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# **SAS/GRAPH<sup>®</sup> 9.2** **Statistical Graphics** **Procedures Guide**

**Second Edition**



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# What's New

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## Overview

In the third maintenance release for SAS 9.2, SAS/GRAPH Statistical Graphics Procedures include a production release of the SGDESIGN procedure.

In addition, the procedures have the following changes and enhancements for SAS 9.2 Phase 2:

- A new VECTOR plot type is available for the SGPLOT and SGPANEL procedures.
- A new JOIN plot type is available for the COMPARE and PLOT statements for the SGSCATTER procedure.
- New panel layout types are available for the SGPANEL procedure.
- New options are available for the PANELBY statement of the SGPANEL procedure.
- The COMPARE, PLOT, and MATRIX statements for the SGSCATTER procedure now support transparency.

---

## Production Release of the SGDESIGN Procedure

The production release of the SGDESIGN procedure is available with the third maintenance release for SAS 9.2. The SGDESIGN procedure renders graphs (SGD files) that have been created by using the SAS/GRAPH ODS Graphics Designer application.

The preproduction version of ODS Graphics Designer stored graphs as two separate files: one for the actual graph (SGD), and a second file (SGN) for the graph's icon. For convenience, in the production version both files are packaged in an archive file with the SGD extension. To render an SGD file that was created with the preproduction version of ODS Graphics Designer, use the OLDSGD option.

---

## New VECTOR Plot Type for the SGPLOT and SGPANEL Procedures

A new VECTOR statement for the SGPLOT and SGPANEL procedures enables you to create vector plots. Vector plots create arrows between two points.

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## New JOIN Plot Type for the SGSCATTER Procedure

A new JOIN option for the COMPARE and PLOT statements of the SGSCATTER procedure enables you to create a join plot.

---

## New Panel Layout Types

The SGPANEL procedure supports two new layout types. The LAYOUT= option in the PANELBY statement enables you to specify the COLUMNLATTICE and ROWLATTICE layout types.

---

## New Options for the SGPANEL PANELBY Statement

The PANELBY statement for the SGPANEL procedure has the following new options:

- BORDER | NOBORDER specifies whether borders are displayed around each cell.
- COLHEADERPOS= specifies the location of the column headings.
- ONEPANEL disables automatic paging for panels.
- ROWHEADERPOS= specifies the location of the row headings.
- START= specifies the order in which data crossings are assigned to the panel.

---

## New Axis Options for the SGPANEL and SGPLOT Procedures

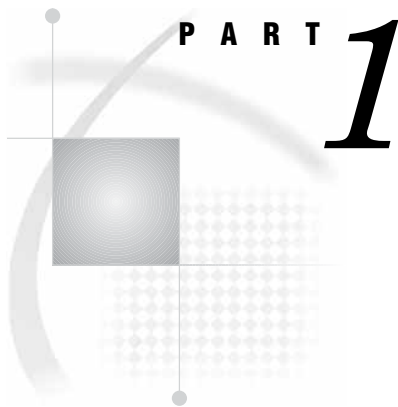
The axis control statements for the SGPANEL and SGPLOT procedures contain the following new options:

- INTERVAL= specifies the tick interval for time axes.
- OFFSETMAX= specifies the spacing between the last tick value on the axis and the edge of the plot area.
- OFFSETMIN= specifies the spacing between the first tick value on the axis and the edge of the plot area.
- TICKVALUEFORMAT= specifies the data format for the axis tick values.

---

## Transparency for Output from the SGSCATTER Procedure

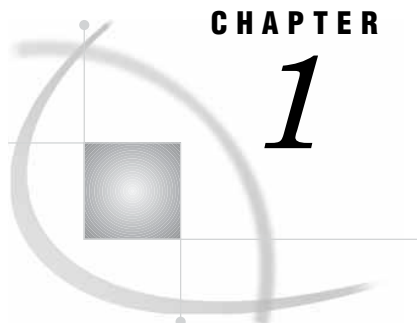
The COMPARE, MATRIX, and PLOT statements for SGSCATTER now support the TRANSPARENCY= option. You can use the TRANSPARENCY option to specify the amount of transparency for your plot elements.



## Introduction

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## CHAPTER

## 1

# Introduction to SAS/GRAPH Statistical Graphics Procedures

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## Overview of SAS/GRAPH Statistical Graphics Procedures

SAS/GRAPH statistical graphics procedures (SG procedures) enable you to easily create complex statistical graphics that use the principles of effective graphics\* to accurately communicate the results of your analysis to your consumers. The SG procedures require minimal coding, which enables you to focus on your statistical analysis instead of the visual appearance of your graphs.

Default appearance attributes such as colors, fonts, and line styles are set by the current ODS style. SAS provides a set of styles that have been optimized to produce clear and effective graphics. Attributes have been chosen to ensure that graph elements have sufficient visibility and contrast, even when color is not used. Graphs elements are visually balanced so that no one element unintentionally appears to be more important than any other. Graphs produced by the SG procedures are clean and uncluttered, which enables you to make easy comparisons and interpret information accurately.

The SG procedures use the Graph Template Language (GTL) to create the most commonly used graphs. The GTL is a comprehensive language for defining statistical graphics. For more information about the GTL, see *SAS/GRAPH: Graph Template Language User's Guide*.

There are five SAS/GRAPH statistical graphics procedures, each with a specific purpose. Each procedure supports BY processing and the paging of large paneled graphs where applicable.

- The SGPLOT procedure is designed to create a single-celled graph, with multiple plots overlaid within a single set of axes. The procedure syntax supports many different types of plots and graph features.

---

\* For more information about the principles of effective graphics, see Cleveland (1993) and Robbins (2005).

- The SGPANEL procedure 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.
- The SGSCATTER procedure creates paneled graphs with multiple scatter plots. You can create three different types of layouts.
- The SGRENDER procedure is a utility procedure that produces graphs from templates that are written in the Graph Template Language.
- The SGDESIGN procedure creates graphical output based on a graph file that has been created by using the SAS/GRAPH ODS Graphics Designer application.

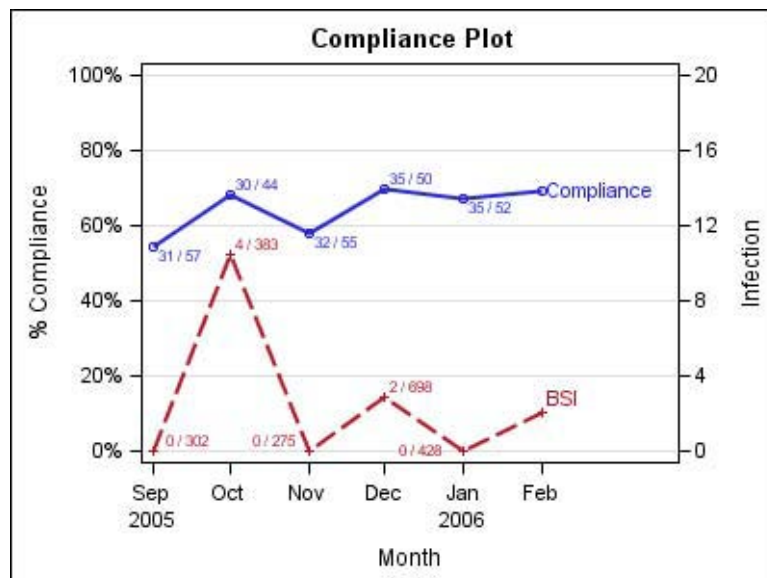
## Introduction to the SGPLOT Procedure

The SGPLOT procedure is optimized to display overlaid plots on a single set of axes. The procedure syntax supports the following features:

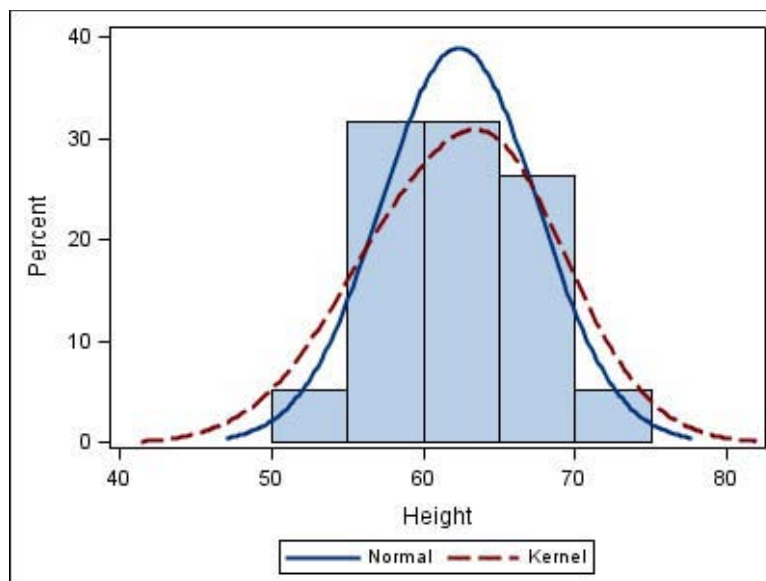
- Basic plots: scatter plots, series plots, band plots, needle plots, and vector plots.
- Fit and confidence plots: loess curves, regression curves, penalized B-spline curves, and ellipses.
- Distribution plots: histograms, box plots, and density curves.
- Categorization plots: bar charts, dot plots, and bar-line charts.
- Insets, legends, and reference lines.

All of the plot statements that are used in the SGPLOT procedure share a single set of axes. You can customize these axes by using axis statements such as XAXIS and YAXIS.

The following images show examples of types of graphs that you can create with the SGPLOT procedure:



This is an example of two series plots that are overlaid in a single graph. Each plot is assigned to a different vertical axis. Data labels and curve labels have been added for direct reference.



This is an example of a graph that uses a histogram, a kernel density curve, and a normal density curve.

For more information about the SGPLOT procedure and the procedure syntax, see Chapter 4, “The SGPLOT Procedure,” on page 123.

---

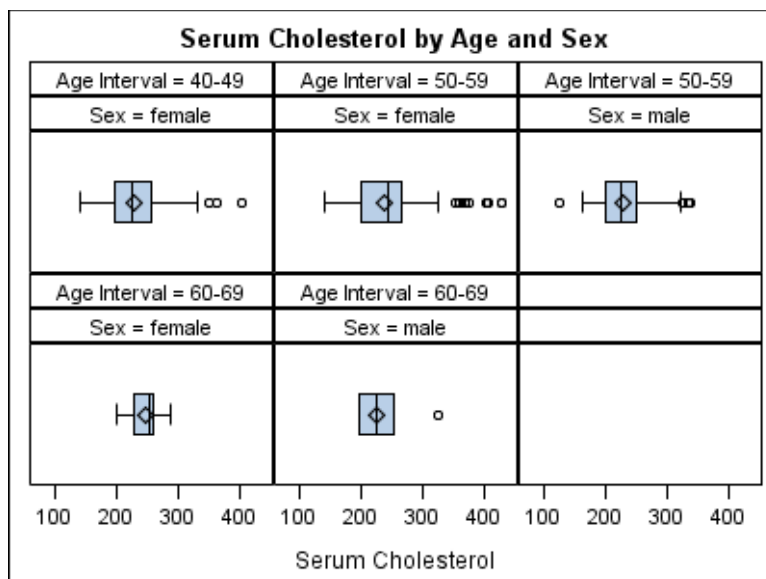
## Introduction to the SGPANEL Procedure

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 procedure syntax supports the following features:

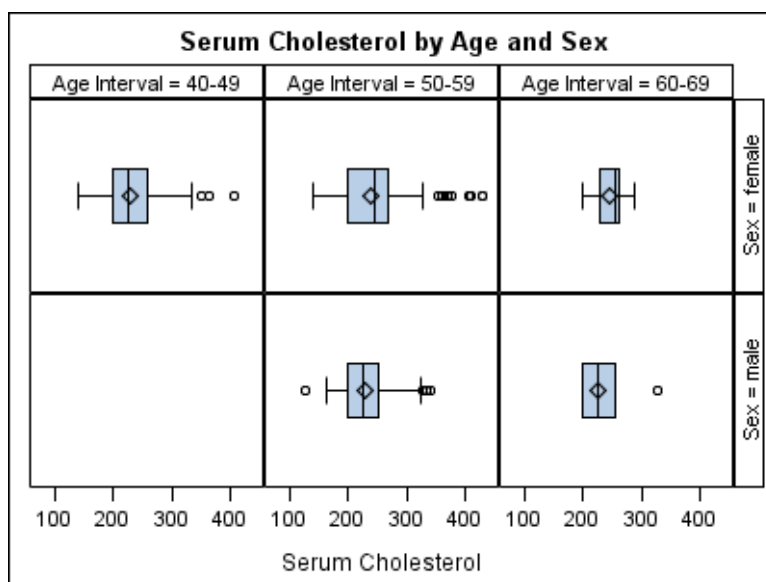
- four types of panel layouts: PANEL, LATTICE, COLUMNLATTICE, and ROWLATTICE
- basic plots: scatter plots, series plots, band plots, needle plots, and vector plots
- fit and confidence plots: loess curves, regression curves, and penalized B-spline curves
- distribution plots: histograms, box plots, and density curves
- categorization plots: bar charts, dot plots, and bar-line charts
- legends and reference lines

The SGPANEL procedure can create several layouts, depending on the value of the LAYOUT= option. You can specify the PANEL layout, the LATTICE layout, the COLUMNLATTICE layout, or the ROWLATTICE layout.

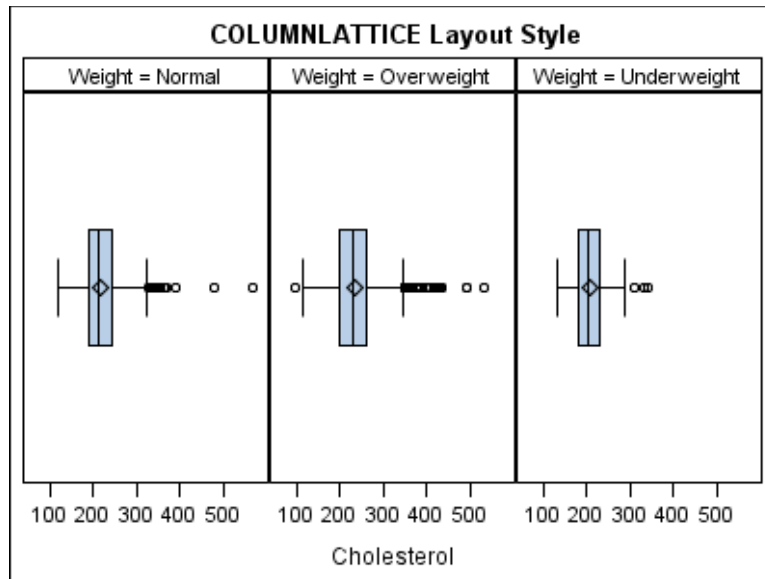
The following examples show some types of layouts that you can create with the SGPANEL procedure.



This is an example of 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.



This is an example of the LATTICE layout. In the 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.



This is an example of the COLUMNLATTICE layout. In the COLUMNLATTICE and ROWLATTICE layouts, the graph cells are arranged in a single row or column by using a single classification variable. A cell is created for each value of the classification variable.

For more information about the SG PANEL procedure and the procedure syntax, see Chapter 3, “The SG PANEL Procedure,” on page 29.

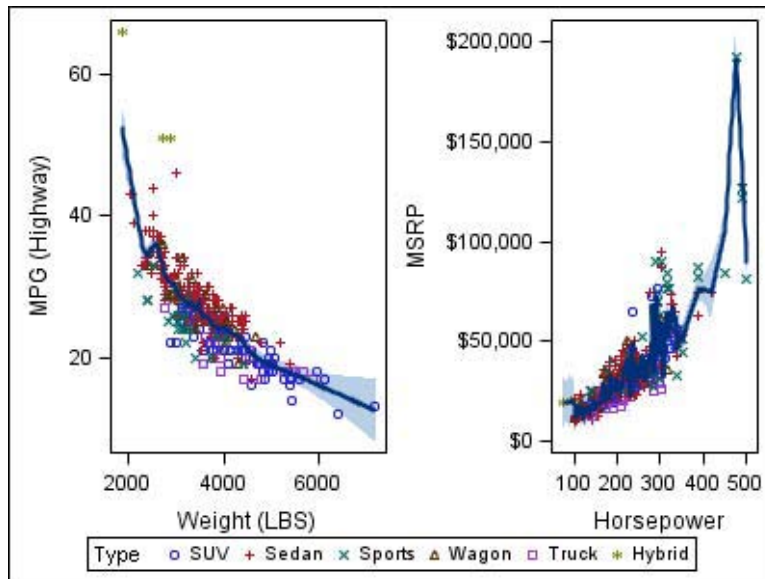
---

## Introduction to the SGSCATTER Procedure

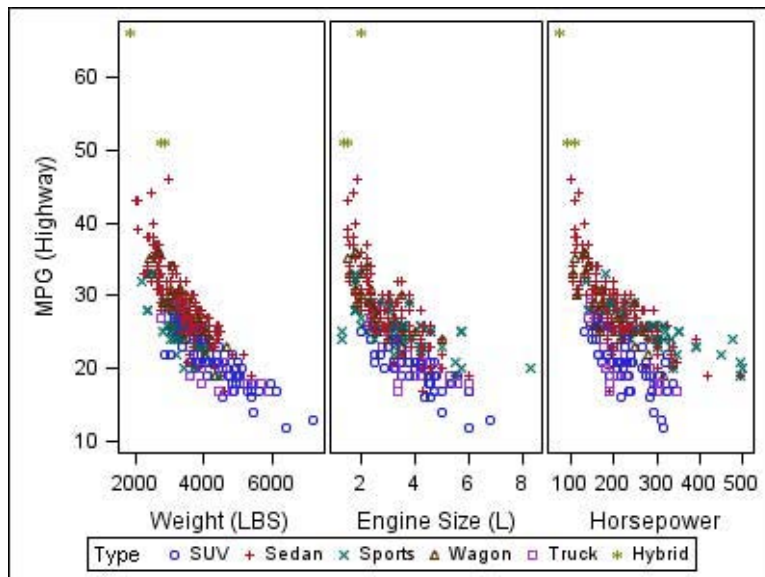
The SGSCATTER procedure creates a paneled graph for multiple combinations of variables. The procedure syntax supports the following features:

- ☐ 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, box plots, and density curves
- ☐ legends

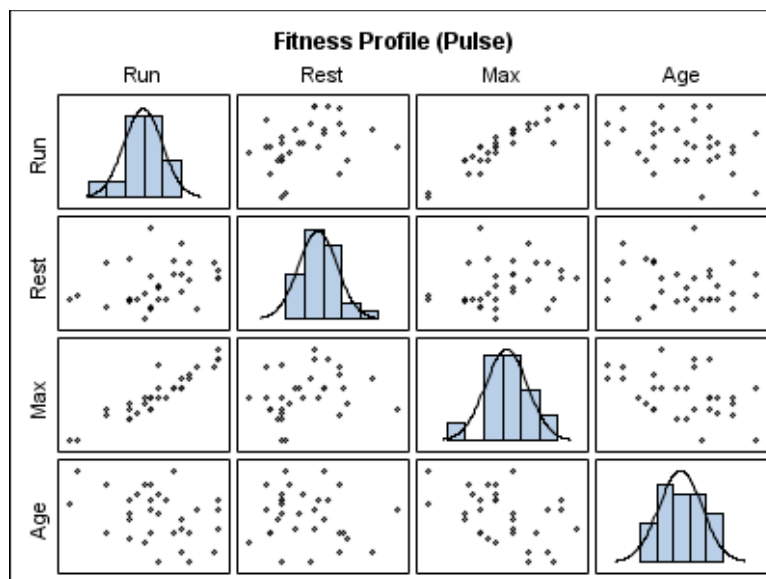
The SGSCATTER procedure has three plot statements that create different types of layouts, as shown in the following examples:



The PLOT statement creates a paneled graph with multiple independent cells. A cell is created for each combination of X and Y variables that you specify.



The COMPARE statement creates a paneled graph that uses common axes for each row and column of cells.



The MATRIX statement creates a matrix of scatter plots, in which each cell represents a different combination of variables. In the diagonal cells, you can place labels, histograms, or density curves.

For more information about the SGSCATTER procedure and the procedure syntax, see Chapter 5, "The SGSCATTER Procedure," on page 225.

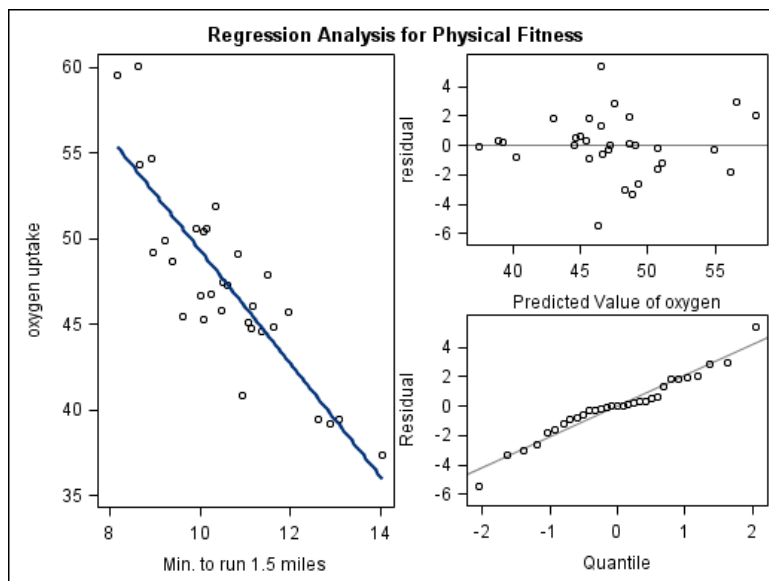
---

## Introduction to the SGRENDER Procedure

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 other SG procedures.

For more information about the SGRENDER procedure, see Chapter 6, "The SGRENDER Procedure," on page 255. For more information about the GTL, see *SAS/GRAPH: Graph Template Language User's Guide*.

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




---

## Introduction to the SGDESIGN Procedure

The SGDESIGN procedure creates graphical output based on a graph file (SGD) that has been created by using the SAS/GRAPH 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 defined in the SGD file.
- The procedure can generate any graph type that can be created in 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.
- 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. The SGDESIGN procedure also supports the ODS GRAPHICS statement, which can be applied anytime.

For more information about the SGDESIGN procedure and the procedure syntax, see Chapter 7, "The SGDESIGN Procedure," on page 263.

---

## The ODS Graphics System

SAS/GRAPH statistical graphics procedures (SG procedures) are a part of the ODS Graphics System—a set of SAS/GRAPH features that enable you to create and edit statistical graphics.

The ODS Graphics System contains the following features:

*SAS/GRAPH statistical graphics procedures*

provide a concise syntax for creating effective statistical graphs. The SG procedures provide a traditional SAS procedure interface for the most commonly used features of the Graph Template Language.

*SAS/GRAPH 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 SG procedures.

For more information about the Graph Template Language, see the *SAS/GRAPH: Graph Template Language Reference* and the *SAS/GRAPH: Graph Template Language User's Guide*.

*SAS/GRAPH ODS Graphics Editor*

enables you to edit and enhance graphs that are produced by the SG 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.

For more information about the ODS Graphics Editor, see the *SAS/GRAPH: ODS Graphics Editor User's Guide*.

*SAS/GRAPH 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.

For more information about the ODS Graphics Designer, see the *SAS/GRAPH: ODS Graphic Designer User's Guide*.

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## Statistical Graphics Procedures and the Output Delivery System (ODS)

Output from the SAS/GRAPH statistical graphics procedures (SG procedures) is generated by the Output Delivery System (ODS). An ODS destination must be open to create output from the SG procedures.

The SG procedures automatically obtain their default appearance options from the current ODS style. The ODS styles are optimized to produce effective graphics without any changes to the defaults. However, you can use appearance options in your plot statements to override the default style settings, such as colors and fonts.

The ODS GRAPHICS statement enables you to set the output options for your statistical graphics. For example, you can use options in the ODS GRAPHICS statement to specify the size and format of your output images. For more information about the ODS GRAPHICS statement, see “Using the ODS GRAPHICS Statement” on page 296.

---

## Differences between Statistical Graphics Procedures and Traditional SAS/GRAPH Procedures

In SAS 9.2, the default appearance of all graphs is determined by the ODS style that is currently in use. In general, this provides an effective default graph with minimal coding. When SAS/GRAPH coding is added to modify fonts, colors, line properties, or marker properties, it overrides the defaults that are defined by the style. This is true for both traditional SAS/GRAPH procedures and the statistical graphics procedures.

