</td>
</tr>
<tr>
<td>ODS Graphics Procedures</td>
<td>SAS/GRAPH Procedures</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>All of the ODS destinations are supported. For the LISTING destination, an image node is created for the graph in the Results tree.</td>
<td>All of the ODS destinations are supported. For the LISTING destination, a GRSEG node is created in the Results tree and the image appears in the graph window.</td>
</tr>
<tr>
<td>Some options for the TITLE and FOOTNOTE statements are not supported. See “TITLE and FOOTNOTE Statements” on page 58.</td>
<td>All options for the TITLE and FOOTNOTE statements are supported.</td>
</tr>
<tr>
<td>Only system fonts are supported.</td>
<td>SAS/GRAPH supports SAS/GRAPH fonts (such as SWISSB), device-resident fonts, and system fonts (such as Arial).</td>
</tr>
<tr>
<td>Marker symbols can be selected only from a predefined set of named marker symbols. The named marker symbols are different from the named marker symbols in SAS/GRAPH.</td>
<td>Marker symbols can be either created from fonts or selected from a predefined set of named marker symbols.</td>
</tr>
<tr>
<td>Area fills can use solid colors only. Transparent fills are supported.</td>
<td>Area fills can use either solid colors or patterns such as crosshatching.</td>
</tr>
<tr>
<td>Scaling of fonts and markers is on by default. This means that the sizes of fonts and markers are adjusted as appropriate to the size of your graph. You can disable scaling by using the NOSCALE option in the ODS GRAPHICS statement.</td>
<td>Scaling of fonts and markers is not supported.</td>
</tr>
<tr>
<td>RUN-group processing is not supported.</td>
<td>Some procedures support RUN-group processing.</td>
</tr>
<tr>
<td>An SG Annotation facility is supported. The ODS Graphics procedures do not support the SAS/GRAPH Annotate facility. You can also use the ODS Graphics Editor to annotate your graphs.</td>
<td>The SAS/GRAPH Annotate facility is supported.</td>
</tr>
</tbody>
</table>
axis
a line that represents the midpoints (for a discrete axis) or the scale (for a continuous or interval axis) for graphing variable or data values. An axis typically consists of an axis line with tick marks, tick values (or midpoint values), and a label.

cell
in ODS graphics, a distinct rectangular subregion of a graph that can contain plots, text, or legends. For example, a graph created with the SGPLOT procedure contains only one cell, whereas a graph created with the SGPANEL procedure contains more than one cell.

classification panel
a multi-cell graph in which the cell data is driven by the values of one or more classification variables. The number of the cells is determined by the unique values of the classification variables. Each cell of the panel has the same types of plots.

classification variable
a variable whose values are used to group (or classify) the observations in a data set into different groups that are meaningful for analysis.

dynamic variable
a variable defined in a template with the DYNAMIC statement that can be initialized at template run time.

global statement
a SAS statement that you can specify anywhere in a SAS program.

Graph Template Language
an extension to the Output Delivery System (ODS) that enables users to create sophisticated analytical graphs. Short form: GTL.

GTL
See Graph Template Language.

ODS
See Output Delivery System.

ODS Graphics
an extension to ODS that is used to create analytical graphs using the Graph Template Language.
Output Delivery System  
a component of SAS software that can produce output in a variety of formats such as markup languages (HTML, XML), PDF, listing, RTF, PostScript, other formats, and SAS data sets. Short form: ODS.

panel  
a graph with multiple cells.

plot  
a visual representation of data such as a scatter plot, a series line, or a histogram. Multiple plots can be overlaid in a cell to create a graph.

SGD file  
an ODS Graphics Designer file. Users can open this file in the designer and change the graph. Users can also render the graph to an ODS destination by using the SGDESIGN procedure.

style attribute  
a visual property such as a color, line pattern, or font property that has a reserved name. For example, COLOR, FONTFAMILY, FONTSIZE, FONTWEIGHT, and FONTSTYLE are all attributes of style elements such as GraphTitleText, GraphLabelText, and so on. Style attributes are collectively referenced by a style element within a style definition.

style element  
a named collection of style attributes that affects specific parts of ODS output. For example, a style element might specify the color and font properties of title text or other text in a table or graph.

system font  
a font that can be used by any SAS procedure and by other software such as Microsoft Word. These fonts include TrueType and Type1 fonts. Examples of system fonts include Albany AMT, Monotype Sorts, and Arial.
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