The following table lists some of the differences between traditional SAS/GRAPH and statistical graphics procedures:

Traditional SAS/GRAPH	Statistical Graphics Procedures
Properties for text, markers, and lines can be set with global statements such as GOPTIONS, AXIS, LEGEND, PATTERN, SYMBOL, and NOTE.	User control over visual properties is set with statements or options within the procedure.
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.	The plot type is determined by the plot statement only.
The default graph output is produced as 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.	Only image files are created—GRSEGs and device drivers are not used. You can select your image format by using the IMAGEFMT= option in the ODS GRAPHICS statement.
The size and format of graphical output is controlled with options such as the HSIZE=, VSIZE=, and DEVICE= options in the GOPTIONS statement.	The size, format, and name of output images can be controlled with the HEIGHT=, WIDTH=, IMAGEFMT=, 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 Statistical Graphics procedures only.
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.	All of the ODS destinations are supported. For the LISTING destination, an image node is created for the graph in the Results tree. You can open the graph in an external viewer or in the ODS Graphics Editor.
All options for the TITLE and FOOTNOTE statements are supported.	Some options for the TITLE and FOOTNOTE statements are not supported. See “TITLE and FOOTNOTE Statements” on page 21.
Both SAS/GRAPH fonts (such as SWISSB) and system fonts (such as Arial) are supported.	Only system fonts are supported.
Marker symbols can be either created from fonts or selected from a predefined set of named marker symbols.	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 traditional SAS/GRAPH.
Area fills can use either solid colors or patterns such as crosshatching.	Area fills can use solid colors only. Transparent fills are supported.
Anti-aliasing is not supported.	Anti-aliasing is used for text and lines by default. You can disable anti-aliasing by using the NOANTIALIAS option in the ODS GRAPHICS statement.
Transparency is not supported.	You can specify the degree of transparency for many graphics elements.

Traditional SAS/GRAPH	Statistical Graphics Procedures
Scaling of fonts and markers is not supported.	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.
Some procedures support RUN-group processing.	RUN-group processing is not supported.
The Annotate facility is supported.	The Annotate facility is not supported. However, you can use the ODS Graphics Editor to annotate your graphs.

---

## 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 ► SAS/GRAPH ► 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.

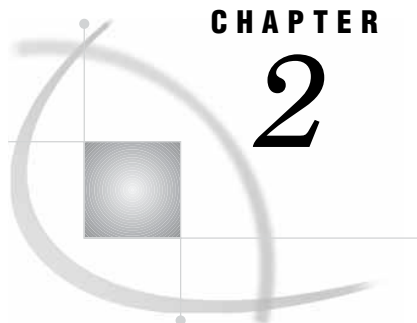
For more information about the samples, see “Information You Should Know” in the *SAS/GRAPH: Reference*.

---

## References

- Cleveland, W. S. (1993), *Visualizing Data*, Summitt, NJ: Hobart Press.
- Robbins, N. B. (2005), *Creating More Effective Graphs*, Hoboken, NJ: Wiley InterScience.





## CHAPTER

## 2

## SAS/GRAPH Statements That Are Used with Statistical Graphics Procedures

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*BY Statement* 16

*FORMAT Statement* 17

*LABEL Statement* 20

*ODS GRAPHICS Statement* 20

*TITLE and FOOTNOTE Statements* 21

### Overview of SAS/GRAPH Statements That Are Used with Statistical Graphics Procedures

SAS/GRAPH Statistical 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.

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.

*Note:* Some of the statements that can be used with traditional SAS/GRAPH procedures are not used with statistical graphics procedures. △

## BY Statement

**Creates a separate graph for each BY group.**

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

### Syntax

**BY** <DESCENDING> *variable-1* <... <DESCENDING> *variable-n*><NOTSORTED>;

### Required Arguments

#### *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.

### Options

#### **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 it encounters as the first observation in a new BY group and 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, either sort it with the SORT procedure using the same BY statement that you plan to use in the target SAS/GRAPH procedure or create an appropriate index on the BY variables. For more information about indexes, see “Understanding SAS Indexes” in the SAS Data Files chapter of the *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 21.

---

# FORMAT Statement

**Associates SAS formats or user-defined formats with variables.**

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

---

## Details

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

The following SAS formats are supported by the SG procedures:

**Table 2.1** Character Formats Supported By Java

\$	\$ASCII	\$BINARY	\$CHAR
\$F	\$HEX	\$OCTAL	

**Table 2.2** Numeric Formats Supported By Java

BEST	BINARY	COMMA	COMMAX	COMMAX
D	DOLLAR	DOLLARX	E	EURO
EUROX	F	HEX	LOGPROB	NEGPAREN
NLBEST	NLD	NLMNIAED	NLMNIAUD	NLMNIBGN
NLMNIBRL	NLMNICAD	NLMNICHF	NLMNICNY	NLMNICZK
NLMNIDKK	NLMNIEEK	NLMNIEGP	NLMNIEUR	NLMNIGBP
NLMNIHKD	NLMNIHRK	NLMNIHUF	NLMNIIDR	NLMNIILS
NLMNIINR	NLMNIJPY	NLMNIKRW	NLMNILTL	NLMNILVL
NLMNIMOP	NLMNIMXN	NLMNIMYR	NLMNINOK	NLMNINZD
NLMNIPLN	NLMNIROL	NLMNIRUB	NLMNIRUR	NLMNISEK
NLMNISGD	NLMNISKK	NLMNITHB	NLMNITRY	NLMNITWD
NLMNIUSD	NLMNIZAR	NLMNLAED	NLMNLAUD	NLMNLBGN
NLMNLBRL	NLMNLCAD	NLMNLCHF	NLMNLCNY	NLMNLCZK
NLMNLDDK	NLMNLEEK	NLMNLEGP	NLMNLEUR	NLMNLGBP
NLMNLHKD	NLMNLHRK	NLMNLHUF	NLMNLIDR	NLMNLILS
NLMNLINR	NLMNLJPY	NLMNLKRW	NLMNLLTL	NLMNLLVL
NLMNLMOP	NLMNLMXN	NLMNLMYR	NLMNLNOK	NLMNLNZD
NLMNLPLN	NLMNLROL	NLMNLRUB	NLMNLRUR	NLMNLSEK
NLMNLSGD	NLMNLSKK	NLMNLTHB	NLMNLTRY	NLMNLTWD
NLMNLUSD	NLMNLZAR	NLMNY	NLMNYI	NLNUM
NLNUMI	NLPCT	NLPCTI	NLPVALUE	NUMX
OCTAL	PERCENT	PERCENTN	PVALUE	ROMAN
RSTDOCNY	RSTDOCYY	RSTDONYN	RSTDOPNY	RSTDOPYN
RSTDOPYY	YEN			

**Table 2.3** Date and Time Formats Supported By Java

AFRDFDD	AFRDFDE	AFRDFDN	AFRDFDT	AFRDFDWN
AFRDFMN	AFRDFMY	AFRDFWDX	AFRDFWKX	CATDFDD
CATDFDE	CATDFDN	CATDFDT	CATDFDWN	CATDFMN
CATDFMY	CATDFWDX	CATDFWKX	CRODFDD	CRODFDE
CRODFDN	CRODFDT	CRODFDWN	CRODFMN	CRODFMY
CRODFWDX	CRODFWKX	CSYDFDD	CSYDFDE	CSYDFDN
CSYDFDT	CSYDFDWN	CSYDFMN	CSYDFMY	CSYDFWDX
CSYDFWKX	DANDFDD	DANDFDE	DANDFDN	DANDFDT
DANDFDWN	DANDFMN	DANDFMY	DANDFWDX	DANDFWKX
DATE	DATEAMPM	DATEIME	DAY	DDMMYY
DDMMYYN	DESDFDD	DESDFDE	DESDFDN	DESDFDT
DESDFDWN	DESDFMN	DESDFMY	DESDFWDX	DESDFWKX
DEUDFDD	DEUDFDE	DEUDFDN	DEUDFDT	DEUDFDWN
DEUDFMN	DEUDFMY	DEUDFWDX	DEUDFWKX	DOWNAME
DTDATE	DTMONYY	DTWKDATX	DTYEAR	DTYYQC
ENGDFDD	ENGDFDE	ENGDFDN	ENGDFDT	ENGDFDWN
ENGDFMN	ENGDFMY	ENGDFWDX	ENGDFWKX	ESPDFDD
ESPDFDE	ESPDFDN	ESPDFDT	ESPDFDWN	ESPDMN
ESPDMY	ESPDFWDX	ESPDFWKX	EURDFDD	EURDFDE
EURDFDN	EURDFDT	EURDFDWN	EURDFMN	EURDFMY
EURDFWDX	EURDFWKX	FINDFDD	FINDFDE	FINDFDN
FINDFDT	FINDFDWN	FINDFMN	FINDFMY	FINDFWDX
FINDFWKX	FRADFDD	FRADFDE	FRADFDN	FRADFDT
FRADFOWN	FRADFMN	FRADFMY	FRADFWDX	FRADFWKX
FRSDFDD	FRSDFDE	FRSDFDN	FRSDFDT	FRSDFDWN
FRSDFMN	FRSDFMY	FRSDFWDX	FRSDFWKX	HHMM
HOURL	HUNDFDD	HUNDFDE	HUNDFDN	HUNDFDT
HUNDFDWN	HUNDFMN	HUNDFMY	HUNDFWDX	HUNDFWKX
ITADFDD	ITADFDE	ITADFDN	ITADFDT	ITADFOWN
ITADFMN	ITADFMY	ITADFWDX	ITADFWKX	JDATEMD
JDATEMON	JDATEQRW	JDATEQTR	JDATESEM	JDATESMW
JULDATE	JULDAY	JULIAN	MACDFDD	MACDFDE
MACDFDN	MACDFDT	MACDFOWN	MACDFMN	MACDFMY
MACDFWDX	MACDFWKX	MMDDYY	MMDDYYN	MMSS
MMYY	MMYYN	MONNAME	MONTH	MONYY
NLDATE	NLDATEMD	NLDATEMN	NLDATEW	NLDATEWN
NLDATEYM	NLDATEYQ	NLDATEYR	NLDATEYW	NLDATM

NLDATMAP	NLDATMDT	NLDATMMD	NLDATMTM	NLDATMW
NLDATMWN	NLDATMYM	NLDATMYQ	NLDATMYR	NLDATMYW
NLDDFDD	NLDDFDE	NLDDFDN	NLDDFDT	NLDDFDWN
NLDDFMN	NLDDFMY	NLDDFWDX	NLDDFWKX	NLSTRMON
NLSTRQTR	NLSTRWK	NLTIMAP	NLTIME	NORDFDD
NORDFDE	NORDFDN	NORDFDT	NORDFDWN	NORDFMN
NORDFMY	NORDFWDX	NORDFWKX	POLDFDD	POLDFDE
POLDFDN	POLDFDT	POLDFDWN	POLDFMN	POLDFMY
POLDFWDX	POLDFWKX	PTGDFDD	PTGDFDE	PTGDFDN
PTGDFDT	PTGDFDWN	PTGDFMN	PTGDFMY	PTGDFWDX
PTGDFWKX	QTR	QTRR	RUSDFDD	RUSDFDE
RUSDFDN	RUSDFDT	RUSDFDWN	RUSDFMN	RUSDFMY
RUSDFWDX	RUSDFWKX	SLODFDD	SLODFDE	SLODFDN
SLOFDT	SLODFDWN	SLODFMN	SLODFMY	SLODFWDX
SLODFWKX	SVEDFDD	SVEDFDE	SVEDFDN	SVEDFDT
SVEDFDWN	SVEDFMN	SVEDFMY	SVEDFWDX	SVEDFWKX
TIME	TIMEAMPM	TOD	WEEKDATE	WEEKDATX
WEEKDAY	WEEKU	WEEKV	WEEKW	WORDDATE
WORDDATX	YEAR	YMM	YMMDD	YMMDDN
YMMN	YMON	YYQ	YYQN	YYQR
YYQRN	YYWEEKU	YYWEEKV	YYWEEKW	

---

## LABEL Statement

**Associates descriptive labels with variables.**

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

---

### Details

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

---

## ODS GRAPHICS Statement

**Specifies the settings for your graphics output.**

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

**Valid:** anywhere in your program

---

For information about using the ODS GRAPHICS statement, see “Using the ODS GRAPHICS Statement” on page 296. For the complete statement syntax, see “ODS GRAPHICS Statement” in the “Dictionary of ODS Language Statements” chapter of *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.

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

**Valid:** anywhere in your program

---

### 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">;

*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

## 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  $\mathbf{x}$  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 ( $\alpha = .05$ )" 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 25.

*Note:* The Listing destination does not honor the `(*ESC*)` statement.  $\triangle$

## Options

### **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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter 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 26 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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter 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:

```
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.

*Note:* SAS/GRAPH software fonts such as SWISS cannot be used with statistical graphics procedures. △

**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.

**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:

You can also specify the unit of measure. See “Measurement Units for TITLE and FOOTNOTE Statement Options” on page 26 for a list of the 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 26 for a list of the units that are supported.

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

**Alias:** LS

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

**Default:** 0

## **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*.

### #BYVAL $n$ | #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.

### #BYVAR $n$ | #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, either a space or other non-alphanumeric character, such as the quotation mark that ends the text string. If not, 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.

If you use a #BYVAR or #BYVAL specification for a variable that is not named in the BY statement (such as #BYVAL2 when there is only one BY-variable or #BYVAL(ABC) when ABC is not a BY-variable or does not exist), or if there is no BY statement at all, then the substitution for #BYVAR or #BYVAL does not occur. No error or warning message is issued, and the option specification is displayed with the rest of the string.

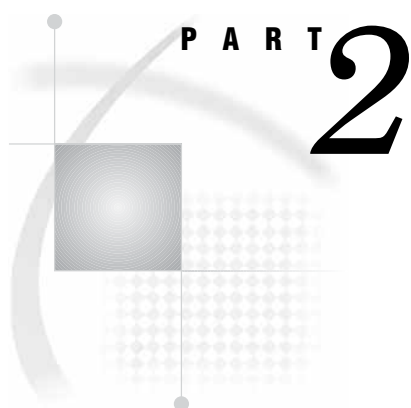
The graph continues to display a BY line at the top of the page unless you suppress it by using the NOBYLINE option in an OPTION statement.

### 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 2.4** Measurement Units

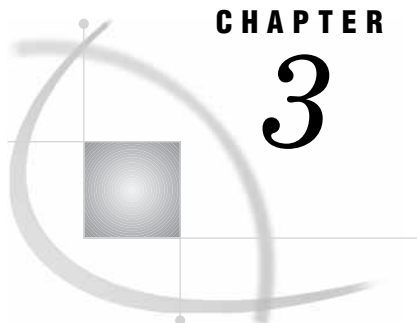
Unit	Description
CM	centimeters
IN	inches
PCT or %	percentage
PT	point size, calculated at 100 dots per inch



## **SAS/GRAPH Statistical Graphics Procedures**

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## CHAPTER

## 3

## The SGPPANEL Procedure

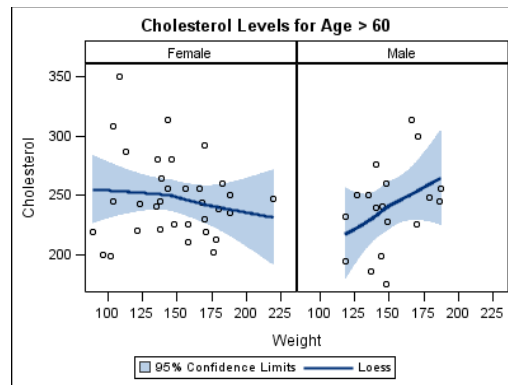
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---

## Overview

The SGPPANEL 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 SGPPANEL to create this panel. The SGPPANEL procedure creates a layout for you automatically and splits the panel into multiple graphs if necessary.

The SGPPANEL 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. Table 3.1 on page 31 contains some examples of panels that the SGPPANEL procedure can create.

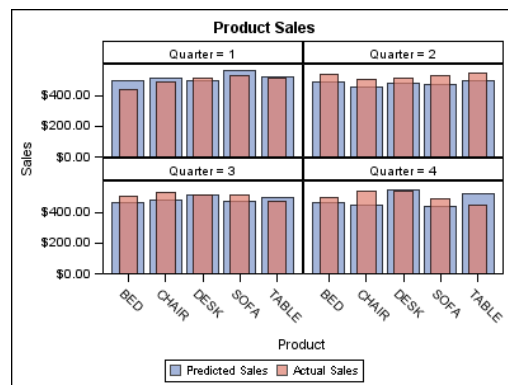
**Table 3.1** Examples of Panels that Can Be Generated by the SG PANEL Procedure

The following code creates a panel of loess curves:

```

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

```

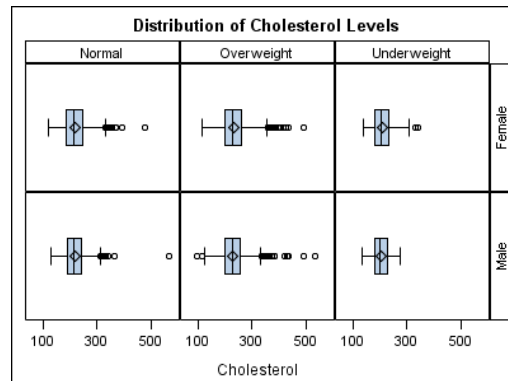


The following code creates a panel of vertical bar charts:

```

title1 "Product Sales";
proc sgpanel data=sashelp.prdsale;
  panelby quarter;
  rowaxis label="Sales";
  vbar product / response=predict stat=mean
                transparency=0.3;
  vbar product / response=actual stat=mean
                barwidth=0.5 transparency=0.3;
run;

```

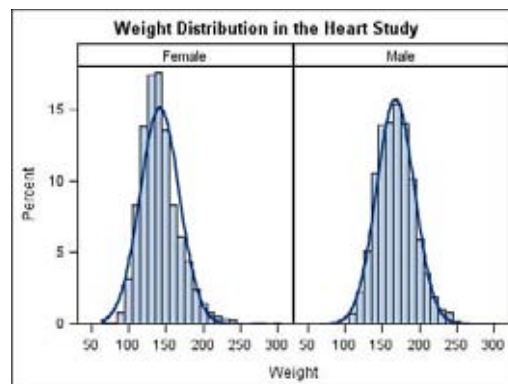


The following code creates a panel of box plots in a lattice layout:

```

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

```



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

```

title1 "Weight Distribution in the Heart Study";
proc sgpanel data=sashelp.heart noautolegend;
  panelby sex / novarname;
  histogram weight;
  density weight;
run;

```

# Concepts

## Panel Creation

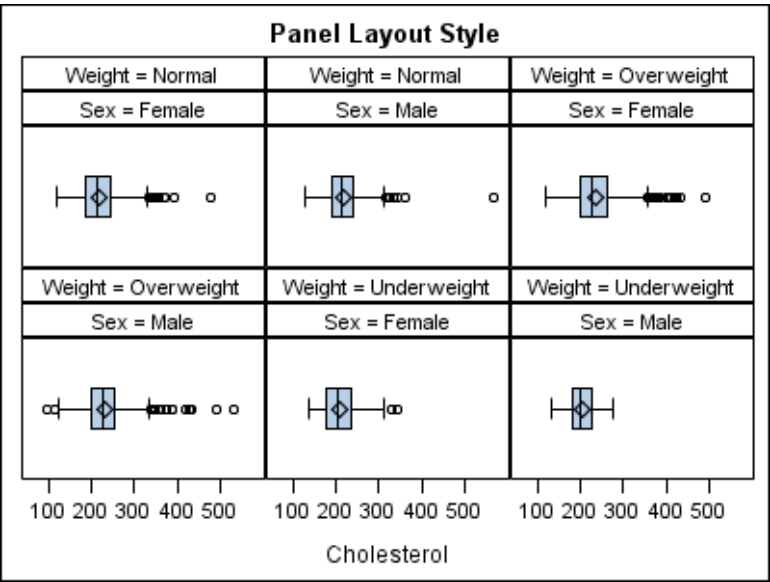
The SGPPANEL procedure has a required PANELBY statement that is used to define the classifier variables for the panel. This statement must be specified before any plot, axis, or legend statement or else an error occurs. You can use options in the PANELBY statement to control the attributes of the panel.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

SGPPANEL 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.

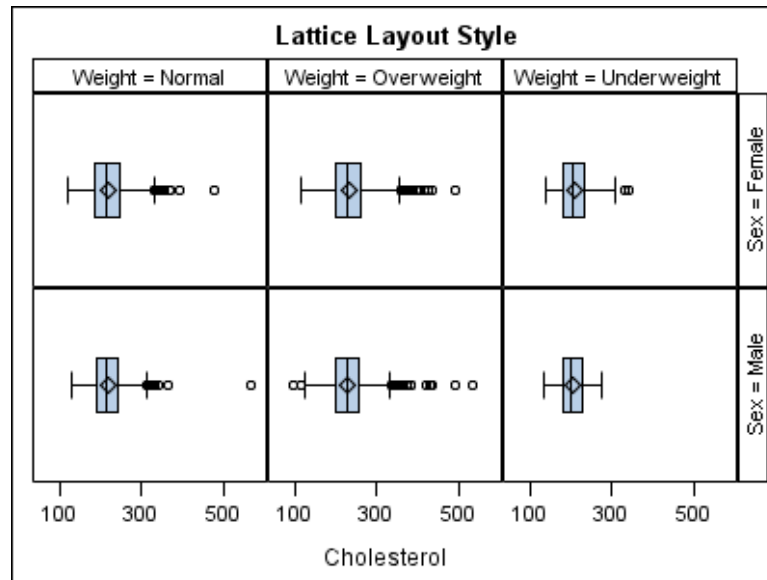
Figure 3.1 on page 32 shows an example of the PANEL layout.

Figure 3.1   Example of the PANEL Layout



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.

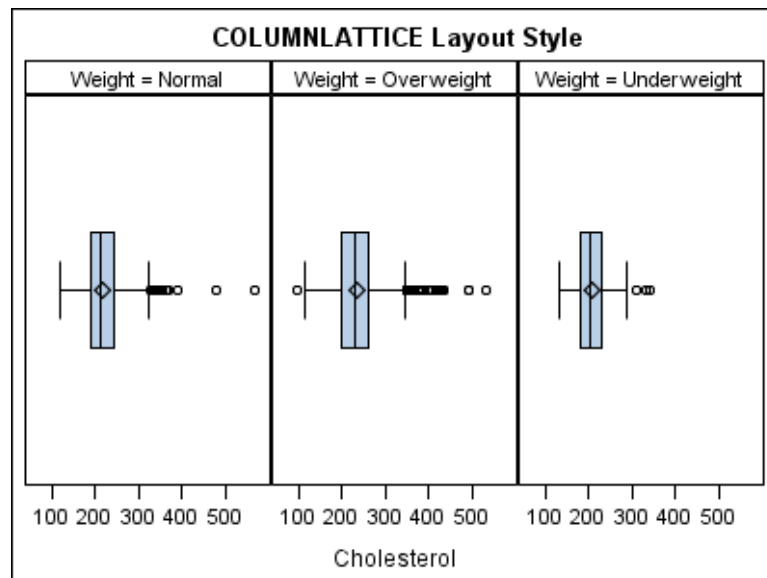
Figure 3.2 on page 33 shows an example of the LATTICE layout.

**Figure 3.2** Example of the LATTICE Layout

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.

*Note:* The COLUMNLATTICE and ROWLATTICE layouts are available with SAS 9.2 Phase 2 and later.  $\Delta$

Figure 3.3 on page 33 shows an example of the COLUMNLATTICE layout.

**Figure 3.3** Example of the COLUMNLATTICE Layout

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 and 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 Content

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 SGPPANEL procedure:

### Basic plots

scatter, series, step, band, 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 SGPPANEL step. The following table shows which of the plot types can be used together:

**Table 3.2** Plot Type Compatibility

	Basic	Fit and Confidence	Distribution	Categorization
Basic	x	x		
Fit and Confidence	x	x		
Distribution			x	
Categorization				x

*Note:* Box plots cannot be combined with any other plot types.  $\triangle$

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

The SGPPANEL 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 SGPPANEL 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 68.

---

## 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.

## Units of Measurement

Some options such as `LINEATTRS` enable you to specify the unit of measurement as part of the value. The following table contains the units that are available:

**Table 3.3** Measurement Units

Unit	Description
CM	centimeters
IN	inches
MM	millimeters
PCT or %	percentage
PT	point size, calculated at 100 dots per inch
PX	pixels

## 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. Figure 3.4 on page 36 shows the marker symbols that you can use.

**Figure 3.4** List of Marker Symbols

$\downarrow$ <b>ArrowDown</b>	$\nabla$ <b>HomeDown</b>	$\sim$ <b>Tilde</b>	$\bullet$ <b>CircleFilled</b>
$*$ <b>Asterisk</b>	$\text{I}$ <b>Ibeam</b>	$\triangle$ <b>Triangle</b>	$\blacklozenge$ <b>DiamondFilled</b>
$\circ$ <b>Circle</b>	$+$ <b>Plus</b>	$\cup$ <b>Union</b>	$\blacktriangledown$ <b>HomeDownFilled</b>
$\diamond$ <b>Diamond</b>	$\square$ <b>Square</b>	$\times$ <b>X</b>	$\blacksquare$ <b>SquareFilled</b>
$>$ <b>GreaterThan</b>	$\star$ <b>Star</b>	$\Upsilon$ <b>Y</b>	$\star$ <b>StarFilled</b>
$\#$ <b>Hash</b>	$\text{T}$ <b>Tack</b>	$\geq$ <b>Z</b>	$\blacktriangle$ <b>TriangleFilled</b>

## 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. Figure 3.5 on page 37 shows the line patterns that you can use.

**Figure 3.5** List of Line Patterns

Solid	—————	1
ShortDash	- - - - -	2
MediumDash	- - - - -	4
LongDash	— — — — —	5
MediumDashShortDash	- - - - -	8
DashDashDot	- - - - -	14
DashDotDot	- - - - -	15
Dash	- - - - -	20
LongDashShortDash	— - — - — - — - —	26
Dot	. . . . .	34
ThinDot	. . . . .	35
ShortDashDot	- - - - -	41
MediumDashDotDot	- - - - -	42

---

## Procedure Syntax

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

---

```

PROC SGPPANEL < option(s)>;
  PANELBY variable(s) < /option(s)>;
  BAND X= variable | Y= variable
  UPPER= numeric-value | numeric-variable LOWER= numeric-value |
    numeric-variable
  < /option(s)>;
  COLAXIS <option(s)>;
  DENSITY response-variable < /option(s)>;
  DOT category-variable < /option(s)>;
  HBAR category-variable < /option(s)>;
  HBOX response-variable < /option(s)>;
  HISTOGRAM response-variable < /option(s)>;
  HLINE category-variable < /option(s)>;
  KEYLEGEND <"name(s)"> < /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)>;
  ROWAXIS <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)>;
  VBOX response-variable < /option(s)>;

```

**VECTOR** *X= numeric-variable Y= numeric-variable* </option(s)>;  
**VLINE** *category-variable* </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.

**Requirements:** An input data set is required.

---

### Syntax

```
PROC SGPANEL <DATA= input-data-set>
  <CYCLEATTRS | NOCYCLEATTRS>
  < DESCRIPTION="text-string">
  <NOAUTOLEGEND>
;
```

### Options

#### 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.

#### 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 SGPPANEL Procedure”.

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

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

**Alias:** DES

#### **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.

---

## **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)*>;

*option(s)* can be one or more of the following:

BORDER | NOBORDER

COLHEADERPOS= TOP | BOTTOM | BOTH

COLUMNS= *n*

LAYOUT= LATTICE | PANEL | ROWLATTICE | COLUMNLATTICE

MISSING

NOVARNAME

ONEPANEL

ROWHEADERPOS= RIGHT | LEFT | BOTH

ROWS= *n*

SPACING= *n*

SPARSE

START= TOPLEFT | BOTTOMLEFT

UNISCALE= ROW | ALL

### **Required Arguments**

***variable(s)***

specifies one or more classification variables for the panel.

## Options

### **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.

**Style element:** The default status of the cell borders is determined by the `FrameBorder` attribute of the `GraphWalls` element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### **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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### **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.

**Restriction:** This value is available with SAS 9.2 Phase 2 and later.

ROWLATTICE

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

**Restriction:** This value is available with SAS 9.2 Phase 2 and later.

**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.

*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.     $\Delta$

**Interaction:** 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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

#### **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:** TOP

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

#### **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 SGPPANEL 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 SGPPANEL 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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

---

**BAND** X= *variable* | Y= *variable*

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

*option(s)* can be one or more options from the following categories:

□ Band options:

FILL | NOFILL

FILLATTRS= *style-element* | ( COLOR=*color*)

LINEATTRS= *style-element* < (*options*) > | (*options*)

MODELNAME= "*plot-name*"

NOEXTEND

NOMISSINGGROUP

OUTLINE | NOOUTLINE

□ Plot options:

GROUP= *variable*

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *value*

## 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.

## Options

**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.

**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. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\triangle$

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 36 for a list of line patterns.

**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. See "Units of Measurement" on page 36 for a list of the measurement units that are supported.

**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.

**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.

**Interaction:** This option has no effect if you do not specify numeric values for the UPPER= and LOWER= options.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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 style element in the current style.

**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).

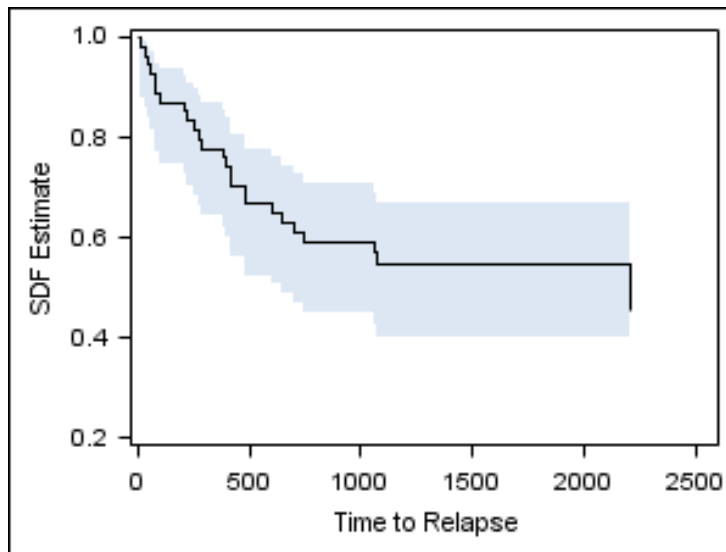
**Default:** 0.0

**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:

```
band x=t upper=ucl lower=lcl / modelname="myname" transparency=.5;
step x=t y=survival / name="myname";
```

**Figure 3.6** Fitted Band Plot Example


---

## 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 SG PANEL procedure.

**Featured in:** Example 1 on page 118

---

### Syntax

**DENSITY** *response-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ DENSITY options:

FREQ= *numeric-variable*

LINEATTRS= *style-element* < (*options*) > | (*options*)

SCALE= *scaling-type*

TYPE= NORMAL(*option(s)*) | KERNEL(*option(s)*)

□ Plot options:

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-value*

## Required Arguments

### ***response-variable***

specifies the variable for the x axis. The variable must be numeric.

## Options

### **FREQ= *numeric-variable***

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.

### **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.  $\Delta$

### **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 additionally specify suboptions to override specific appearance attributes.

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

#### **COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 36 for a list of line patterns.

**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. See "Units of Measurement" on page 36 for a list of the measurement units that are supported.

**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.

### **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

**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:

$$\hat{f}_\lambda(x) = \frac{100h\%}{n\lambda} \sum_{i=1}^n K_0\left(\frac{x-x_i}{\lambda}\right)$$

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

$$K_0(t) = 1 - |t| \text{ for } -|t| \leq 1$$

---

## 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 SGPPANEL procedure. See “Plot Content” on page 34.

---

### Syntax

DOT *category-variable* *</option(s)>*;

*option(s)* can be one or more options from the following categories:

□ Dot options:

ALPHA= *numeric-value*  
 DATALABEL <= *variable*>  
 FREQ= *numeric-variable*  
 LIMITATTRS= *style-element* <(options)> | (options)  
 LIMITS= UPPER | LOWER | BOTH  
 LIMITSTAT= CLM | STDERR | STDDEV  
 MARKERATTRS= *style-element* <(options)> | (options)  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 RESPONSE= *numeric-variable*  
 STAT= FREQ | SUM | MEAN  
 URL= *character-variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "*text-string*"  
 NAME= "*text-string*"  
 TRANSPARENCY= *numeric-value*

## Required Arguments

### *category-variable*

specifies the variable that classifies the observations into distinct subsets.

## 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 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.

### 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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### FREQ= *numeric-variable*

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 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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 36 for a list of line patterns.

**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. See "Units of Measurement" on page 36 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

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 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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the markers. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Units of Measurement" on page 36 for a list of the measurement units that are supported.

**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. See "Marker Symbols" on page 36 for a list of valid marker symbols.

**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.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**WEIGHT= *numeric-variable***

specifies that 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 Content” on page 34.

**Featured in:** Example 3 on page 120

### Syntax

**HBAR** *category-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

□ Bar options:

ALPHA= *numeric-value*  
 BARWIDTH= *numeric-value*  
 DATALABEL  
 FILL | NOFILL  
 FILLATTRS= *style-element* | (*options*)  
 FREQ= *numeric-variable*  
 LIMITATTRS= *style-element* <(options)> | (*options*)  
 LIMITS= BOTH | LOWER | UPPER  
 LIMITSTAT= CLM | STDDEV | STDERR  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 OUTLINE | NOOUTLINE  
 RESPONSE= *response-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= “*text-string*”  
 NAME= “*text-string*”  
 TRANSPARENCY= *numeric-value*

### Required Arguments

***category-variable***

specifies the variable that classifies the observations into distinct subsets.

## 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 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.

### **BARWIDTH= *numeric-value***

specifies the width of the bars as a ratio of the maximum possible width. The maximum width is equal to the space between the center of each bar and the centers of the adjacent bars. Specify a value between .1 and 1.

For example, if you specify a width of 1, then there is no distance between the bars. If you specify a value of .5, then the width of the bars is equal to the space between the bars.

**Default:** .8

### **DATALABEL**

adds data labels for bars. The values of the response variable appear at the end of the bars.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### **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

### **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. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\Delta$

**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.

### **FREQ= *numeric-variable***

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 grouping variable.

### **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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**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.

**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.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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

**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.

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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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.

## 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.

### Description

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 3.7** Parts of a Box Plot

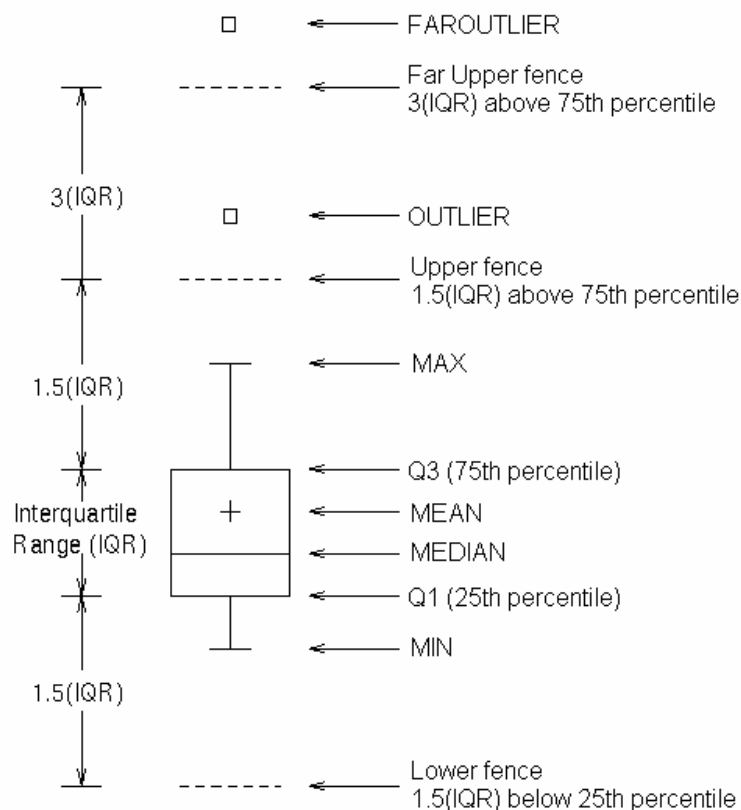


Figure 3.7 on page 58 shows a diagram of a vertical box plot. The bottom and top edges of the box indicate the *intra-quartile range* (IQR). That is, the range of values between the first and third quartiles (the 25th and 75th percentiles). The marker inside the box indicates the mean value. The line 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, but are close enough not to be considered outliers (a distance less than or equal to  $1.5 \times \text{IQR}$ ). 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  $1.5 \times \text{IQR}$  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  $3 \times \text{IQR}$  from the box have data labels.

## Syntax

HBOX *response-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

- Box options:
  - BOXWIDTH= *numeric-value*
  - CATEGORY= *category-variable*
  - DATALABEL <= *variable*>
  - EXTREME
  - FREQ= *numeric-variable*
  - LABELFAR
  - MISSING
  - PERCENTILE= 1 | 2 | 3 | 4 | 5
  - SPREAD
- Plot options:
  - LEGENDLABEL= "*text-string*"
  - NAME= "*text-string*"
  - TRANSPARENCY= *numeric-value*

## Required Arguments

### *response-variable*

specifies the response variable for the plot. If you do not specify the CATEGORY= option, then one box is created for the response variable.

## Options

### BOXWIDTH= *n*

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

**CATEGORY= *category-variable***

specifies the category variable for the plot. A box plot is created for each distinct value of the category variable.

**DATALABEL <= *variable*>**

adds data labels for the outlier markers. If you specified a variable, then the values for that variable are used as data labels. If you do not specify a variable, then the values of the response variable are used.

*Note:* This option has no effect if the plot does not contain outlier points.  $\Delta$

**EXTREME**

specifies that the whiskers can extend to the maximum and minimum values for the response 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.

**FREQ= *numeric-variable***

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.

**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 DATALABELS option, or if there are no far outliers.  $\Delta$

**LEGENDLABEL= "*text-string*"**

specifies a label that identifies the box plot in the legend. By default, the label of the response variable is used.

**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.

**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 response variable.  $\Delta$

**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

## 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 SGPPANEL procedure.

**Note:** The range of the response variable is automatically divided into an appropriate number of bins.

**Featured in:** Example 1 on page 118

### Syntax

**HISTOGRAM** *response-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

- Histogram options:
  - BOUNDARY= UPPER | LOWER
  - FILL | NOFILL
  - FILLATTRS= *style-element* | (COLOR= *color*)
  - FREQ= *numeric-variable*
  - OUTLINE | NOOUTLINE
  - SCALE= PERCENT | COUNT | PROPORTION
- Plot options:
  - LEGENDLABEL= "*text-string*"
  - NAME= "*text-string*"
  - TRANSPARENCY= *numeric-value*

### Required Arguments

***response-variable***

specifies a response variable for the histogram.

### Options

**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.

**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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\triangle$

**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.

**FREQ= *numeric-variable***

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.

**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.

**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.

**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 plot (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 Content” on page 34.

---

### Syntax

**HLINE** *category-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ Line options:

ALPHA= *numeric-value*  
 BREAK  
 CURVELABEL <= *text-string*>  
 CURVELABELPOS= MIN | MAX | START | END  
 DATALABEL <= *variable*>  
 FREQ= *numeric-variable*  
 LIMITATTRS= *style-element* <(options)> | (options)  
 LIMITS= BOTH | LOWER | UPPER  
 LIMITSTAT= CLM | STDDEV | STDERR  
 LINEATTRS= *style-element* <(options)> | (options)  
 MARKERATTRS= *style-element* <(options)> | (options)  
 MARKERS  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 RESPONSE= *response-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *character-variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= “*text-string*”  
 NAME= “*text-string*”  
 TRANSPARENCY= *numeric-value*

## Required Arguments

### ***category-variable***

specifies the variable that classifies the observations into distinct subsets.

## 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 LIMITSTAT=CLM.

If your plot is overlaid with other summary plots, then the first ALPHA value that you specify is used for all of the plots.

### **BREAK**

creates a break in the line for each missing value for the category variable.

### **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.

### **CURVELABELPOS= MIN | MAX | START | END**

specifies the location of the curve label. Specify one of the following values:

MIN

places the curve label at the minimum value for the response axis.

MAX

places the curve label at the maximum value for the response axis.

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

### **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.

### **FREQ= *numeric-variable***

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 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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

*Note:* Limit lines are displayed only when you specify STAT= MEAN.  $\Delta$

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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 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.

## NOSTATLABEL

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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)*>;

*option(s)* can be any of the following:

ACROSS=  $n$

BORDER | NOBORDER

DOWN=  $n$

POSITION= *position-value*

TITLE= “*text-string*”

**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.  $\Delta$

**Options****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.  $\Delta$

**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.  $\Delta$

**POSITION= *position-value***

specifies the position of the legend within the plot. The positions are as follows:

<i>BOTTOM</i>	places the legend at the bottom of the plot.
<i>LEFT</i>	places the legend at the left side of the plot.
<i>RIGHT</i>	places the legend at the right side of the plot.
<i>TOP</i>	places the legend at the top of the plot.

*Note:* By default, if you use more than one KEYLEGEND statement, then each legend is placed in a different position.  $\Delta$

**Default:** BOTTOM

**TITLE= "*text-string*"**

adds a title to the legend.

---

## LOESS Statement

Creates a fitted loess curve.

### Syntax

**LOESS** X= *numeric-variable* Y= *numeric-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

□ LOESS options:

ALPHA= *numeric-value*

CLM <= "*text-string*">

CLMATTRS= *style-element*

CLMTRANSPARENCY= *numeric-value*

CURVELABEL <= "*text-string*">

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

DEGREE= 1 | 2  
 INTERPOLATION= CUBIC | LINEAR  
 LINEATTRS= *style-element* < (*options*) > | (*options*)  
 MARKERATTRS= *style-element* < (*options*) > | (*options*)  
 MAXPOINTS= *n*  
 NOLEGCLM  
 NOLEGFIT  
 NOMARKERS  
 REWEIGHT= *n*  
 SMOOTH= *numeric-value*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "*text-string*"  
 NAME= "*text-string*"

## Required Arguments

**X= *numeric-variable***

specifies the variable for the x axis.

**Y= *numeric-variable***

specifies the variable for the y axis.

## 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).

*Note:* This option has no effect if you do not specify the CLM option. △

**Default:** .05

**CLM <= "*text-string*">**

creates confidence limits for a mean predicted value for each observation. The optional text string overrides the default legend label for the confidence limit.

**CLMATTRS = *style-element***

specifies the appearance of the confidence limits by using an ODS style element.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**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).

*Note:* This option has no effect if you do not specify the CLM option. △

**Default:** 0.0

**CURVELABEL** <=*“text-string”*>

adds a label for the loess 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 curve label at the minimum value for the X axis.

MAX

places the curve label at the maximum value for the X axis.

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

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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 ... 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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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 ... GraphDatan` 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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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.

**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.

**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.

*Note:* This option has no affect if you do not specify the WEIGHT option.  $\Delta$

**Default:** 0

**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 that 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:

$$\text{minimum} = \frac{\text{degree} + 1}{\text{number of observations}}$$

---

## 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.

**Syntax**

**NEEDLE** X= *variable* Y= *numeric-variable* </option(s)>;

*option(s)* can be one or more options from the following categories:

☐ NEEDLE options:

BASELINE= *numeric-value*

DATALABEL <= *variable*>

LINEATTRS= *style-element* < (*options*) > | (*options*)

MARKERATTRS= *style-element* < (*options*) > | (*options*)

MARKERS

NOMISSINGGROUP

URL= *character-variable*

□ Plot options:

GROUP= *variable*

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-value*

## Required Arguments

**X= *variable***

specifies the variable for the x axis.

**Y= *numeric-variable***

specifies a numeric variable for the y axis.

## Options

**BASELINE= *numeric-value***

specifies a value on the Y axis for the baseline.

**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.

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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.

**NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

---

## PBSPLINE Statement

Creates a fitted penalized B-spline curve.

**Syntax**

**PBSPLINE** *x= numeric-variable y= numeric-variable* *</ options>*;

*option(s)* can be one or more options from the following categories:

□ PBSPLINE options:

ALPHA= *numeric-value*

CLI <= "*text-string*">

CLIATTRS= *style-element*

CLM <= "*text-string*">

CLMATTRS= *style-element*

CLMTRANSPARENCY= *numeric-value*

CURVELABEL <= "*text-string*">

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

DEGREE= *n*

FREQ= *numeric-variable*

LINEATTRS= *style-element* *< (options) >* | *(options)*

MARKERATTRS= *style-element* *< (options) >* | *(options)*

MAXPOINTS= *n*

NKNOTS= *n*

NOLEGCLI

NOLEGCLM

NOLEGFIT  
 NOMARKERS  
 SMOOTH= *numeric-value*  
 WEIGHT= *numeric-variable*  
☐ Plot options:  
     GROUP= *variable*  
     LEGENDLABEL= "*text-string*"  
     NAME= "*text-string*"

## Required Arguments

**X= *numeric-variable***  
 specifies the variable for the x axis.

**Y= *numeric-variable***  
 specifies the variable for the y axis.

## 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).  
*Note:* This option has no effect if you do not specify either the CLI option or CLM option.  $\Delta$

**Default:** .05

**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***  
 specifies the appearance of the individual value prediction limits by using an ODS style element.

**Default:** The default appearance of the prediction limits is specified by the GraphPredictionLimits style element in the current style.

**CLM <= "*text-string*">**  
 creates confidence limits for the mean predicted values. The optional text string overrides the default legend label for the confidence limits.

**CLMATTRS = *style-element***  
 specifies the appearance of the mean value confidence limits by using an ODS style element.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**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).

*Note:* This option has no effect if you do not specify the CLM option.  $\Delta$

**Default:** 0.0

**CURVELABEL** <=*“text-string”*>

adds a label for the spline curve. You can also specify the label text. If you do not specify a label, then 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 curve label at the minimum value for the X axis.

## MAX

places the curve label at the maximum value for the X axis.

## 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

**DATALABEL** <= *variable*>

displays a label for each scatter 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.

**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 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.

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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 ... 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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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 ... GraphDatan` 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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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.

**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.

**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 that 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:

$$\text{minimum} = \frac{\text{degree} + 1}{\text{number of observations}}$$

---

## REFLINE Statement

**Creates a horizontal or vertical reference line.**

**Syntax**

**REFLINE** *variable* | *value-1* <... *value-n*> </ *option(s)*>;

*option(s)* can be one or more options from the following categories:

□ REFLINE options:

AXIS= X | Y

LABEL <= ("*text-string-1*" ... "*text-string-n*")>

LABELPOS= MIN | MAX

LINEATTRS= *style-element* < (*options*) > | (*options*)

NOCLIP

- Plot options:
  - LEGENDLABEL= *“text-string”*
  - NAME= *“text-string”*
  - TRANSPARENCY= *numeric-value*

## Required Arguments

### *variable*

draws a reference line for each value of the specified variable.

**Restriction:** This argument is available with SAS 9.2 Phase 2 and later.

### *value-1 <... value-n>*

draws one or more reference lines at the values that you specify.

## Options

### 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

### 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 additionally specify suboptions to override specific appearance attributes.

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

#### COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**Default:** The default line pattern is specified by the LinePattern 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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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.

**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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Featured in:** Example 2 on page 119

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### Syntax

**REG** *X= numeric-variable Y= numeric-variable* *</ option(s)>*;

*option(s)* can be one or more options from the following categories:

□ REG options:

ALPHA= *numeric-variable*

CLI <= “*text-string*”>

CLIATTRS= *style-element*

CLM <= “*text-string*”>

CLMATTRS= *style-element*

CLMTRANSPARENCY= *numeric-value*

CURVELABEL <= “*text-string*”>

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

DEGREE= *n*

FREQ= *variable*

LINEATTRS= *style-element* < (*options*) > | (*options*)  
 MARKERATTRS= *style-element* < (*options*) > | (*options*)  
 MAXPOINTS= *n*  
 NOLEGCLI  
 NOLEGCLM  
 NOLEGFIT  
 NOMARKERS  
 WEIGHT= *numeric-variable*  
 □ Plot options:  
     GROUP= *variable*  
     LEGENDLABEL= "*text-string*"  
     NAME= "*text-string*"

## Required Arguments

**X= *numeric-variable***  
 specifies the variable for the x axis.  
**Y= *numeric-variable***  
 specifies the variable for the y axis.

## 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).  
*Note:* This option has no effect if you do not specify either the CLI option or CLM option. △  
**Default:** .05

**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***  
 specifies the appearance of the individual value prediction limits by using an ODS style element.  
**Default:** The default appearance of the prediction limits is specified by the GraphPredictionLimits style element in the current style.

**CLM <= "*text-string*">**  
 creates confidence limits for the mean predicted values. The optional text string overrides the default legend label for the confidence limits.

**CLMATTRS = *style-element***  
 specifies the appearance of the mean value confidence limits by using an ODS style element.  
**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**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).

*Note:* This option has no effect if you do not specify the CLM option. △

**Default:** 0.0

**CURVELABEL <="text-string">**

adds a label for the regression curve. You can also specify the label text. If you do not specify a label, then 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 curve label at the minimum value for the X axis.

MAX

places the curve label at the maximum value for the X axis.

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

**DATALABEL <= *variable*>**

displays a label for each scatter 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 value of the Y variable is used for the data label.

**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 a variable whose values represent the number of occurrences of each observation. Values for the FREQ= variable are rounded down to the nearest integer. Values for the FREQ= variable that are less than 1 are not used.

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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.

**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.

**WEIGHT= *numeric-variable***

specifies that 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.**

**Syntax**

**SCATTER** X= *variable* Y= *variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ SCATTER options:

DATALABEL <= *variable*>

ERRORBARATTRS= *style-element* <(options)> | (options)

FREQ= *numeric-variable*

MARKERATTRS= *style-element* <(options)> | (options)

MARKERCHAR= *variable*

MARKERCHARATTRS= *style-element* <(options)> | (options)

NOMISSINGGROUP

URL= *character-variable*

XERRORLOWER= *numeric-variable*

XERRORUPPER= *numeric-variable*

YERRORLOWER= *numeric-variable*

YERRORUPPER= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= *“text-string”*  
 NAME= *“text-string”*  
 TRANSPARENCY= *numeric-value*

## Required Arguments

**X= *variable***

specifies the variable for the x axis.

**Y= *variable***

specifies the variable for the y axis.

## Options

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**FREQ= *numeric-variable***

specifies a variable whose values represent the number of occurrences of each observation. Values for the FREQ= variable are rounded down to the nearest integer. Values for the FREQ= variable that are less than 1 are not used.

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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.

**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.

*Note:* The MARKERCHAR= option overrides the DATALABEL= option and the SYMBOL= suboption of the MARKERS= option.  $\triangle$

**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 additionally 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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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.

**NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**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.**

### **Syntax**

**SERIES** X= *variable* Y= *variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ SERIES options:

BREAK

CURVELABEL <= *text-string*>

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

LINEATTRS= *style-element* < (*options*) > | (*options*)

MARKERATTRS= *style-element* < (*options*) > | (*options*)

MARKERS

NOMISSINGGROUP

URL= *character-variable*

□ Plot options:

GROUP= *variable*

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-value*

### **Required Arguments**

**X= *variable***

specifies the variable for the x axis.

**Y= *variable***

specifies the variable for the y axis.

## Options

### **BREAK**

creates a break in the line for each missing value for the Y variable.

### **CURVELABEL** <= *text-string*>

adds a label for the series curve. You can also specify the label text. If you do not specify a label, then 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 curve label at the minimum value for the X axis.

#### **MAX**

places the curve label at the maximum value for the X axis.

#### **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

### **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.

### **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.

### **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 additionally specify suboptions to override specific appearance attributes.

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

#### **COLOR**= *color*

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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.

## **NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

---

## STEP Statement

**Creates a step plot.**

**Restriction:** The vertical axis that is used with the STEP statement cannot be a discrete axis.

---

### Syntax

**STEP** X= *variable* Y= *numeric-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ STEP options:

BREAK

CURVELABEL <= *text-string*>

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

ERRORBARATTRS= *style-element* <(options)> | (options)

JUSTIFY= LEFT | CENTER | RIGHT

LINEATTRS= *style-element* <(options)> | (options)

MARKERATTRS= *style-element* <(options)> | (options)

MARKERS

NOMISSINGGROUP

URL= *variable*

YERRORLOWER= *numeric-variable*

YERRORUPPER= *numeric-variable*

□ Plot options:

GROUP= *variable*

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-variable*

## Required Arguments

### **X= *variable***

specifies the variable for the x axis.

### **Y= *numeric-variable***

specifies the variable for the y axis.

## Options

### **BREAK**

creates a break in the line for each missing value.

### **CURVELABEL <= *text-string*>**

adds a label for the step curve. You can also specify the label text. If you do not specify a label, then 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 curve label at the minimum value for the X axis.

#### **MAX**

places the curve label at the maximum value for the X axis.

#### **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

### **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.

### **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 additionally specify suboptions to override specific appearance attributes.

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

#### **COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**JUSTIFY=** LEFT | CENTER | RIGHT

specifies the location of each step relative to its data point. Figure 3.8 on page 95 shows the effect of each option:

Figure 3.8 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=** *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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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.

**NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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=** *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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify `IMAGEMAP` in the ODS `GRAPHICS` statement.

**Default:** By default, no HTML links are created.

**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.

---

## 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 SGPPANEL procedure. See “Plot Content” on page 34.

---

### Syntax

**VBAR** *category-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ Bar options:

ALPHA= *numeric-value*

BARWIDTH= *numeric-value*

DATALABEL

FILL | NOFILL

FILLATTRS= *style-element* < (*fill-options*) > | (*fill-options*)

FREQ= *numeric-variable*

LIMITATTRS= *style-element* <(*options*)> | (*options*)

LIMITS= BOTH | LOWER | UPPER

LIMITSTAT= CLM | STDDEV | STDERR

MISSING

NOSTATLABEL

NUMSTD= *n*

OUTLINE | NOOUTLINE

RESPONSE= *response-variable*

STAT= FREQ | MEAN | SUM

URL= *character-variable*

WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*

LEGENDLABEL= “*text-string*”

NAME= “*text-string*”

TRANSPARENCY= *numeric-value*

## Required Arguments

### *category-variable*

specifies the variable that classifies the observations into distinct subsets.

## 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 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.

### **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 between .1 and 1.

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:** .8

### **DATALABEL**

adds data labels for bars. The values of the response variable appear at the end of the bars.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### **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

### **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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\triangle$

**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.

### **FREQ=** *numeric-variable*

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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**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.

**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.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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

**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.

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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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.

---

## 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 SGPPANEL procedure.

---

**Description**

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.

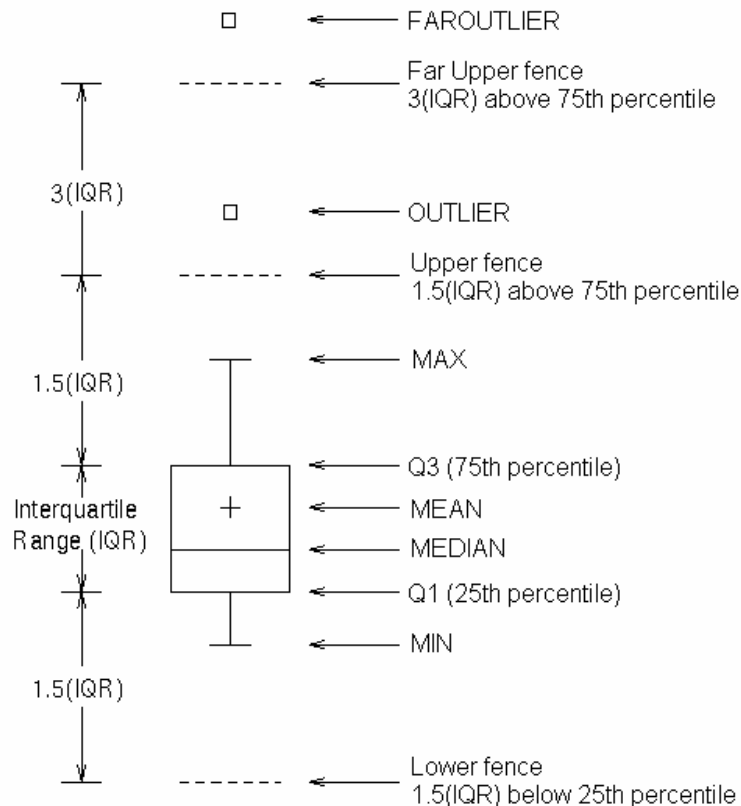
**Figure 3.9** Parts of a Box Plot

Figure 3.9 on page 102 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, but are close enough not to be considered outliers (a distance less than or equal to  $1.5 \times IQR$ ). 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  $1.5 \times IQR$  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  $3 \times IQR$  from the box have data labels.

## Syntax

VBOX *response-variable* *</option(s)>*;

*option(s)* can be one or more options from the following categories:

□ Box options:

BOXWIDTH= *numeric-value*

CATEGORY= *category-variable*

DATALABEL *<= variable>*

EXTREME  
 FREQ= *numeric-variable*  
 LABELFAR  
 MISSING  
 PERCENTILE= 1 | 2 | 3 | 4 | 5  
 SPREAD  
 □ Plot options:  
     LEGENDLABEL= "*text-string*"  
     NAME= "*text-string*"  
     TRANSPARENCY= *numeric-value*

## Required Arguments

### ***response-variable***

specifies the response variable for the plot. If you do not specify the CATEGORY= option, then one box is created for the response variable.

## Options

### **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

### **CATEGORY= *category-variable***

specifies the category variable for the plot. A box plot is created for each distinct value of the category variable.

### **DATALABEL <= *variable*>**

adds data labels for the outlier markers. If you specified a variable, then the values for that variable are used as data labels. If you do not specify a variable, then the values of the response variable are used.

*Note:* This option has no effect if the plot does not contain outlier points.  $\Delta$

### **EXTREME**

specifies that the whiskers can extend to the maximum and minimum values for the response 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.

### **FREQ= *numeric-variable***

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.

### **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 DATALABELS option, or if there are no far outliers.  $\Delta$

**LEGENDLABEL= “text-string”**

specifies a label that identifies the box plot in the legend. By default, the label of the response variable is used.

**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.

**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 response variable.  $\Delta$

**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

---

## VECTOR Statement

**Creates a vector plot that draws arrows from a point of origin to each data point.**

**Restriction:** This statement is available for SAS 9.2 Phase 2 and later.

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**VECTOR** X= *numeric-variable* Y= *numeric-variable* </ option(s)>;

*option(s)* can be one or more of the following:

☐ Vector options:

ARROWDIRECTION= OUT | IN | BOTH

ARROWHEADSHAPE= *shape*

DATALABEL <= *variable*>

LINEATTRS= *style-element* <(options)> | (options)

NOARROWHEADS

NOMISSINGGROUP

XORIGIN= *numeric-value* | *numeric-variable*

YORIGIN= *numeric-value* | *numeric-variable*

☐ Plot options:

GROUP= *variable*

LEGENDLABEL= *"text-string"*  
 NAME= *"text-string"*  
 TRANSPARENCY= *numeric-value*  
 X2AXIS  
 Y2AXIS

## Required Arguments

**X= *numeric-variable***  
 specifies a numeric variable for the x axis.

**Y= *numeric-variable***  
 specifies numeric variable for the y axis.





## Options

**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

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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.

**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

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## VLINE Statement

**Creates a vertical line plot (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 SGPPANEL procedure. See “Plot Content” on page 34.

**Featured in:** Example 4 on page 121

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**Syntax**

**VLINE** *category-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ Line options:

ALPHA= *numeric-value*

BREAK

CURVELABEL <= *text-string*>

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

FREQ= *numeric-variable*

LIMITATTRS= *style-element* <(options)> | (options)

LIMITS= BOTH | LOWER | UPPER

LIMITSTAT= CLM | STDDEV | STDERR

LINEATTRS= *style-element* <(options)> | (options)

MARKERATTRS= *style-element* <(options)> | (options)

MARKERS

MISSING

NOSTATLABEL

NUMSTD= *n*

RESPONSE= *response-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *character-variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "*text-string*"  
 NAME= "*text-string*"  
 TRANSPARENCY= *numeric-value*

## Required Arguments

### ***category-variable***

specifies the variable that classifies the observations into distinct subsets.

## 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 LIMITSTAT=CLM.

If your plot is overlaid with other summary plots, then the first ALPHA value that you specify is used for all of the plots.

### **BREAK**

creates a break in the line for each missing value.

### **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.

### **CURVELABELPOS= MIN | MAX | START | END**

specifies the location of the curve label. Specify one of the following values:

MIN

places the curve label at the minimum value for the response axis.

MAX

places the curve label at the maximum value for the response axis.

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

### **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.

**FREQ= *numeric-variable***

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 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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 36 for a list of line patterns.

**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. See "Units of Measurement" on page 36 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

*Note:* Limit lines are displayed only when you specify STAT= MEAN.  $\triangle$

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= color**

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 36 for a list of line patterns.

**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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 36 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 36 for a list of valid marker symbols.

**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 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.

## NOSTATLABEL

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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.

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## COLAXIS, ROWAXIS Statements

Specify the axis options for each plot axis.

**Description**

The COLAXIS and ROWAXIS statements specify options for the plot axes. You can control the features of the axis (for example, the axis label, grid lines, and minor tick marks) and you can also control the structure of the axis (for example, the data range, data type, and tick mark values).

The COLAXIS statement specifies the properties for each X axis in the panel and the ROWAXIS statement specifies the properties for each Y axis in the panel.

**Syntax**

**COLAXIS** *option(s)*;

**ROWAXIS** *option(s)*;

*option(s)* can be one or more options from the following:

ALTERNATE

DISCRETEORDER= DATA | FORMATTED | UNFORMATTED

DISPLAY= ALL | NONE | (*options*)

FITPOLICY= *policy-value*  
 GRID  
 INTEGER  
 INTERVAL= *interval-value*  
 LABEL= "*text-string*"  
 LOGBASE= 2 | 10 | e  
 LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT  
 MAX= *numeric-value*  
 MIN= *numeric-value*  
 MINOR  
 NOTIMESPLIT  
 OFFSETMAX= *numeric-value*  
 OFFSETMIN= *numeric-value*  
 REFTICKS  
 TICKVALUEFORMAT= DATA | SAS-format  
 TYPE= DISCRETE | LINEAR | LOG | TIME  
 VALUES= ( *value-1* < ... *value-n* > )  
 VALUESHINT

## Options

### 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:

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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 does not affect vertical axes; only the THIN fit policy is used for vertical axes. △

**Restriction:** This option does not affect logarithmic 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.

**HOURL**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**LABEL=** *“text-string”*

specifies a label for the axis.

**LOGBASE=** 2 | 10 | e

specifies the base value for the logarithmic scale.

**Default:** 10

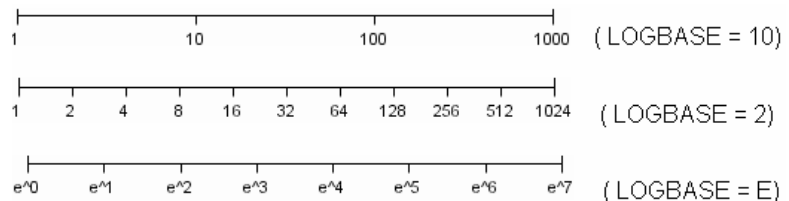
**Interaction:** This option has no effect unless you also specify TYPE=LOG.

**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 3.10 on page 115.

**Figure 3.10** 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 3.11 on page 115.

**Figure 3.11** 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 3.12 on page 116.

**Figure 3.12** 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.

**Interaction:** This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

**Restriction:** This option affects linear and time axes only.

**MIN= *numeric-value***

specifies the minimum value for the axis.

**Interaction:** This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

**Restriction:** This option affects linear and time axes only.

**MINOR**

adds minor tick marks to the axis.

**Interaction:** This option has no effect if you specify the VALUES= option.

**Restriction:** This option has no effect on discrete axes.

**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 the amount of offset space between the last tick mark on the axis and the edge of the plot area. Specify a value between 0 and 1. The value represents the offset as a proportion to the total length of the axis. For example, .12 specifies that the offset space for the last tick mark is 12% of the total axis length.

By default, the offset space is determined automatically based on the tick mark values, markers, and labels that are inside of the plot area.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**OFFSETMIN= *numeric-value***

specifies the amount of offset space between the first tick mark on the axis and the edge of the plot area. Specify a value between 0 and 1. The value represents the offset as a proportion to the total length of the axis. For example, .12 specifies that the offset space for the first tick mark is 12% of the total axis length.

By default, the offset space is determined automatically based on the tick mark values, markers, and labels that are inside of the plot area.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**REFTICKS**

adds tick marks to the side of the panel that is opposite from the specified axis. For example, if you specify the REFTICKS option in the COLAXIS statement, then tick marks are added to the top side of the panel.

**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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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. Additionally, 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 that do not have date or time formats.
LOG	specifies a logarithmic scale for the axis. This axis type is never a default. <b>Interaction:</b> 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.

**VALUES= ( *values-list* )**

specifies the values for the ticks on the axis.

For values on a numeric 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.

You can also create ticks in descending order by using a negative increment value. For example, **VALUES= (100 to 0 by -25)** creates tick marks at 100, 75, 50, 25, and 0.

<*value ... value-n*> *value-1* TO *value-2* BY *increment-value* <*value ... value-n*>

creates ticks for specific values, and additionally 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= on page 114 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.

**VALUESHINT**

specifies that the minimum and maximum axis values are determined independently of the values 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.

*Note:* This option has no effect unless you also specify the VALUES= option.  $\triangle$

---

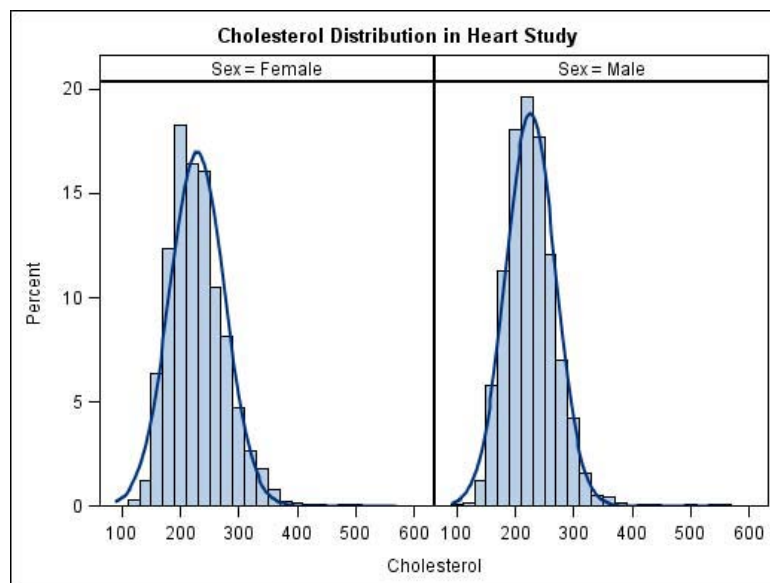
## Examples

---

### Example 1: Creating a Panel of Graph Cells with Histograms and Density Plots

**Procedure features:** HISTOGRAM statement, DENSITY statement

**Sample library member:** GSGPNHST



This example shows a panel of graph cells with histograms and density plots.

**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.**

```

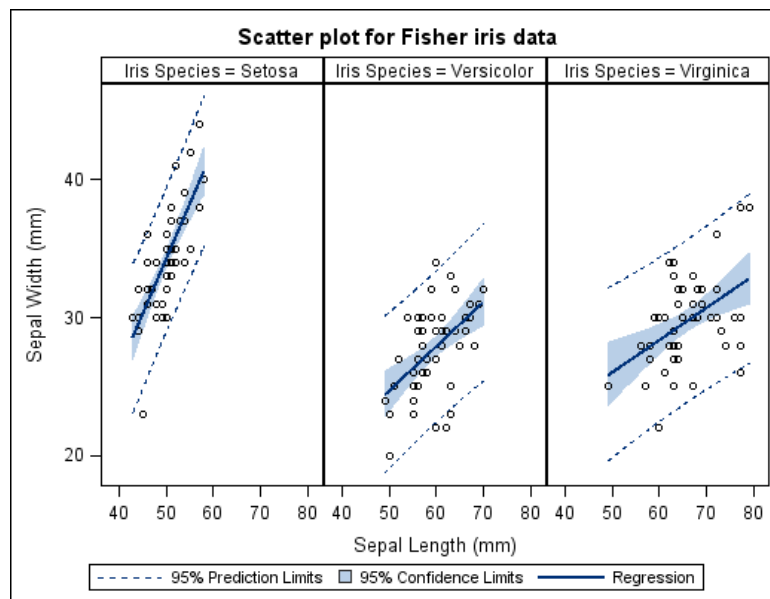
    histogram cholesterol;
    density cholesterol;
run;

```

## Example 2: Creating a Panel of Regression Curves

Procedure features: REG statement

Sample library member: GSGPNREG



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.

**Create the panel and specify the title.**

```

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.

```

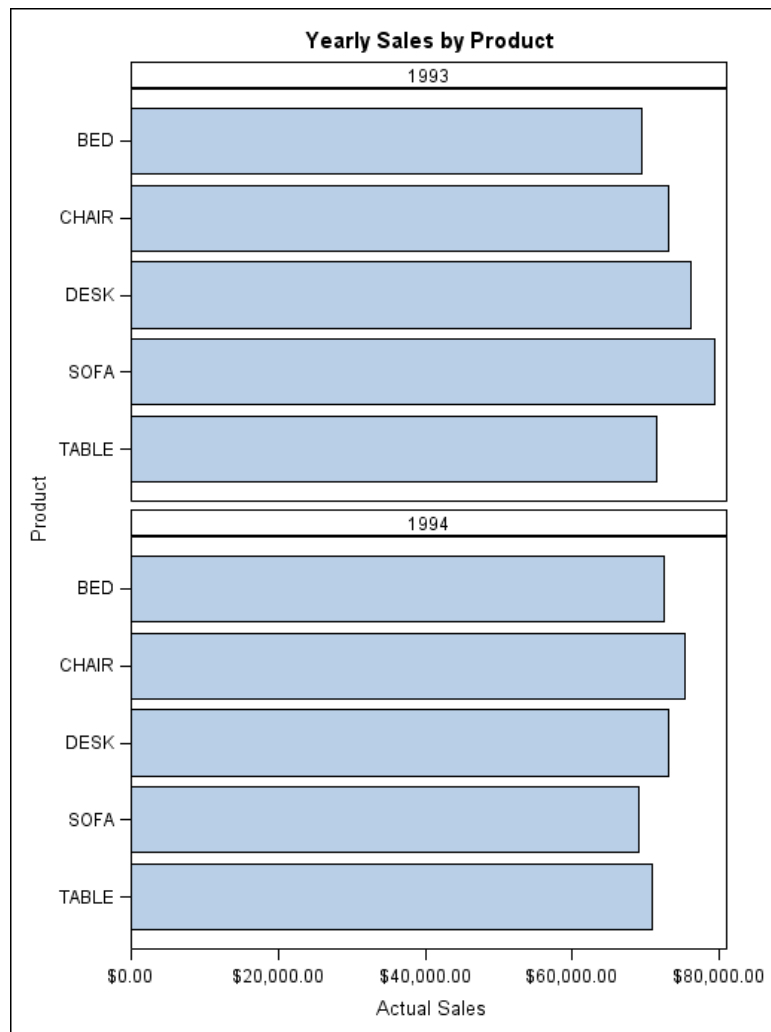
    reg x=sepalength y=sepalwidth / cli clm;
run;

```

## Example 3: Creating a Panel of Bar Charts

Procedure features: HBAR statement

Sample library member: GSGPNBAR



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.

### Create the panel and set the title.

```
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;
```

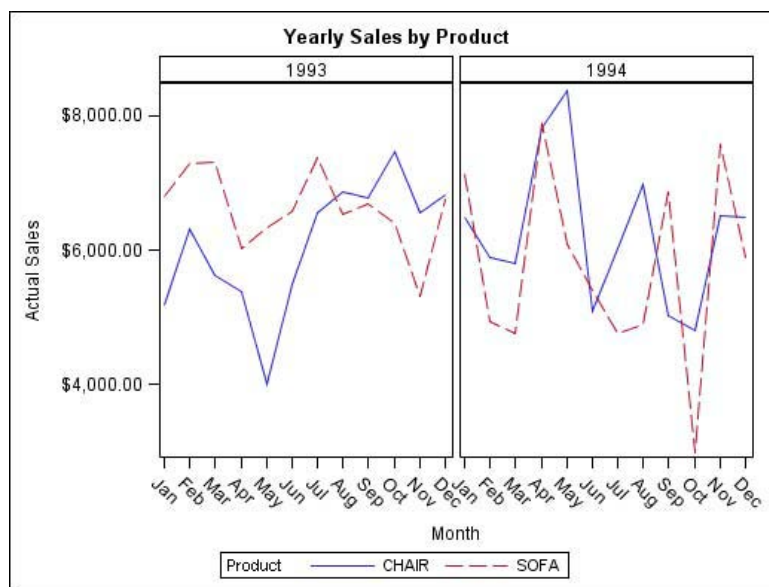
**Create the horizontal bar chart.** The RESPONSE= option specifies the response variable for the chart.

```
hbar product / response=actual;
run;
```

## Example 4: Creating a Panel of Line Plots

Procedure features: VLINE statement

Sample library member: GSGPNLIN



This example shows a panel of line plots with grouped data.

**Create the panel and specify a title.**

```
proc sgpanel data=sashelp.prdsale;
  where product in ("CHAIR" "SOFA");
  title "Yearly Sales by Product";
```

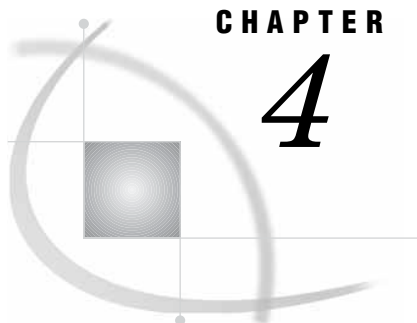
**Specify the classification variable for the panel.** The SPACING= option specifies the number of pixels between the panels in the plot. The NOVARNAME option specifies that the classification variable name is not shown in the headings for each cell.

```
panelby year / spacing=5 novarname;
```

**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;
```





## CHAPTER

## 4

## The SGPLOT Procedure

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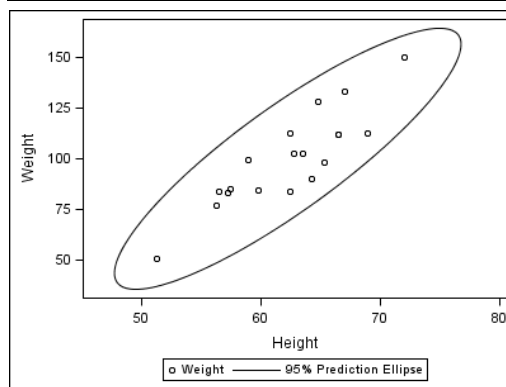
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---

## Overview

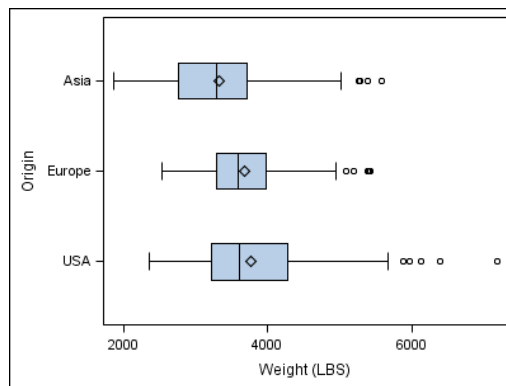
The SGPLOT procedure creates one or more plots and overlays them on a single set of axes. You can use the SGPLOT procedure to create statistical graphics such as histograms and regression plots, in addition to simple graphics such as scatter plots and line plots. Statements and options enable you to 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. Table 4.1 on page 125 contains some examples of graphs that the SGPLOT procedure can create.

**Table 4.1** Examples of Graphs that Can Be Generated by the SGPLOT Procedure

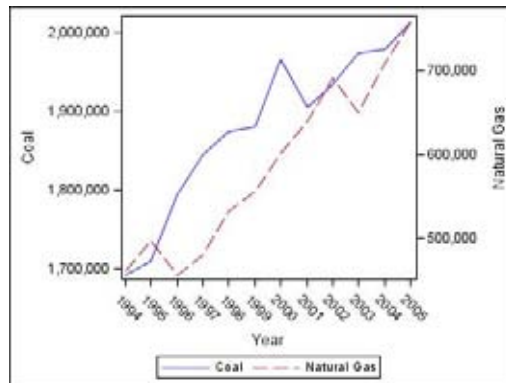
The following code creates an ellipse plot:

```
proc sgplot data=sashelp.class;
  scatter x=height y=weight;
  ellipse x=height y=weight;
run;
```



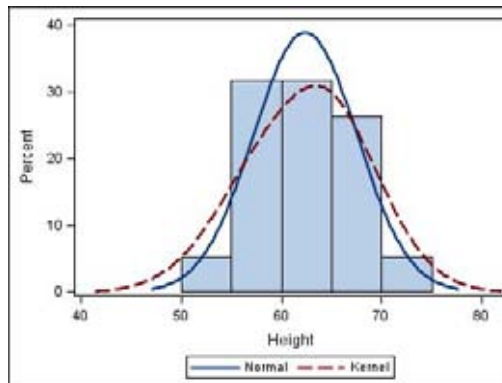
The following code creates a horizontal box plot:

```
proc sgplot data=sashelp.cars;
  hbox weight / category=origin;
run;
```



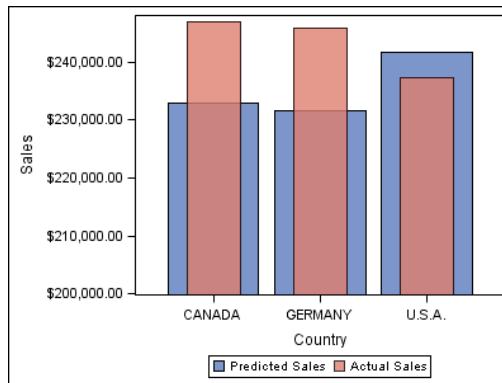
The following code creates a graph with two series plots:

```
proc sgplot data=sashelp.electric(
  where=(customer="Residential"));
  xaxis type=discrete;
  series x=year y=coal;
  series x=year y=naturalgas / y2axis;
run;
```



The following code 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;
```



The following code creates a graph with two bar charts:

```
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

### Plot Content

There are four basic types of plots that you can create with the SGPLOT procedure:

Basic plots

scatter, series, step, band, 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, and line plots

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 4.2** Plot Type Compatibility

	Basic	Fit and Confidence	Distribution	Categorization
Basic	x	x		
Fit and Confidence	x	x		
Distribution			x	
Categorization				x

*Note:* Box plots cannot be combined with any other plot types. △

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 162.

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 pattern and 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.

---

## 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 4.3** Measurement Units

Unit	Description
CM	centimeters
IN	inches
MM	millimeters
PCT or %	percentage
PT	point size, calculated at 100 dots per inch
PX	pixels

---

## 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. Figure 4.1 on page 129 shows the marker symbols that you can use.

**Figure 4.1** List of Marker Symbols

↓ <b>ArrowDown</b>	▽ <b>HomeDown</b>	~ <b>Tilde</b>	● <b>CircleFilled</b>
* <b>Asterisk</b>	I <b>Ibeam</b>	△ <b>Triangle</b>	◆ <b>DiamondFilled</b>
○ <b>Circle</b>	+ <b>Plus</b>	∪ <b>Union</b>	▼ <b>HomeDownFilled</b>
◇ <b>Diamond</b>	□ <b>Square</b>	× <b>X</b>	■ <b>SquareFilled</b>
> <b>GreaterThan</b>	☆ <b>Star</b>	Υ <b>Y</b>	★ <b>StarFilled</b>
# <b>Hash</b>	T <b>Tack</b>	Z <b>Z</b>	▲ <b>TriangleFilled</b>

---

## 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. Figure 4.2 on page 129 shows the line patterns that you can use.

**Figure 4.2** List of Line Patterns

Solid	—————	1
ShortDash	- - - - -	2
MediumDash	- - - - -	4
LongDash	- - - - -	5
MediumDashShortDash	- - - - -	8
DashDashDot	- - - - -	14
DashDotDot	- - - - -	15
Dash	- - - - -	20
LongDashShortDash	- - - - -	26
Dot	.....	34
ThinDot	.....	35
ShortDashDot	- - - - -	41
MediumDashDotDot	- - - - -	42

---

## Procedure Syntax

**Requirements:** At least one plot statement is required.

---

**PROC SGPLOT** < option(s)>;

**BAND** X= *variable* | Y= *variable*

**UPPER**= *numeric-value* | *numeric-variable* **LOWER**= *numeric-value* |  
*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)>;

```

HBOX response-variable </option(s)>;
HISTOGRAM response-variable </option(s)>;
HLINE category-variable </option(s)>;
INSET “text-string-1” <... “text-string-n”> | (label-list);
KEYLEGEND <“name-1” ... “name-n”> </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)>;
VBOX response-variable </option(s)>;
VECTOR X= numeric-variable Y= numeric-variable </option(s)>;
VLINE category-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.

**Requirements:** An input data set is required.

---

### Syntax

```

PROC SGPLOT <DATA= input-data-set>
  <CYCLEATTRS | NOCYCLEATTRS>
  < DESCRIPTION=“text-string”>
  <NOAUTOLEGEND>
  <TMPLOUT= “filename”>
  <UNIFORM= GROUP | SCALE | ALL>;

```

## Options

### CYCLEATTRS | NOCYCLEATTRS

specifies whether plots are drawn with unique attributes in the graph. By default, the SGPLOT 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.

### 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".

*Note:* You can disable the alternate text in HTML output by specifying an empty string. That is, **DESCRIPTION=""**. △

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

**Alias:** DES

### 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.

### TMPOUT= "*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.

### UNIFORM= GROUP | SCALE | ALL

specifies how to control axis scaling and marker attributes when you use a BY statement.

Specify one of the following values:

<i>ALL</i>	specifies that both the legend group values and the axis scaling are shared between all of the levels of the BY variable(s).
<i>GROUP</i>	specifies that the legend group values are shared between all of the levels of the BY variable(s).
<i>SCALE</i>	specifies that the axis scaling is shared between all of the levels of the BY variable(s).

By default, each level of the BY variable(s) can have different legend group values and different axis scaling.

*Note:* 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.

**Featured in:** Example 5 on page 219

---

### Syntax

**BAND** X= *variable* | Y= *variable*

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

*option(s)* can be one or more options from the following categories:

□ Band options:

FILL | NOFILL  
FILLATTRS= *style-element* | ( COLOR=*color*)  
LINEATTRS= *style-element* <(options)> | (options)  
MODELNAME= "*plot-name*"  
NOEXTEND  
NOMISSINGGROUP  
OUTLINE | NOOUTLINE

□ Plot options:

GROUP= *variable*  
LEGENDLABEL= "*text-string*"  
NAME= "*text-string*"  
TRANSPARENCY= *numeric-value*  
X2AXIS  
Y2AXIS

### 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.

**Options****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.

**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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\Delta$

**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.

**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 additionally specify suboptions to override specific appearance attributes.

*Note:* This option has no effect unless you also specify the OUTLINES option.  $\Delta$   
*options* can be one or more of the following:

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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.

**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.

**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.

**Interaction:** This option has no effect if you do not specify numeric values for the `UPPER=` and `LOWER=` options.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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`.

**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

**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.

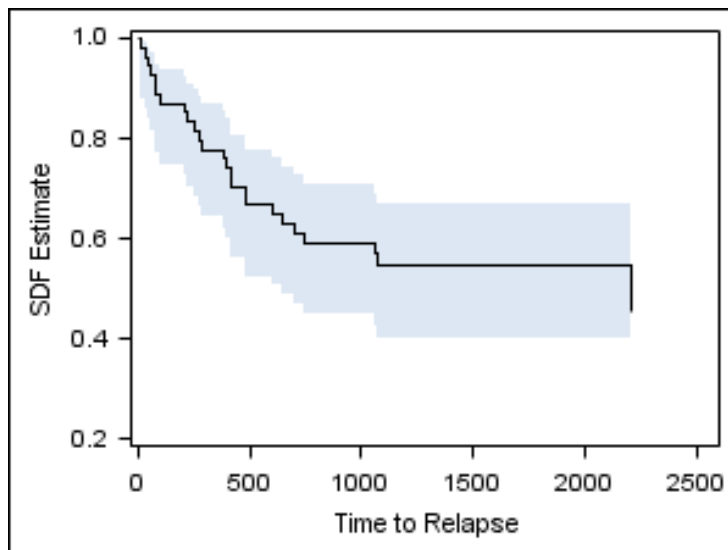
## Details

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:

```
band x=t upper=ucl lower=lcl / modelname="myname" transparency=.5;
step x=t y=survival / name="myname";
```

**Figure 4.3** Fitted Band Plot Example




---

## 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.

**Featured in:** Example 7 on page 221

### Syntax

**DENSITY** *response-variable* *</option(s)>*;

*option(s)* can be one or more options from the following categories:

- Density options:
  - FREQ= *numeric-variable*
  - LINEATTRS= *style-element <(options)> | (options)*
  - SCALE= *scaling-type*
  - TYPE = NORMAL *<(normal-opts)> | KERNEL <(kernel-opts)>*
- Plot options:
  - LEGENDLABEL= *"text-string"*
  - NAME= *"text-string"*
  - TRANSPARENCY= *numeric-value*

X2AXIS  
Y2AXIS

## Required Arguments

### ***response-variable***

specifies the variable for the x axis. The variable must be numeric.

## Options

### **FREQ= *numeric-variable***

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.

### **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.  $\Delta$

### **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 additionally specify suboptions to override specific appearance attributes.

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

#### **COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**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.

### **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.

*Note:* The PROPORTION scale can be used only when you combine a density plot and a histogram together.  $\Delta$

**Default:** DENSITY

**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

**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:

$$p(x) = \frac{100h\%}{\sigma\sqrt{2\pi}} \exp\left(-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2\right) \text{ for } -\infty < x < \infty$$

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:

$$\hat{f}_\lambda(x) = \frac{100h\%}{n\lambda} \sum_{i=1}^n K_0\left(\frac{x-x_i}{\lambda}\right)$$

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**

$$K_0(t) = 1 - |t| \text{ for } -|t| \leq 1$$

## 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 Content” on page 126.

**Featured in:** Example 6 on page 220

---

### Syntax

**DOT** *category-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

□ Dot options:

ALPHA= *numeric-value*  
 DATALABEL <= *variable*>  
 FREQ= *numeric-variable*  
 LIMITATTRS= *style-element* <(options)> | (options)  
 LIMITS= BOTH | LOWER | UPPER  
 LIMITSTAT= CLM | STDDEV | STDERR  
 MARKERATTRS= *style-element* <(options)> | (options)  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 RESPONSE= *numeric-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *character-variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= “*text-string*”  
 NAME= “*text-string*”  
 TRANSPARENCY= *numeric-value*

### Required Arguments

***category-variable***

specifies the variable that classifies the observations into distinct subsets.

## 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 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.

### **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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### **FREQ= *numeric-variable***

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.

### **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 additionally specify suboptions to override specific appearance attributes.

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

#### **COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

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 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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= color**

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

### NOSTATLABEL

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**WEIGHT= *numeric-variable***

specifies that 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.

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## ELLIPSE Statement

**Adds a confidence or prediction ellipse to another plot.**

**Featured in:** Example 4 on page 218

**Restriction:** The ELLIPSE statement must be used with another plot statement that uses numeric axes.

---

### Syntax

**ELLIPSE** X= *numeric-variable* Y= *numeric-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

□ Ellipse options:

ALPHA= *numeric-value*

CLIP

FILL | NOFILL

FILLATTRS= *style-element* | ( COLOR=*color*)

FREQ= *numeric-variable*

LINEATTRS= *style-element* <(options)> | (options)

OUTLINE | NOOUTLINE

TYPE = MEAN | PREDICTED

□ Plot options:

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-value*

X2AXIS

Y2AXIS

## Required Arguments

### **X= *numeric-variable***

specifies a numeric variable for the X axis.

### **Y= *numeric-variable***

specifies a numeric variable for the Y axis.

## Options

### **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.

### **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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\triangle$

**Default:** The default color is specified by the Color attribute of the GraphDataDefault style element in the current style.

### **FREQ= *numeric-variable***

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.

### **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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**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.

**OUTLINE | NOOUTLINE**

specifies whether the outlines of the ellipse are visible. 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 GraphEllipse style element in the current style.

**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.**

**Interaction:** The HBAR statement can be combined only with other categorization plot statements in the SGPLOT procedure. See “Plot Content” on page 126.

### Syntax

**HBAR** *category-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

□ Bar options:

ALPHA= *numeric-value*  
 BARWIDTH= *numeric-value*  
 DATALABEL  
 FILL | NOFILL  
 FILLATTRS= *style-element* < (*fill-options*) > | (*fill-options*)  
 FREQ= *numeric-variable*  
 LIMITATTRS= *style-element* <(*options*)> | (*options*)  
 LIMITS= BOTH | LOWER | UPPER  
 LIMITSTAT= CLM | STDDEV | STDERR  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 OUTLINE | NOOUTLINE  
 RESPONSE= *response-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= “*text-string*”  
 NAME= “*text-string*”  
 TRANSPARENCY= *numeric-value*

### Required Arguments

***category-variable***

specifies the variable that classifies the observations into distinct subsets.

## 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 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.

### **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 between .1 and 1.

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:** .8

### **DATALABEL**

adds data labels for bars. The values of the response variable appear at the end of the bars.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### **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

### **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. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option. △

**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.

### **FREQ= *numeric-variable***

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.

### **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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**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.

#### 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.

#### NOSTATLABEL

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

#### 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

#### 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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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.

## 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.

**Featured in:** Example 8 on page 222

### Description

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 4.4** Parts of a Box Plot

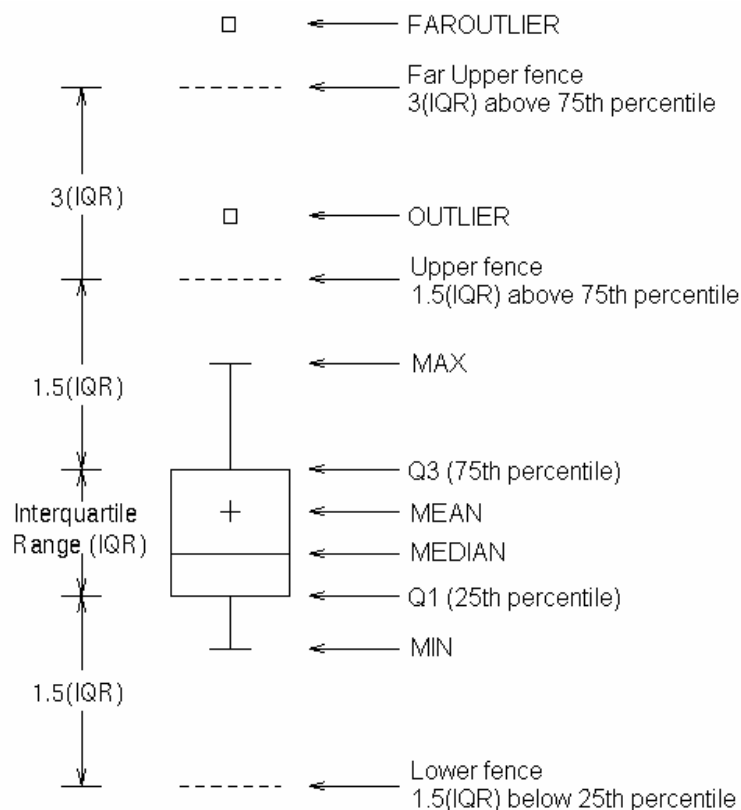


Figure 4.4 on page 150 shows a diagram of a vertical box plot. The bottom and top edges of the box indicate the *intra-quartile range* (IQR). That is, the range of values between the first and third quartiles (the 25th and 75th percentiles). The marker inside the box indicates the mean value. The line 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, but are close enough not to be considered outliers (a distance less than or equal to  $1.5 \times \text{IQR}$ ). 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  $1.5 \times \text{IQR}$  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  $3 \times \text{IQR}$  from the box have data labels.

## Syntax

HBOX *response-variable* *</ option(s)>*;

*option(s)* can be one or more options from the following categories:

- Box options:
  - BOXWIDTH= *numeric-value*
  - CATEGORY= *category-variable*
  - DATALABEL *<= variable>*
  - EXTREME
  - FREQ= *numeric-variable*
  - LABELFAR
  - MISSING
  - PERCENTILE= *numeric-value*
  - SPREAD
- Plot options:
  - LEGENDLABEL= "*text-string*"
  - NAME= "*text-string*"
  - TRANSPARENCY= *numeric-value*
  - X2AXIS
  - Y2AXIS

## Required Arguments

### *response-variable*

specifies the response variable for the plot. If you do not specify the CATEGORY= option, then one box is created for the response variable.

## Options

### **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

### **CATEGORY= *category-variable***

specifies the category variable for the plot. A box plot is created for each distinct value of the category variable.

### **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 do not specify a variable, then the values of the response variable are used.

*Note:* This option has no effect if the plot does not contain outlier points.  $\triangle$

### **EXTREME**

specifies that the whiskers can extend to the maximum and minimum values for the response 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.

### **FREQ= *numeric-variable***

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.

### **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.  $\triangle$

### **LEGENDLABEL= “*text-string*”**

specifies a label that identifies the box plot in the legend. By default, the label of the response variable is used.

### **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.

### **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 response variable.  $\triangle$

**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

**X2AXIS**

assigns the response variable to the secondary (top) horizontal axis.

**Y2AXIS**

assigns the category variable to the secondary (right) vertical axis.

---

## 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.

**Featured in:** Example 7 on page 221

---

**Syntax**

**HISTOGRAM** *response-variable* *</ option(s)>*;

*option(s)* can be one or more options from the following categories:

□ Histogram options:

BOUNDARY= LOWER | UPPER

FILL | NOFILL

FILLATTRS= *style-element* | (COLOR= *color*)

FREQ= *numeric-variable*

OUTLINE | NOOUTLINE

SCALE= COUNT | PERCENT | PROPORTION

SHOWBINS

□ Plot options:

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-value*

X2AXIS

Y2AXIS

**Required Arguments*****response-variable***

specifies the response variable for the histogram.

## Options

### 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.

### 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. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\triangle$

**Default:** The default color is specified by the Color attribute of the GraphDataDefault style element in the current style.

### FREQ= *numeric-variable*

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.

### 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.

### 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.

### 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 plot. 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 Content” on page 126.

---

### Syntax

**HLINE** *category-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ Line options:

ALPHA= *numeric-value*  
 BREAK  
 CURVELABEL <= *text-string*>  
 CURVELABELPOS= MIN | MAX | START | END  
 DATALABEL <= *variable*>  
 FREQ= *numeric-variable*  
 LIMITATTRS= *style-element*<(options)> | (options)  
 LIMITS= BOTH | LOWER | UPPER  
 LIMITSTAT= CLM | STDDEV | STDERR  
 LINEATTRS= *style-element* <(options)> | (options)  
 MARKERATTRS= *style-element* <(options)> | (options)  
 MARKERS  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 RESPONSE= *response-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *character-variable*  
 WEIGHT= *numeric-variable*

- Plot options:
  - GROUP= *variable*
  - LEGENDLABEL= "*text-string*"
  - NAME= "*text-string*"
  - TRANSPARENCY= *numeric-value*
  - X2AXIS
  - Y2AXIS

## Required Arguments

### **category-variable**

specifies the variable that classifies the observations into distinct subsets.

## 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 LIMITSTAT=CLM.

If your plot is overlaid with other summary plots, then the first ALPHA value that you specify is used for all of the plots.

### **BREAK**

creates a break in the line for each missing value for the category variable.

### **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.

### **CURVELABELPOS= MIN | MAX | START | END**

specifies the location of the curve label. Specify one of the following values:

MIN

places the curve label at the minimum value for the response axis.

MAX

places the curve label at the maximum value for the response axis.

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

### **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.

### **FREQ= *numeric-variable***

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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

*Note:* Limit lines are displayed only when you specify `STAT= MEAN`.  $\triangle$

**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 additionally specify suboptions to override specific appearance attributes.

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

`COLOR= color`

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

`COLOR= color`

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

## NOSTATLABEL

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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

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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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.

**Syntax**

**INSET** *“text-string-1” <... “text-string-n”>* *</ option(s)>*;

**INSET** (*label-list*) *</ option(s)>*;

*option(s)* can be one or more of the following:

BORDER | NOBORDER

LABELALIGN= LEFT | CENTER | RIGHT

POSITION= *position-value*

TEXTATTRS= *style-element*

TITLE= *“text-string”*

TITLEATTRS= *style-element*

VALUEALIGN= LEFT | CENTER | RIGHT

**Required Arguments**

*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”)`

For example, `(‘‘My label 1’’ = ‘‘My value 1’’ ‘‘My label 2’’ = ‘‘My value 2’’)`.

## Options

### **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***

specifies the appearance of the text in the text box.

**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***

specifies the appearance of the title for the text box.

**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.**

**Featured in:** Example 4 on page 218, Example 5 on page 219, Example 7 on page 221

---

**Syntax**

**KEYLEGEND** <“*name-1*” ... “*name-n*”> </ *option(s)*>;

*option(s)* can be any of the following:

ACROSS= *n*

BORDER | NOBORDER

DOWN= *n*

LOCATION= OUTSIDE | INSIDE

POSITION= *position-value*

TITLE= “*text-string*”

**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. △

## Options

### 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

### POSITION= *position-value*

specifies the position of the legend within the graph. The positions are as follows:

<i>BOTTOM</i>	places the legend at the bottom of the graph.
<i>BOTTOMLEFT</i>	places the legend at the bottom left corner of the graph.
<i>BOTTOMRIGHT</i>	places the legend at the bottom right corner of the graph.
<i>LEFT</i>	places the legend at the left side of the graph.
<i>RIGHT</i>	places the legend at the right side of the graph.
<i>TOP</i>	places the legend at the top of the graph.
<i>TOPLEFT</i>	places the legend at the top left corner of the graph.
<i>TOPRIGHT</i>	places the legend at the top right corner of the graph.

*Note:* By default, if you use more than one KEYLEGEND statement, then each legend is placed in a different position. △

*Note:* If you specify more than one legend with the same position, then all of your legends are placed at that position. △

**Default:** BOTTOM

### TITLE= "*text-string*"

specifies a title for the legend.

## LOESS Statement

Creates a fitted loess curve.

### Syntax

**LOESS** *X= numeric-variable Y= numeric-variable* *</ option(s)>;*

*option(s)* can be one or more options from the following categories:

□ LOESS options:

ALPHA= *numeric-value*  
 CLM <= "text-string">  
 CLMATTRS= *style-element*  
 CLMTRANSPARENCY= *numeric-value*  
 CURVELABEL <= "text-string">  
 CURVELABELLOC= OUTSIDE | INSIDE  
 CURVELABELPOS= MIN | MAX | START | END  
 DATALABEL <= *variable*>  
 DEGREE= 1 | 2  
 INTERPOLATION= CUBIC | LINEAR  
 LINEATTRS= *style-element* *<(options)> | (options)*  
 MARKERATTRS= *style-element* *<(options)> | (options)*  
 MAXPOINTS= *n*  
 NOLEGCLM  
 NOLEGFIT  
 NOMARKERS  
 REWEIGHT= *n*  
 SMOOTH= *numeric-value*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "text-string"  
 NAME= "text-string"  
 X2AXIS  
 Y2AXIS

### Required Arguments

**X= *numeric-variable***

specifies the variable for the x axis.

**Y= *numeric-variable***

specifies the variable for the y axis.

## 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).

*Note:* This option has no effect if you do not specify the CLM option.  $\Delta$

**Default:** .05

### **CLM <= "text-string">**

creates confidence limits. The optional text string overrides the default legend label for the confidence limit.

### **CLMATTRS = *style-element***

specifies the appearance of the confidence limits by using an ODS style element.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

### **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).

*Note:* This option has no effect if you do not specify the CLM option.  $\Delta$

**Default:** 0.0

### **CURVELABEL <= "text-string">**

adds a label for the loess 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= MIN | MAX | START | END**

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.

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

### **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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**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. See "Marker Symbols" on page 128 for a list of valid marker symbols.

**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.

**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.

*Note:* This option has no affect if you do not specify the WEIGHT option.  $\Delta$

**Default:** 0

**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 that 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:

$$\text{minimum} = \frac{\text{degree} + 1}{\text{number of observations}}$$

---

**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.

---

**Syntax**

**NEEDLE** X= *variable* Y= *numeric-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

□ NEEDLE options:

BASELINE= *numeric-value*

DATALABEL <= *variable*>

LINEATTRS= *style-element* <(options)> | (options)

MARKERATTRS= *style-element* <(options)> | (options)

MARKERS

NOMISSINGGROUP

URL= *character-variable*

□ Plot options:

GROUP= *variable*

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-value*

X2AXIS

Y2AXIS

**Required Arguments**

**X= *variable***

specifies the variable for the x axis.

**Y= *numeric-variable***  
 specifies the variable for the y axis.

## Options

**BASELINE= *numeric-value***  
 specifies a value on the Y axis for the baseline.

**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.

**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 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 additionally specify suboptions to override specific appearance attributes.  
*options* can be one or more of the following:

**COLOR= *color***  
 specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.  
**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.  
**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

**NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**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.

**Syntax**

**PBSPLINE** *x= numeric-variable y= numeric-variable* *</ options>*;

*option(s)* can be one or more options from the following categories:

□ PBSPLINE options:

ALPHA= *numeric-value*  
 CLI <= "text-string">  
 CLIATTRS= *style-element*  
 CLM <= "text-string">  
 CLMATTRS= *style-element*  
 CLMTRANSPARENCY= *value*  
 CURVELABEL <= "text-string">  
 CURVELABELLOC= OUTSIDE | INSIDE  
 CURVELABELPOS= MIN | MAX | START | END  
 DATALABEL <= *variable*>  
 DEGREE= *n*  
 FREQ= *numeric-variable*  
 LINEATTRS= *style-element* *<(options)>* | *(options)*  
 MARKERATTRS= *style-element* *<(options)>* | *(options)*  
 MAXPOINTS= *n*  
 NKNOTS= *n*  
 NOLEGCLI  
 NOLEGCLM  
 NOLEGFIT  
 NOMARKERS  
 SMOOTH= *numeric-value*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "text-string"  
 NAME= "text-string"  
 X2AXIS  
 Y2AXIS

## Required Arguments

**X= *numeric-variable***

specifies the variable for the x axis.

**Y= *numeric-variable***

specifies the variable for the y axis.

## 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).

*Note:* This option has no effect if you do not specify either the CLI option or CLM option.  $\Delta$

**Default:** .05

**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***

specifies the appearance of the individual value prediction limits by using an ODS style element.

**Default:** The default appearance of the prediction limits is specified by the GraphPredictionLimits style element in the current style.

**CLM <= "*text-string*">**

creates confidence limits for the mean predicted values. The optional text string overrides the default legend label for the confidence limits.

**CLMATTRS = *style-element***

specifies the appearance of the mean value confidence limits by using an ODS style element.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**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).

*Note:* This option has no effect if you do not specify the CLM option.  $\Delta$

**Default:** 0.0

**CURVELABEL <= "*text-string*">**

adds a label for the spline curve. You can also specify the label text. If you do not specify a label, then 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= MIN | MAX | START | END**

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.

**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

**DATALABEL <= variable>**

displays a label for each scatter 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.

**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 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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

**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 that 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:

$$\text{minimum} = \frac{\text{degree} + 1}{\text{number of observations}}$$

---

## REFLINE Statement

**Creates a horizontal or vertical reference line.**

### Syntax

**REFLINE** *variable* | *value-1* <... *value-n*> </ *option(s)*>;

*option(s)* can be one or more options from the following categories:

□ REFLINE options:

AXIS= X | X2 | Y | Y2

LABEL <= ("*text-string-1*" ... "*text-string-n*")>

LABELLOC= INSIDE | OUTSIDE

LABELPOS= AUTO | MIN | MAX

LINEATTRS= *style-element* <(options)> | (options)

NOCLIP

- Plot options:
  - LEGENDLABEL= *“text-string”*
  - NAME= *“text-string”*
  - TRANSPARENCY= *numeric-value*

## Required Arguments

### *variable*

draws a reference line for each value of the specified variable.

**Restriction:** This argument is available with SAS 9.2 Phase 2 and later.

### *value-1 <... value-n>*

draws one or more reference lines at the values that you specify.

## Options

### 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

### 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:** INSIDE

### LABELPOS= AUTO | 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. 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 additionally specify suboptions to override specific appearance attributes.

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

### COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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.

**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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Featured in:** Example 3 on page 217

---

### Syntax

**REG** *X= numeric-variable Y= numeric-variable* *</ option(s)>*;

*option(s)* can be one or more options from the following categories:

□ REG options:

ALPHA= *numeric-value*

CLI <= “*text-string*”>

CLIATTRS= *style-element*

CLM <= “*text-string*”>

CLMATTRS= *style-element*

CLMTRANSPARENCY= *value*

CURVELABEL <= “*text-string*”>

CURVELABELLOC= OUTSIDE | INSIDE

CURVELABELPOS= MIN | MAX | START | END  
 DATALABEL <= *variable*>  
 DEGREE= *n*  
 FREQ= *numeric-variable*  
 LINEATTRS= *style-element* <(options)> | (options)  
 MARKERATTRS= *style-element* <(options)> | (options)  
 MAXPOINTS= *n*  
 NOLEGCLI  
 NOLEGCLM  
 NOLEGFIT  
 NOMARKERS  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "*text-string*"  
 NAME= "*text-string*"  
 X2AXIS  
 Y2AXIS

## Required Arguments

**X= *numeric-variable***

specifies the variable for the x axis.

**Y= *numeric-variable***

specifies the variable for the y axis.

## 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).

*Note:* This option has no effect if you do not specify either the CLI option or CLM option. △

**Default:** .05

**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***

specifies the appearance of the individual value prediction limits by using an ODS style element.

**Default:** The default appearance of the prediction limits is specified by the GraphPredictionLimits style element in the current style.

**CLM <= "*text-string*">**

creates confidence limits for the mean predicted values. The optional text string overrides the default legend label for the confidence limits.

**CLMATTRS = *style-element***

specifies the appearance of the mean value confidence limits by using an ODS style element.

**Default:** The default appearance of the confidence limits is specified by the GraphConfidence style element in the current style.

**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).

*Note:* This option has no effect if you do not specify the CLM option.  $\Delta$

**Default:** 0.0

**CURVELABEL <=“*text-string*”>**

adds a label for the regression curve. You can also specify the label text. If you do not specify a label, then 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= MIN | MAX | START | END**

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.

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

**DATALABEL <= *variable*>**

displays a label for each scatter 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 value of the Y variable is used for the data label.

**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 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.

**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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

**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 that 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.

---

## SCATTER Statement

**Creates a scatter plot.**

**Featured in:** Example 1 on page 215, Example 4 on page 218, Example 5 on page 219

---

### Syntax

**SCATTER** X= *variable* Y= *variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ SCATTER options:

DATALABEL <= *variable*>  
 ERRORBARATTRS= *style-element*<(options)> | (options)  
 FREQ= *numeric-variable*  
 MARKERATTRS= *style-element* <(options)> | (options)  
 MARKERCHAR= *variable*  
 MARKERCHARATTRS= *style-element* <(options)> | (options)  
 NOMISSINGGROUP  
 URL= *character-variable*  
 XERRORLOWER= *numeric-variable*  
 XERRORUPPER= *numeric-variable*  
 YERRORLOWER= *numeric-variable*  
 YERRORUPPER= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "*text-string*"  
 NAME= "*text-string*"  
 TRANSPARENCY= *numeric-value*  
 X2AXIS  
 Y2AXIS

## Required Arguments

**X= *variable***

specifies the variable for the x axis.

**Y= *variable***

specifies the variable for the y axis.

## Options

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the `LineThickness` attribute of the `GraphError` style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**FREQ=** *numeric-variable*

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.

**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 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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

**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.

*Note:* The MARKERCHAR= option overrides the DATALABEL= option and the SYMBOL= suboption of the MARKERS= option.  $\triangle$

**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 additionally 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. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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.

**NOMISSINGGROUP**

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**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.

**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.

---

## SERIES Statement

**Creates a line plot.**

**Featured in:** Example 2 on page 216

---

**Syntax**

**SERIES** X= *variable* Y= *variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ SERIES options:

BREAK

CURVELABEL <= *text-string*>

CURVELABELLOC= INSIDE | OUTSIDE

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

LINEATTRS= *style-element* <(options)> | (options)

MARKERATTRS= *style-element* <(options)> | (options)

MARKERS  
 NOMISSINGGROUP  
 URL= *character-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "*text-string*"  
 NAME= "*text-string*"  
 TRANSPARENCY= *numeric-value*  
 X2AXIS  
 Y2AXIS

## Required Arguments

**X= *variable***

specifies the variable for the x axis.

**Y= *variable***

specifies the variable for the y axis.

## Options

**BREAK**

creates a break in the line for each missing value for the Y variable.

**CURVELABEL <="text-string">**

adds a label for the series curve. You can also specify the label text. If you do not specify a label, then 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= MIN | MAX | START | END**

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.

**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

**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.

**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 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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the markers. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

## NOMISSINGGROUP

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

## 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.

---

## Syntax

**STEP** *X= variable Y= numeric-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ STEP options:

BREAK

CURVELABEL <= *text-string*>

CURVELABELLOC= INSIDE | OUTSIDE

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

ERRORBARATTRS= *style-element* <(options)> | (options)

JUSTIFY= LEFT | CENTER | RIGHT

LINEATTRS= *style-element* <(options)> | (options)

MARKERATTRS= *style-element* <(options)> | (options)

MARKERS

NOMISSINGGROUP

URL= *character-variable*

YERRORLOWER= *numeric-variable*

YERRORUPPER= *numeric-variable*

□ Plot options:

GROUP= *variable*

LEGENDLABEL= "*text-string*"

NAME= "*text-string*"

TRANSPARENCY= *numeric-value*

X2AXIS

Y2AXIS

## Required Arguments

**X= *variable***

specifies the variable for the x axis.

**Y= *numeric-variable***

specifies the variable for the y axis.

## Options

**BREAK**

creates a break in the line for each missing value for the Y variable.

**CURVELABEL <= "*text-string*">**

adds a label for the step curve. You can also specify the label text. If you do not specify a label, then 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= MIN | MAX | START | END**

specifies the location of the curve label. Specify one of the following values:

MIN

places the curve label at the minimum value for the response axis.

MAX

places the curve label at the maximum value for the response axis.

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

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**JUSTIFY= LEFT | CENTER | RIGHT**

specifies the location of each step relative to its data point. Figure 4.5 on page 191 shows the effect of each option:

**Figure 4.5** 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=** *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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

## NOMISSINGGROUP

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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

## 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 SGPLOT procedure. See “Plot Content” on page 126.

**Featured in:** Example 9 on page 222

### Syntax

**VBAR** *category-variable* </ option(s)>;

*option(s)* can be one or more options from the following categories:

□ Bar options:

ALPHA= *numeric-value*  
 BARWIDTH= *numeric-value*  
 DATALABEL  
 FILL | NOFILL  
 FILLATTRS= *style-element* < (*fill-options*) > | (*fill-options*)  
 FREQ= *numeric-variable*  
 LIMITATTRS= *style-element* <(*options*)> | (*options*)  
 LIMITS= BOTH | LOWER | UPPER  
 LIMITSTAT= CLM | STDDEV | STDERR  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 OUTLINE | NOOUTLINE  
 RESPONSE= *response-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *character-variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= “*text-string*”  
 NAME= “*text-string*”  
 TRANSPARENCY= *numeric-value*

### Required Arguments

***category-variable***

specifies the variable that classifies the observations into distinct subsets.

## 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 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.

### **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 between .1 and 1.

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:** .8

### **DATALABEL**

adds data labels for bars. The values of the response variable appear at the end of the bars.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

### **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

### **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. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *SAS/GRAPH: Reference*.

*Note:* This option has no effect if you specify the NOFILL option.  $\triangle$

**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.

### **FREQ= *numeric-variable***

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.

### **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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

**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.

**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.

**NOSTATLABEL**  
removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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

**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.  
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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify `IMAGEMAP` in the ODS `GRAPHICS` statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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.

---

## 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.

---

### Description

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.

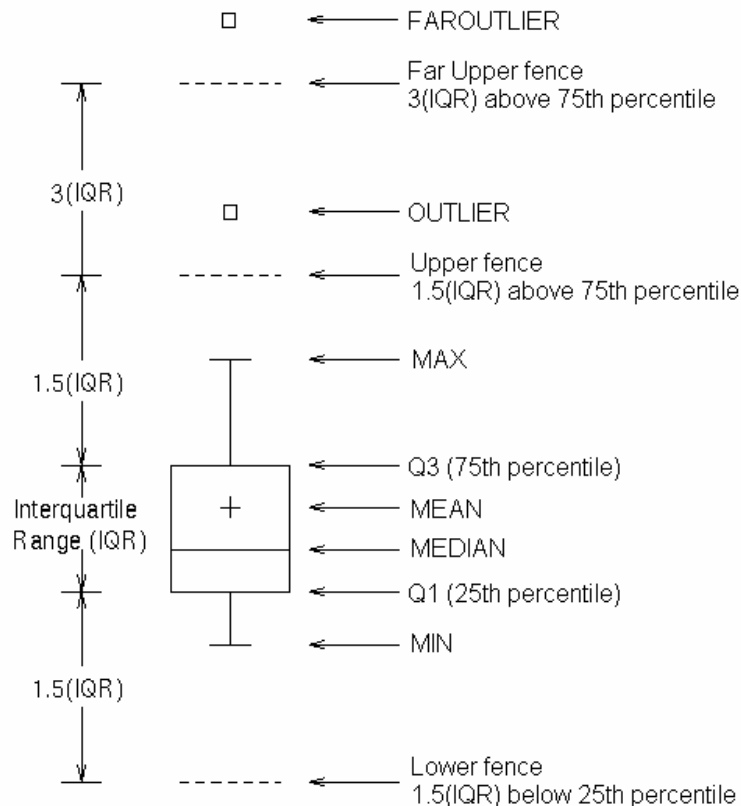
**Figure 4.6** Parts of a Box Plot

Figure 4.6 on page 198 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, but are close enough not to be considered outliers (a distance less than or equal to  $1.5 \times \text{IQR}$ ). 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  $1.5 \times \text{IQR}$  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  $3 \times \text{IQR}$  from the box have data labels.

## Syntax

VBOX *response-variable* *</option(s)>*;

*option(s)* can be one or more options from the following categories:

□ Box options:

BOXWIDTH= *numeric-value*

CATEGORY= *category-variable*

DATALABEL *<= variable>*

EXTREME  
 FREQ= *numeric-variable*  
 LABELFAR  
 MISSING  
 PERCENTILE= *numeric-value*  
 SPREAD  
 □ Plot options:  
   LEGENDLABEL= "*text-string*"  
   NAME= "*text-string*"  
   TRANSPARENCY= *numeric-value*  
   X2AXIS  
   Y2AXIS

## Required Arguments

### ***response-variable***

specifies the response variable for the plot. If you do not specify the CATEGORY= option, then one box is created for the response variable.

## Options

### **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

### **CATEGORY= *category-variable***

specifies the category variable for the plot. A box plot is created for each distinct value of the category variable.

### **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 do not specify a variable, then the values of the response variable are used.

*Note:* This option has no effect if the plot does not contain outlier points.  $\Delta$

### **EXTREME**

specifies that the whiskers can extend to the maximum and minimum values for the response 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.

### **FREQ= *numeric-variable***

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.

### **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.  $\triangle$

**LEGENDLABEL=** *“text-string”*

specifies a label that identifies the box plot in the legend. By default, the label of the response variable is used.

**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.

**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 response variable.  $\triangle$

**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

**X2AXIS**

assigns the category variable to the secondary (top) horizontal axis.

**Y2AXIS**

assigns the response variable to the secondary (right) vertical axis.

---

## VECTOR Statement

**Creates a vector plot that draws arrows from a point of origin to each data point.**

**Restriction:** This statement is available with SAS 9.2 Phase 2 and later.

---

**VECTOR** *X= numeric-variable Y= numeric-variable* *</ option(s)>*;

*option(s)* can be one or more of the following:

☐ Vector options:

ARROWDIRECTION= OUT | IN | BOTH

ARROWHEADSHAPE= *shape*

DATALABEL *<= variable>*

LINEATTRS= *style-element <(options)> | (options)*

NOARROWHEADS  
 NOMISSINGGROUP  
 XORIGIN= *numeric-value* | *numeric-variable*  
 YORIGIN= *numeric-value* | *numeric-variable*  
 □ Plot options:  
   GROUP= *variable*  
   LEGENDLABEL= "*text-string*"  
   NAME= "*text-string*"  
   TRANSPARENCY= *numeric-value*  
   X2AXIS  
   Y2AXIS

## Required Arguments

**X= *numeric-variable***  
 specifies a numeric variable for the x axis.

**Y= *numeric-variable***  
 specifies numeric variable for the y axis.





## Options

**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

**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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR** *= color*

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**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.

**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 plot (the line is horizontal). You can use the VLINE statement with the VBAR statement to create a bar-line chart.**

**Featured in:** Example 9 on page 222

**Interaction:** The VLINE statement can be combined only with other categorization plot statements in the SGPLOT procedure. See “Plot Content” on page 126.

---

**Syntax**

**VLINE** *category-variable* < / option(s)>;

*option(s)* can be one or more options from the following categories:

□ Line options:

ALPHA= *numeric-value*

BREAK

CURVELABEL <= *text-string*>

CURVELABELPOS= MIN | MAX | START | END

DATALABEL <= *variable*>

FREQ= *numeric-variable*

LIMITATTRS= *style-element*<(options)> | (options)

LIMITS= BOTH | LOWER | UPPER

LIMITSTAT= CLM | STDDEV | STDERR

LINEATTRS= *style-element* <(options)> | (options)

MARKERATTRS= *style-element* <(options)> | (options)

MARKERS  
 MISSING  
 NOSTATLABEL  
 NUMSTD= *n*  
 RESPONSE= *response-variable*  
 STAT= FREQ | MEAN | SUM  
 URL= *character-variable*  
 WEIGHT= *numeric-variable*

□ Plot options:

GROUP= *variable*  
 LEGENDLABEL= "*text-string*"  
 NAME= "*text-string*"  
 TRANSPARENCY= *numeric-value*  
 X2AXIS  
 Y2AXIS

## Required Arguments

### ***category-variable***

specifies the variable that classifies the observations into distinct subsets.

## 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 LIMITSTAT=CLM.

If your plot is overlaid with other summary plots, then the first ALPHA value that you specify is used for all of the plots.

### **BREAK**

creates a break in the line for each missing value.

### **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.

### **CURVELABELPOS= MIN | MAX | START | END**

specifies the location of the curve label. Specify one of the following values:

MIN

places the curve label at the minimum value for the response axis.

MAX

places the curve label at the maximum value for the response axis.

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

**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.

**FREQ**= *numeric-variable*

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.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR**= *color*

specifies the color of the line. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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. See "Line Patterns" on page 129 for a list of line patterns.

**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. See "Units of Measurement" on page 128 for a list of the measurement units that are supported.

**Default:** The default line thickness is specified by the LineThickness attribute of the GraphError style element in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

*Note:* Limit lines are displayed only when you specify STAT= MEAN.  $\triangle$

**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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 129 for a list of line patterns.

**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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Units of Measurement” on page 128 for a list of the measurement units that are supported.

**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. See “Marker Symbols” on page 128 for a list of valid marker symbols.

**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.

**NOSTATLABEL**

removes the statistic name from the axis and legend labels.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.

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.

**Interaction:** This option affects graphics output that is created through the ODS HTML destination only.

This option has no effect unless you also specify IMAGEMAP in the ODS GRAPHICS statement.

**Default:** By default, no HTML links are created.

**WEIGHT= *numeric-variable***

specifies that 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.

---

## XAXIS, X2AXIS, YAXIS, Y2AXIS Statements

specify the axis options for each plot axis.

**Description**

The XAXIS, X2AXIS, YAXIS, and Y2AXIS statements specify options for the plot axes. You can control the features of the axis (for example, the axis label, grid lines, and

minor tick marks) and you can also control the structure of the axis (for example, the data range, data type, and tick mark values).

The XAXIS, X2AXIS, YAXIS, and Y2AXIS statements correspond to the axes as follows:

XAXIS	specifies options for the X axis.
X2AXIS	specifies options for the X2 axis.
YAXIS	specifies options for the Y axis.
Y2AXIS	specifies options for the Y2 axis.

## Syntax

**XAXIS** *option(s)*;

**X2AXIS** *option(s)*;

**YAXIS** *option(s)*;

**Y2AXIS** *option(s)*;

*option(s)* can be one or more options from the following:

DISCRETEORDER= DATA | FORMATTED | UNFORMATTED

DISPLAY= ALL | NONE | (*options*)

FITPOLICY= *policy-value*

GRID

INTEGER

INTERVAL= *interval-value*

LABEL= "*text-string*"

LOGBASE= 2 | 10 | e

LOGSTYLE= LINEAR | LOGEXPAND | LOGEXPONENT

MAX= *numeric-value*

MIN= *numeric-value*

MINOR

NOTIMESPLIT

OFFSETMAX= *numeric-value*

OFFSETMIN= *numeric-value*

REFTICKS

TICKVALUEFORMAT= DATA | *sas-format*

TYPE= DISCRETE | LINEAR | LOG | TIME

VALUES= ( *value-1* < ... *value-n* > )

VALUESHINT

## Options

**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 does not affect vertical 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.

**HOURL**

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

**Restriction:** This options is available with SAS 9.2 Phase 2 and later.

**LABEL=** *“text-string”*

specifies a label for the axis.

**LOGBASE=** 2 | 10 | e

specifies the base value for the logarithmic scale.

**Default:** 10

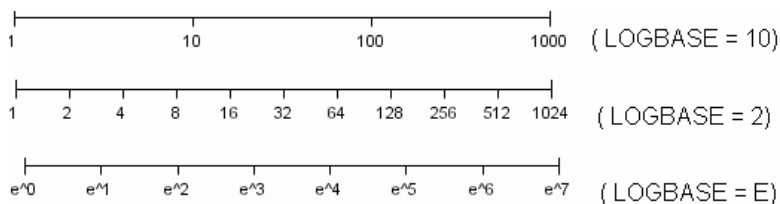
**Interaction:** This option has no effect unless you also specify TYPE=LOG.

**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 4.7 on page 211.

**Figure 4.7** 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 4.8 on page 212.

**Figure 4.8** 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 4.9 on page 212.

**Figure 4.9** 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.

**Interaction:** This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

**Restriction:** This option affects linear and time axes only .

**MIN= *numeric-value***

specifies the minimum value for the axis.

**Interaction:** This option has no effect if you specify the VALUES= option and you do not also specify the VALUESHINT option.

**Restriction:** This option affects linear and time axes only .

**MINOR**

adds minor tick marks to the axis.

**Interaction:** This option has no effect if you specify the VALUES= option.

**Restriction:** This option has no effect on discrete axes.

**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 the amount of offset space between the last tick mark on the axis and the edge of the plot area. Specify a value between 0 and 1. The value represents the offset as a proportion to the total length of the axis. For example, .12 specifies that the offset space for the last tick mark is 12% of the total axis length.

By default, the offset space is determined automatically based on the tick mark values, markers, and labels that are inside of the plot area.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**OFFSETMIN= *numeric-value***

specifies the amount of offset space between the first tick mark on the axis and the edge of the plot area. Specify a value between 0 and 1. The value represents the offset as a proportion to the total length of the axis. For example, .12 specifies that the offset space for the first tick mark is 12% of the total axis length.

By default, the offset space is determined automatically based on the tick mark values, markers, and labels that are inside of the plot area.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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.  $\Delta$

**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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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. Additionally, 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 that do not have date or time formats.
LOG	specifies a logarithmic scale for the axis. This axis type is never a default.  <b>Interaction:</b> 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.

**VALUES= ( *values-list* )**

specifies the values for the ticks on the axis.

For values on a numeric 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.

You can also create ticks in descending order by using a negative increment value. For example, **VALUES= (100 to 0 by -25)** creates tick marks at 100, 75, 50, 25, and 0.

*<value ... value-n> value-1 TO value-2 BY increment-value <value ... value-n>*  
 creates ticks for specific values, and additionally 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 on page 210.

**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.

#### **VALUESHINT**

specifies that the minimum and maximum axis values are determined independently of the values 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.

*Note:* This option has no effect unless you also specify the **VALUES=** option.   △

---

## Examples

---

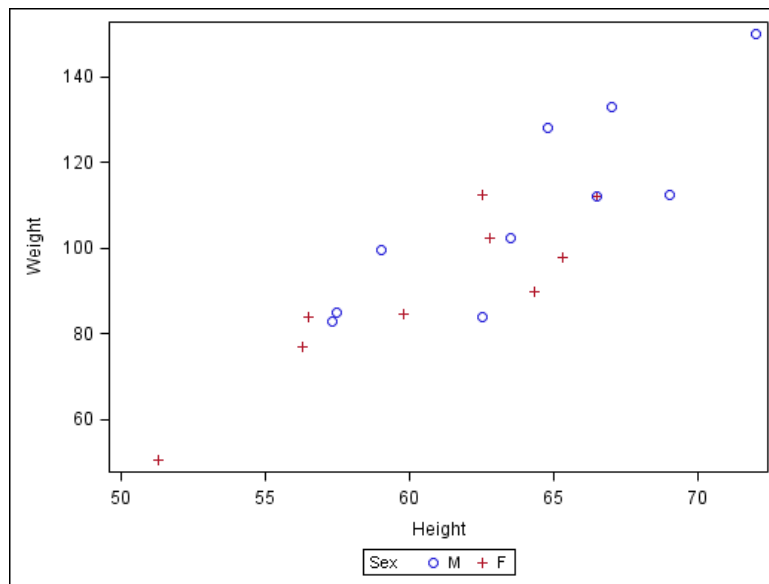
### Example 1: Grouping a Scatter Plot

Procedure features:

SCATTER statement

Sample library member: GSGPLSCT

---



This example shows a simple scatter plot with grouped data.

**Create the scatter plot.** In the SCATTER statement, the GROUP= option groups the data by the SEX variable.

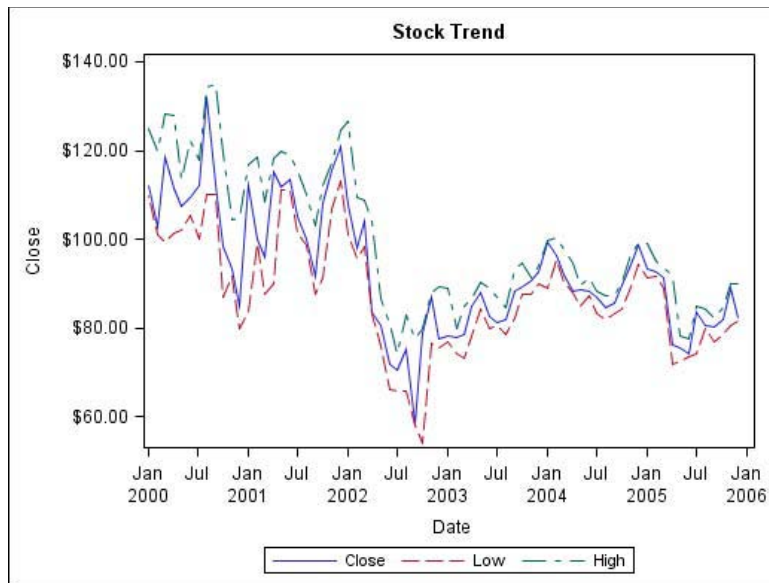
```
proc sgplot data=sashelp.class;  
  scatter x=height y=weight / group=sex;  
run;
```

## Example 2: Plotting Three Series

Procedure features:

SERIES statement

Sample library member: GSGPLSER



This example shows a series plot with three series on the Y axis.

### 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;
```

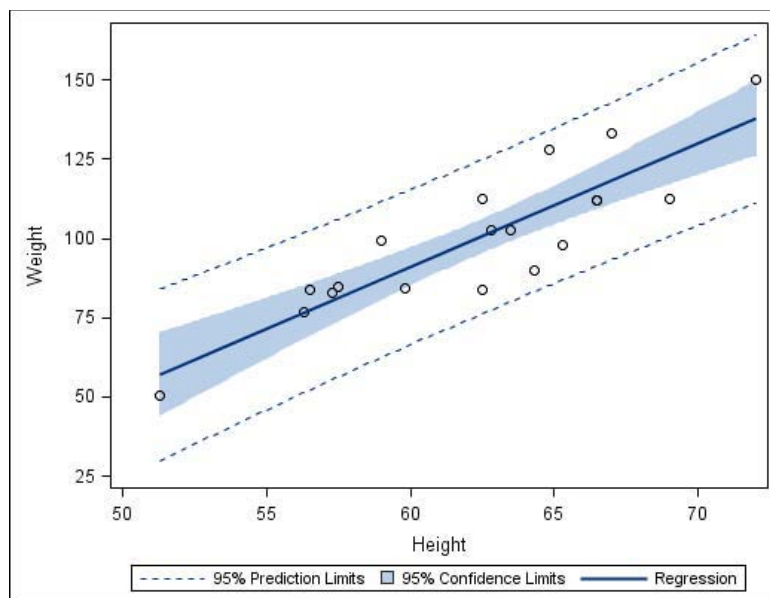
---

## Example 3: Adding Prediction and Confidence Bands to a Regression Plot

Procedure features: REG statement

Sample library member: GSGPLREG

---



This example shows a regression plot with prediction and confidence limits.

**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.

```
proc sgplot data=sashelp.class;  
  reg x=height y=weight / CLM CLI;  
run;
```

## Example 4: Adding a Prediction Ellipse to a Scatter Plot

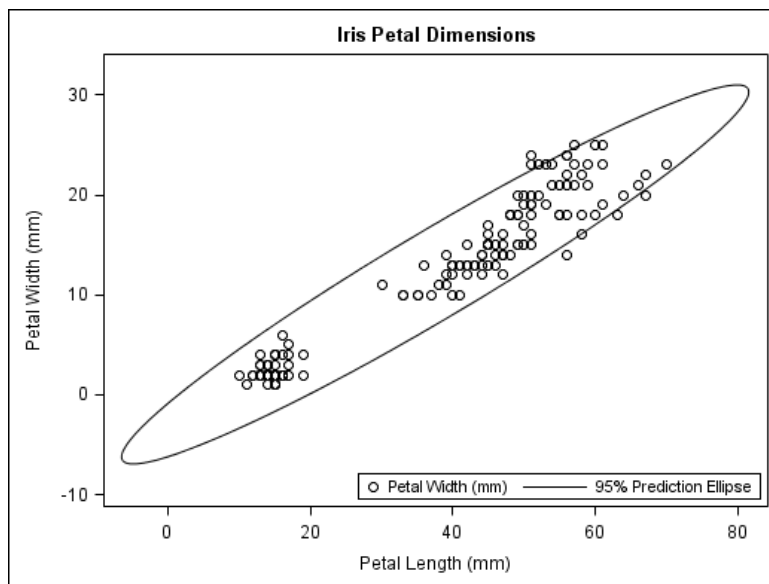
### Procedure features:

SCATTER statement

ELLIPSE statement

KEYLEGEND statement

Sample library member: GSGPLELI



This example shows a scatter plot with a prediction ellipse.

### Set the title and create the scatter plot.

```
proc sgplot data=sashelp.iris;  
  title "Iris Petal Dimensions";  
  scatter x=petalength y=petalwidth;
```

### Create the ellipse.

```
  ellipse x=petalength 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.

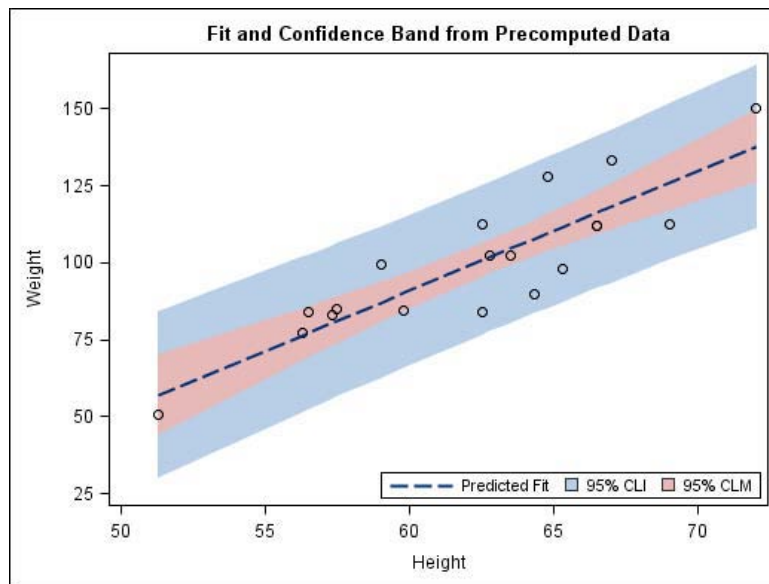
```
  keylegend / location=inside position=bottomright;  
run;
```

## Example 5: Creating Lines and Bands from Pre-Computed Data

### Procedure features:

BAND statement  
KEYLEGEND statement  
SCATTER statement  
SERIES statement

Sample library member: GSGPLBND



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.

**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.

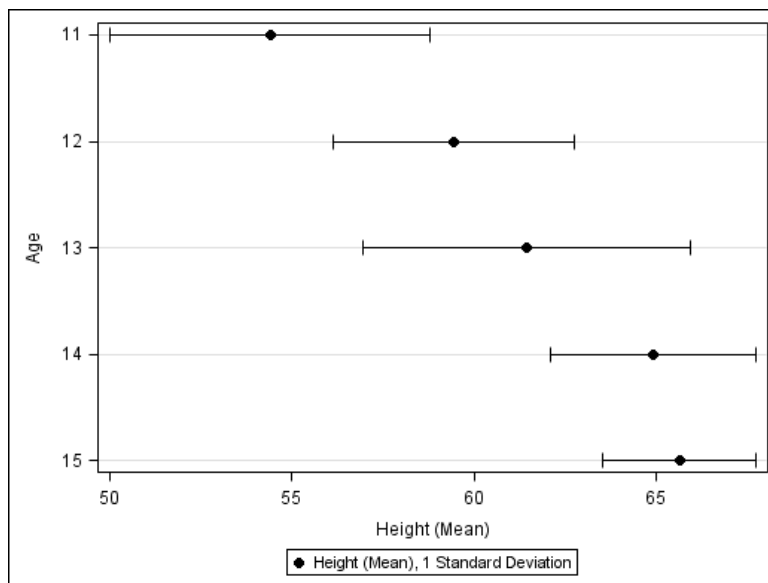
**Create a legend for the graph.** The quoted strings specify the names of the plots that you want to include in the legend. The LOCATION= option places the legend inside of the plot area. The POSITION= option places the legend in the bottom right corner of the graph.

```
keylegend "series" "band1" "band2" / location=inside position=bottomright;
run;
```

## Example 6: Adding Statistical Limits to a Dot Plot

Procedure features: DOT statement

Sample library member: GSGPLDT1



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.

**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.

```
proc sgplot data=sashelp.class(where=(age<16));  
  dot age / response=height stat=mean  
          limitstat=stddev numstd=1;  
run;
```

---

## Example 7: Combining Histograms with Density Plots

### Procedure features:

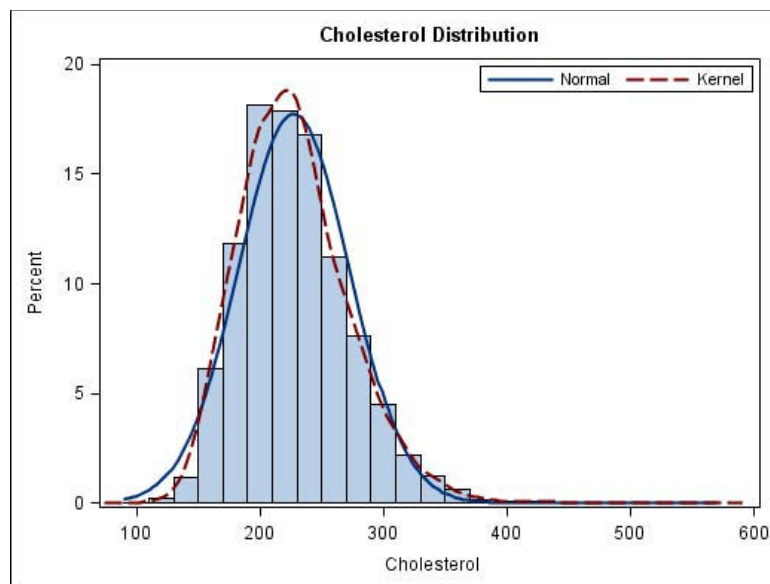
HISTOGRAM statement

DENSITY statement

KEYLEGEND statement

Sample library member: GSGPLHST

---



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.

**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;
```

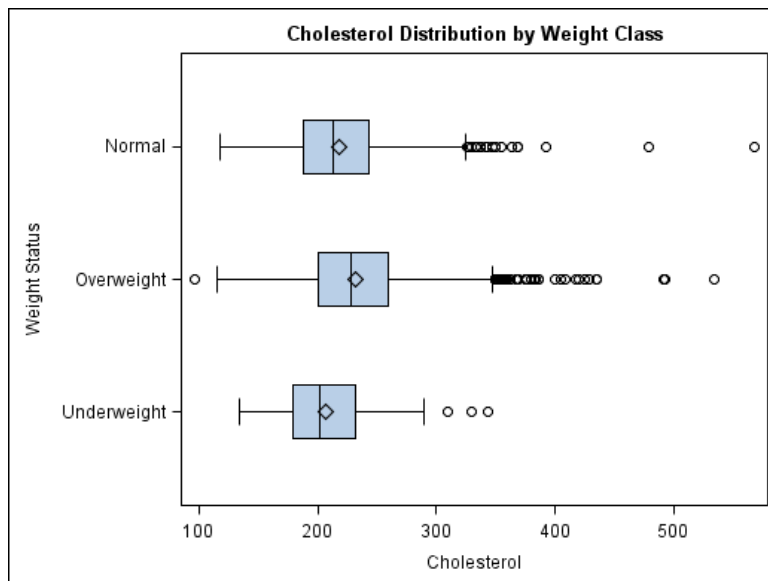
---

## Example 8: Creating a Horizontal Box Plot

**Procedure features:** HBOX statement

**Sample library member:** GSGPLBOX

---



This example shows a horizontal box plot.

**Create the box plot.** The CATEGORY= option specifies the category variable.

```
proc sgplot data=sashelp.heart;
  title "Cholesterol Distribution by Weight Class";
  hbox cholesterol / category=weight_status;
run;
```

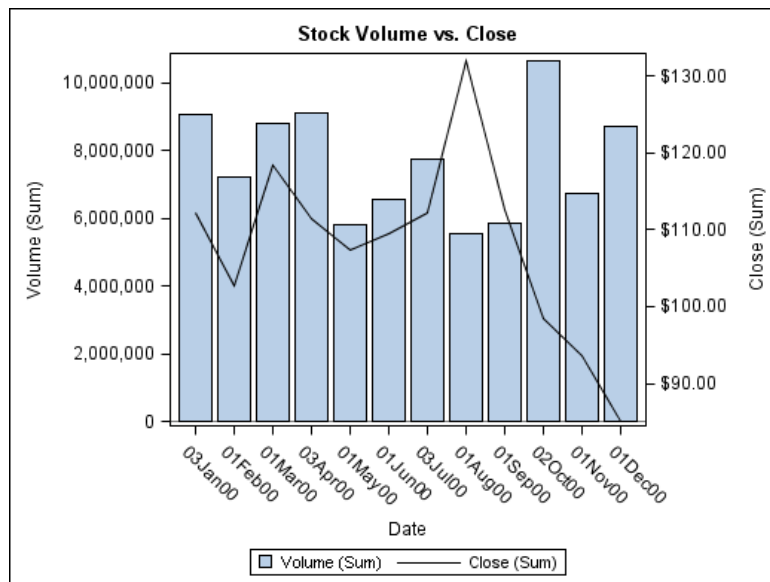
---

## Example 9: Creating a Bar-Line Chart

**Procedure features:** VBAR statement, VLINE statement

Sample library member: GSGPLBAR

---

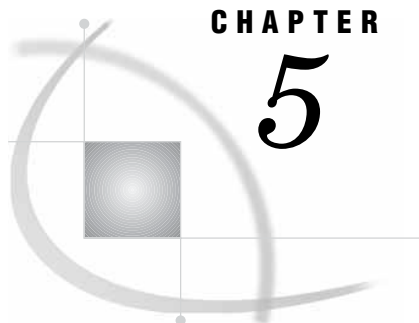


This example creates a bar-line chart.

**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;
```





## CHAPTER

## 5

# The SGSCATTER Procedure

---

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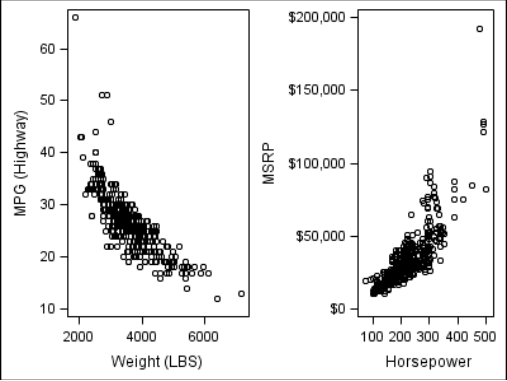
---

## Overview

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.

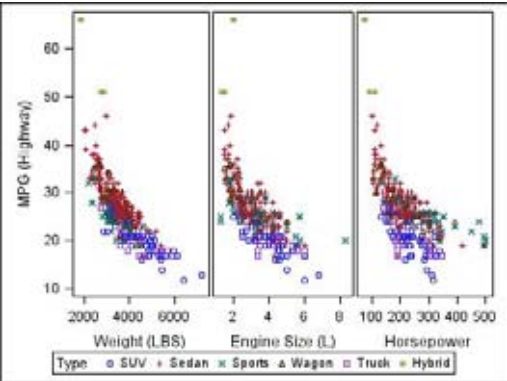
The SGSCATTER procedure can create many different types of paneled graphs. The following table shows some of the types of graphs that you can create:

**Table 5.1** Examples of Graphs that Can Be Generated by the SGSCATTER Procedure



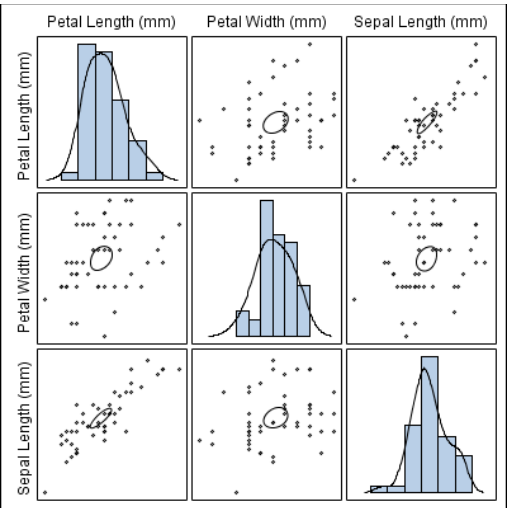
The following code creates a paneled graph of scatter plots:

```
proc sgscatter data=sashelp.cars;  
  plot mpg_highway*weight msrp*horsepower;  
run;
```



The following code creates a paneled graph of scatter plots with shared axes:

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



The following code creates a scatter plot matrix with prediction ellipses and a diagonal with histograms and density plots:

```
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.  $\Delta$

## Concepts

### Statements for Creating Panels

The SGSCATTER procedure contains three statements that you can use to create a paneled graph of scatter plots:

- ☐ PLOT
- ☐ COMPARE
- ☐ MATRIX

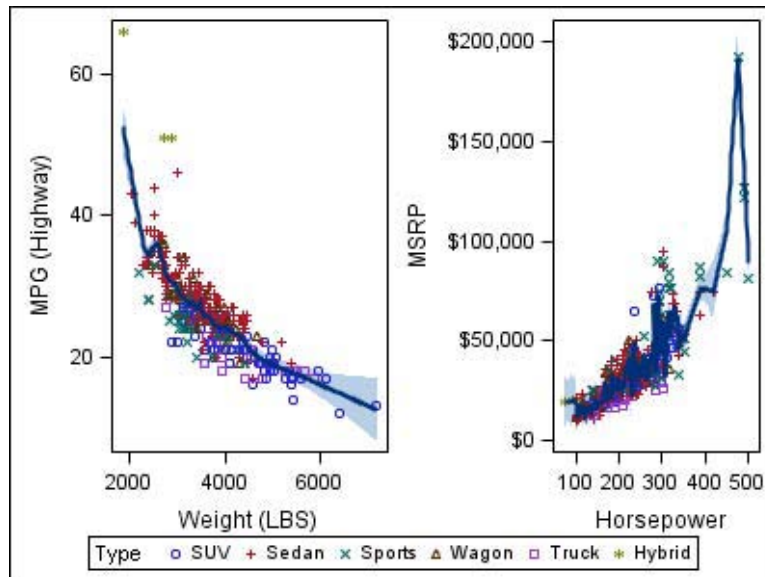
Each of the statements is specialized for creating a different type of paneled graph.

### 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 5.1 on page 227 shows a graph that contains two independent cells. Each cell contains a scatter plot and a loess curve.

**Figure 5.1** 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. △

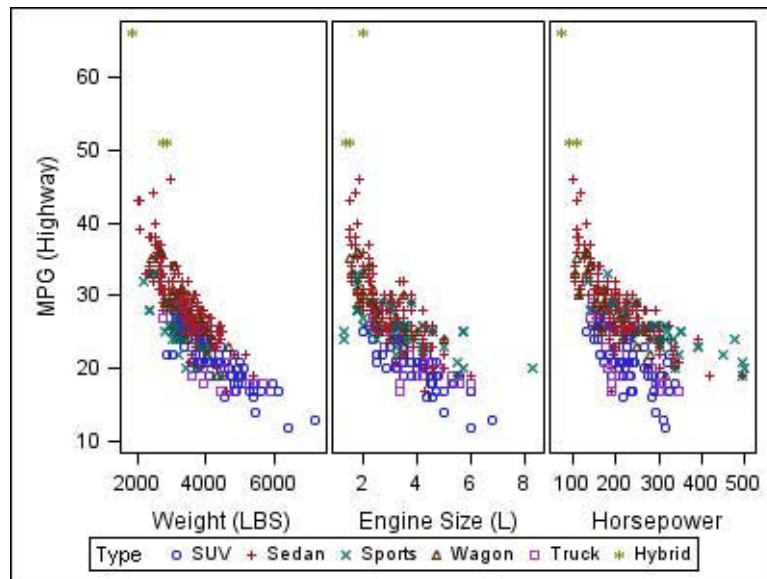
## COMPARE Statement

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 5.2** Example Graph from the COMPARE Statement

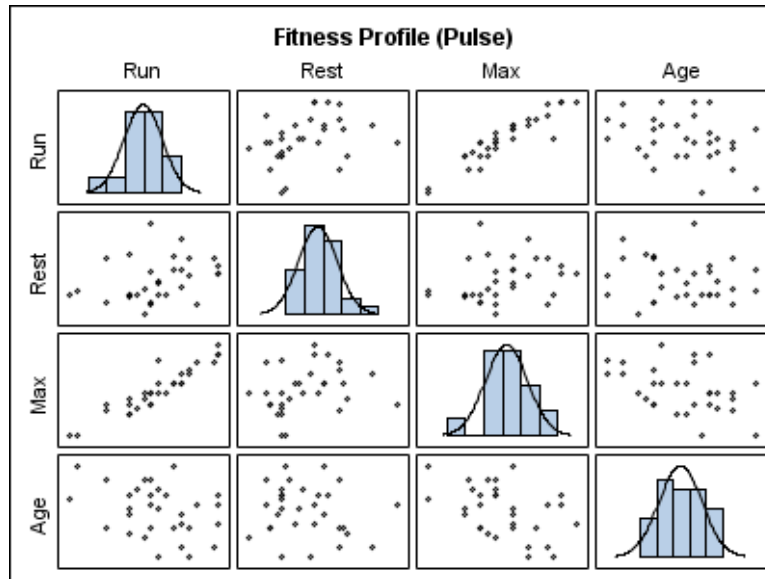


## MATRIX Statement

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 5.3** 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.

---

## 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. Figure 5.4 on page 229 shows the line patterns that you can use.

**Figure 5.4** List of Line Patterns

Solid	—————	1
ShortDash	- - - - -	2
MediumDash	- - - - -	4
LongDash	— — — — —	5
MediumDashShortDash	- - - - -	8
DashDashDot	- - - - -	14
DashDotDot	- - - - -	15
Dash	- - - - -	20
LongDashShortDash	— - — - —	26
Dot	.....	34
ThinDot	.....	35
ShortDashDot	- - - - -	41
MediumDashDotDot	- - - - -	42

## 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 markers that you can use are shown in the following figure:

**Figure 5.5** List of Marker Symbols

↓ <b>ArrowDown</b>	▽ <b>HomeDown</b>	~ <b>Tilde</b>	● <b>CircleFilled</b>
* <b>Asterisk</b>	I <b>Ibeam</b>	△ <b>Triangle</b>	◆ <b>DiamondFilled</b>
○ <b>Circle</b>	+ <b>Plus</b>	∪ <b>Union</b>	▼ <b>HomeDownFilled</b>
◇ <b>Diamond</b>	□ <b>Square</b>	× <b>X</b>	■ <b>SquareFilled</b>
> <b>GreaterThan</b>	☆ <b>Star</b>	Y <b>Y</b>	★ <b>StarFilled</b>
# <b>Hash</b>	T <b>Tack</b>	z <b>Z</b>	▲ <b>TriangleFilled</b>

## Units of Measurement

Some options such as `LINEATTRS` enable you specify the unit of measurement as part of the value. The following table contains the units that are available:

**Table 5.2** Measurement Units

Unit	Description
CM	centimeters
IN	inches
MM	millimeters
PCT or %	percentage
PT	point size, calculated at 100 dots per inch
PX	pixels

## Procedure Syntax

**Requirements:** One `COMPARE`, `MATRIX`, or `PLOT` statement is required.

**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.

**Requirements:** An input data set is required.

---

### Syntax

```
PROC SGSCATTER <DATA= input-data-set>
  <DESCRIPTION="text-string" >
  <TMPOUT= "filename">;
```

### Options

#### **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.

#### **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”.

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

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

**Alias:** DES

#### **TMPOUT=**“*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.**

**Featured in:** Example 3 on page 252, Example 4 on page 253

### Syntax

**COMPARE** X= *variable* | (*variable-1* ... *variable-n*) Y= *variable* | (*variable-1* ... *variable-n*) </options>;

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

DATALABEL <= *variable*>

ELLIPSE <= (*options*)>

GRID

GROUP= *variable*

JOIN <= (*options*)>

LEGEND = (*options*)

LOESS <= (*options*)>

MARKERATTRS= *style-element* <(options)> | (*options*)

NOLEGEND

PBSPLINE <= (*options*)>

REFTICKS

REG <= (*options*)>

SPACING= *n*

TRANSPARENCY= *numeric-value*

### Required Options

**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.

### Options

**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**= *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

**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.

**Restriction:** To use this option, all of the X and Y variables must be numeric.

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR**= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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 columns 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.

*Note:* If you specify more than one legend with the same position, then all of your legends are placed at that position.  $\triangle$

**Default:** BOTTOM

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).

*Note:* This option has no effect if you do not specify the CLM option.  $\triangle$

**Default:** .05

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 additionally specify suboptions to override specific appearance attributes.

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

COLOR= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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.

**Restriction:** This suboption is available with SAS 9.2 Phase 2 and later.

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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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*

specifies the size of the markers in pixels.

**Default:** For ungrouped data, the default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker size is specified by the MarkerSize attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**SYMBOL=** *symbol-name*

specifies the symbol for the markers. See "Marker Symbols" on page 230 for a list of valid marker symbols.

**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).

*Note:* This option has no effect if you do not specify either the CLI option or the CLM option.  $\Delta$

**Default:** .05

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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.

**Restriction:** This suboption is available with SAS 9.2 Phase 2 and later.

**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 the graph.

**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).

*Note:* This option has no effect if you do not specify either the CLI option or the CLM option.  $\Delta$

**Default:** .05

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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.

**Restriction:** This suboption is available with SAS 9.2 Phase 2 and later.

**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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

---

## MATRIX Statement

**Creates a scatter plot matrix.**

**Featured in:** Example 1 on page 250

---

### Syntax

**MATRIX** *numeric-variable-1 numeric-variable-2 < ... numeric-variable-n> </ options>;*

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

DATALABEL= *variable*

DIAGONAL= (*graph-list*)

ELLIPSE <= (*options*)>

GROUP= *variable*

LEGEND = (*options*)

MARKERATTRS= *style-element* <(options)> | (*options*)

NOLEGEND

START= BOTTOMLEFT | TOPLEFT

TRANSPARENCY= *numeric-value*

### Required Options

***numeric-variable-1 numeric-variable-2 < ... numeric-variable-n >***  
specifies two or more numeric variables for the matrix.

### Options

**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

**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.

**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 columns 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.

*Note:* If you specify more than one legend with the same position, then all of your legends are placed at that position.  $\triangle$

**Default:** BOTTOM

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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*

specifies the size of the markers in pixels.

**Default:** For ungrouped data, the default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker size is specified by the MarkerSize attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**SYMBOL=** *symbol-name*

specifies the symbol for the markers. See "Marker Symbols" on page 230 for a list of valid marker symbols.

**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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

---

## PLOT Statement

**Creates a paneled graph that contains multiple independent scatter plots.**

**Featured in:** Example 2 on page 251

---

### Syntax

**PLOT** *plot-request(s)* </ options>;

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

COLUMNS= *n*

DATALABEL <= *variable*>

ELLIPSE <= (*options*)>

GRID

GROUP= *variable*

JOIN <= (*options*)>

LEGEND = (*options*)

LOESS <= (*options*)>

MARKERATTRS= *style-element* <(options)> | (*options*)

NOLEGEND

PBSPLINE <= (*options*)>

REFTICKS

REG <= (*options*)>

ROWS= *n*

SPACING= *n*

TRANSPARENCY= *numeric-value*

UNISCALE= X | Y | ALL

## Required Arguments

### *plot-request-1* < ... *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-variable*\**x-variable*

plots the values of two variables.

*y-variable*

variable plotted on the left vertical axis.

*x-variable*

variable plotted on the horizontal axis.

(*y-variable(s)*)\*(*x-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-variable(s)*

variables plotted on the left vertical axes.

*x-variable(s)*

variables plotted on the horizontal axes.

If you use only one *y-variable* or only one *x-variable*, omit the parentheses for that variable, for example,

```
plot (temp rain)*month;
```

This plot request produces two cells, one for TEMP and MONTH and one for RAIN and MONTH.

## Options

### **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

**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.

**Restriction:** To use this option, all of the X and Y variables must be numeric.

### **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 additionally specify suboptions to override specific appearance attributes.

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

#### **COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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 ... 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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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 ... GraphDatan` style elements in the current style.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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 columns in the legend.

**Interaction:** This suboption has no effect if you also specify the `ACROSS=` suboption.

**LOCATION=** CELL | OUTSIDE

specifies whether the legend is placed inside of the plot area (CELL) or outside of the plot area (OUTSIDE).

**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.

*Note:* If you specify more than one legend with the same position, then all of your legends are placed at that position. △

**Default:** BOTTOM

**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).

*Note:* This option has no effect if you do not specify the CLM option.  $\Delta$

**Default:** .05

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR**= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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.

**Restriction:** This suboption is available with SAS 9.2 Phase 2 and later.

**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* **<(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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR=** *color*

specifies the color of the markers. For more information about specifying colors, see the "SAS/GRAPH Colors and Images" chapter in the *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*

specifies the size of the markers in pixels.

**Default:** For ungrouped data, the default marker size is specified by the MarkerSize attribute of the GraphDataDefault style element in the current style.

For grouped data, the default marker size is specified by the MarkerSize attribute of the GraphData1 ... GraphData*n* style elements in the current style.

**SYMBOL=** *symbol-name*

specifies the symbol for the markers. See "Marker Symbols" on page 230 for a list of valid marker symbols.

**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** **<= (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).

*Note:* This option has no effect if you do not specify either the CLI option or the CLM option.  $\triangle$

**Default:** .05

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR= *color***

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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.

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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).

*Note:* This option has no effect if you do not specify either the CLI option or the CLM option.  $\triangle$

**Default:** .05

**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 additionally specify suboptions to override specific appearance attributes.

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

**COLOR**= *color*

specifies the color of the line. For more information about specifying colors, see the “SAS/GRAPH Colors and Images” chapter in the *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. See “Line Patterns” on page 229 for a list of line patterns.

**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. See “Units of Measurement” on page 230 for a list of the measurement units that are supported.

**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.

**Restriction:** This suboption is available with SAS 9.2 Phase 2 and later.

**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

**Restriction:** This option is available with SAS 9.2 Phase 2 and later.

**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

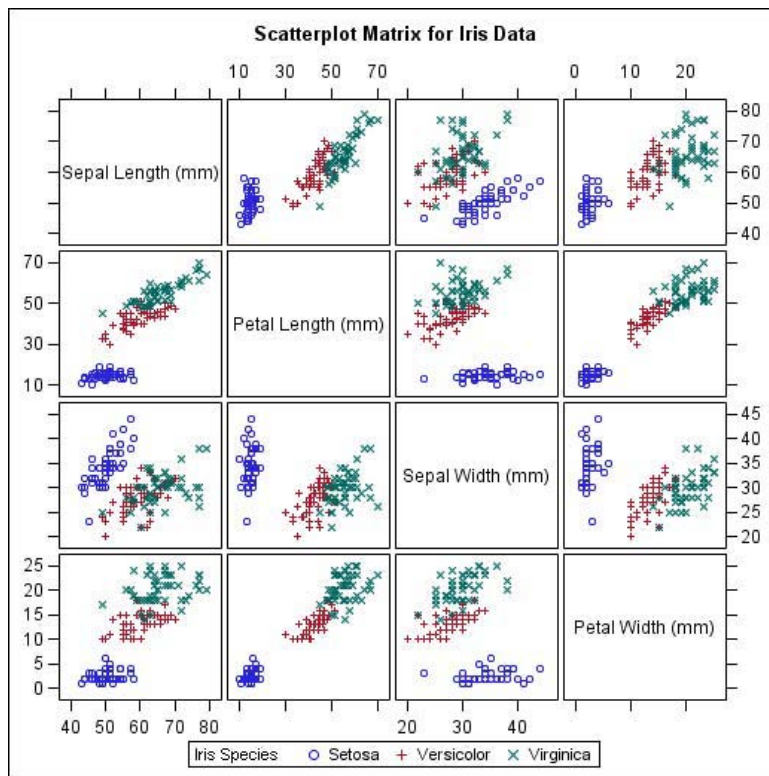
### Example 1: Creating a Scatter Plot Matrix

Procedure features:

MATRIX statement

GROUP option

Sample library member: GSGSCMAT



This example shows a scatter plot matrix with grouped data.

**Set the title and footnote and create the scatter plot matrix.** On 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;
```

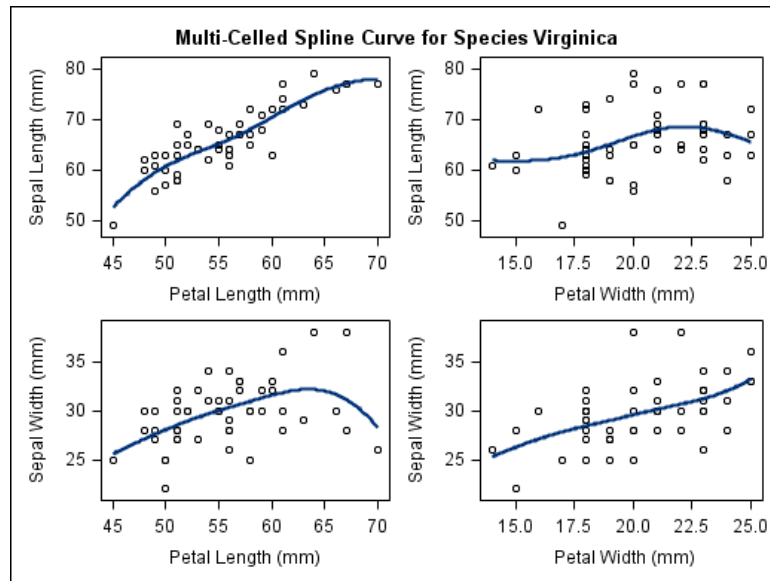
## Example 2: Creating a Graph with Multiple Independent Scatter Plots and Spline Curves

Procedure features:

PLOT statement

PBSPLINE option

Sample library member    GSGSCPLT



This example shows a graph with multiple independent scatter plots with fitted splines.

**Create the scatter plots.** On the PLOT statement, the PBSPLINE option fits the spline curves to the scatter points.

```
proc sgscatter data=sashelp.iris(where=(species="Virginica"));
  title "Multi-Celled Spline Curve for Species Virginica";
  plot (sepallength sepalwidth)*(petallength petalwidth)
    / pbspline;
run;
```

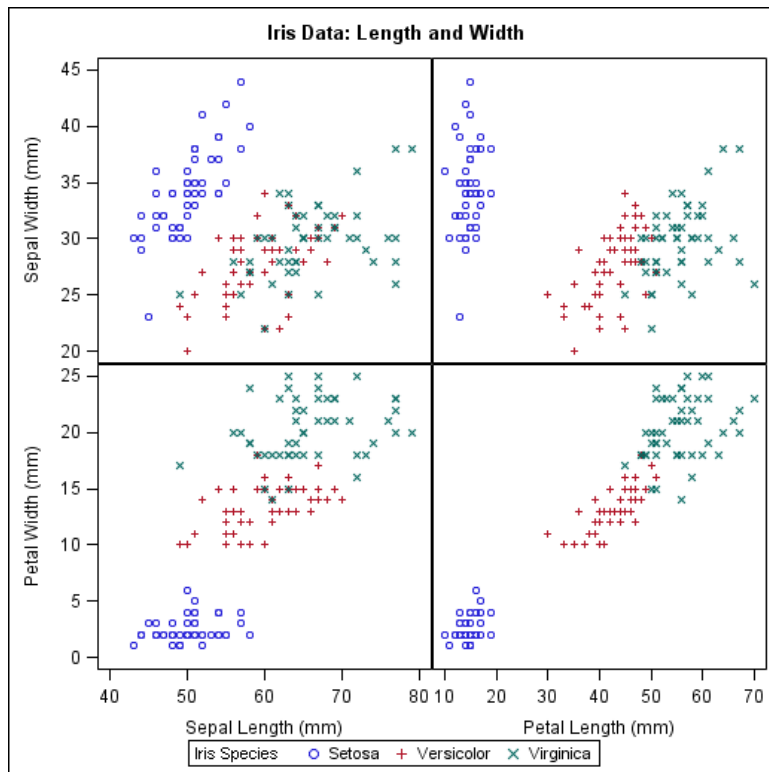
## Example 3: Creating a Simple Comparative Panel

Procedure features:

COMPARE statement

GROUP option

Sample library member GSGSCCMP



This example shows a comparative scatter plot with grouped data.

**Create the scatter plot.** On the COMPARE statement, the GROUP= option groups the data by the SPECIES variable.

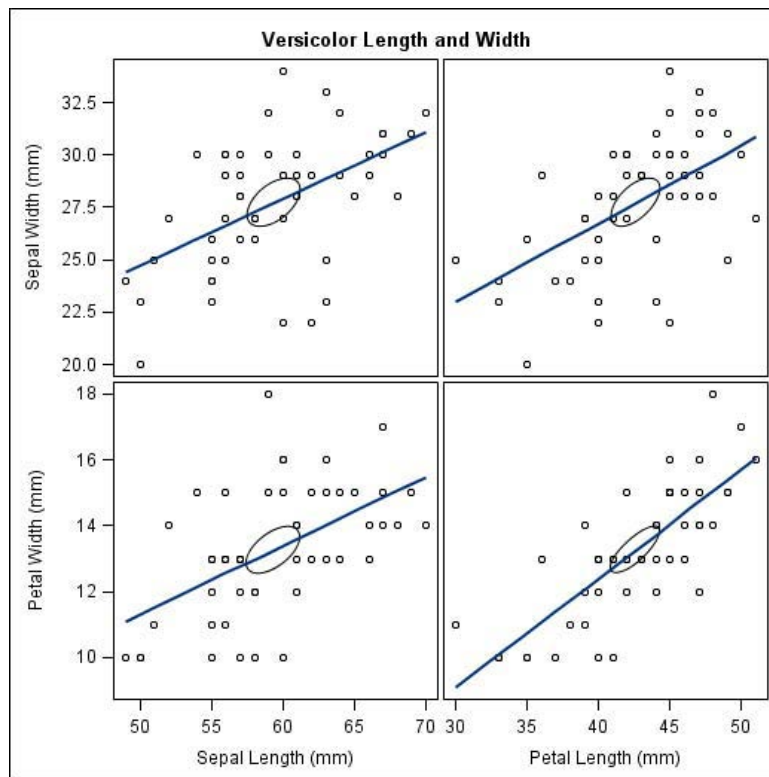
```
proc sgscatter data=sashelp.iris;
  title "Iris Data: Length and Width";
  compare x=(sepalength petallength)
          y=(sepalwidth petalwidth)
          / group=species;
run;
```

## Example 4: Creating a Comparative Panel with Regression Fits and Confidence Ellipses

### Procedure features:

COMPARE statement  
REG option  
ELLIPSE option  
SPACING option

Sample library member `GSGSCCM1`

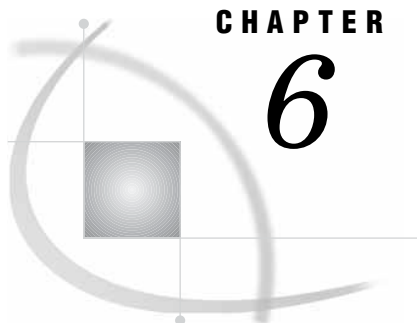


This example shows a comparative panel of scatter plots with regression fits and confidence ellipses.

**Create the scatter plot.** On 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.

```
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;
```





## CHAPTER

## 6

## The SGRENDER Procedure

---

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---

### Overview

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 Statistical Graphics procedures. For more information about the GTL, see the *SAS/GRAPH: Graph Template Language Reference* and the *SAS/GRAPH: Graph Template Language User's Guide*.

---

### Procedure Syntax

```
PROC SGRENDER < option(s)>;
    DYNAMIC variable-assignment(s);
```

### PROC SGRENDER Statement

Identifies the data set that contains the plot variables and the StatGraph template. The statement also gives you the option to specify the name of the output object and the label for the output object.

**Requirements:** An input data set and a template are required.

---

**Syntax**

```
PROC SGRENDER TEMPLATE= statgraph-template <DATA= input-data-set>
  <OBJECT= object-name>
  <OBJECTLABEL=“text-string” > ;
```

**Required Arguments****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.

*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.  $\triangle$

**Options****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.

*Note:* To specify the filename of the output image, use the IMAGENAME= option in the ODS GRAPHICS statement.  $\triangle$

**Alias:** NAME=

**Default:** SGRender

**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=

---

**DYNAMIC Statement**

**Defines the values for dynamic variables in your StatGraph template code.**

**Featured in:** Example 2 on page 259

---

**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 dynamic variables to specify required attributes, and you do not define values for those variables in a DYNAMIC statement, then the SGRENDER procedure might produce errors.  $\Delta$

**Syntax**

**DYNAMIC** *variable-assignment(s)*;

**Required Options*****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**

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:

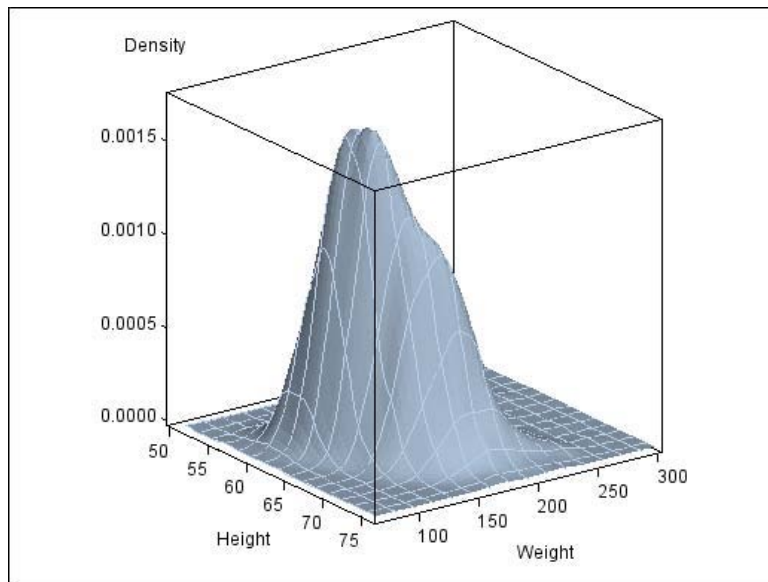
<code>_LIBNAME_</code>	represents the name of the library that contains the data set.
<code>_MEMNAME_</code>	represents the name of the library member that contains the data set.
<code>_BYLINE_</code>	represents the complete BY line, when you specify a BY statement.
<code>_BYVAR_</code>	represents the name of the first BY variable, when you specify a BY statement.
<code>_BYVAR<math>n</math>_</code>	represents the name of the $n$ th BY variable, when you specify a BY statement with multiple variables.
<code>_BYVAL_</code>	represents the first BY value, when you specify a BY statement.
<code>_BYVAL<math>n</math>_</code>	represents the value of the $n$ th BY variable, when you specify a BY statement with multiple variables.

## Examples

### Example 1: Generating a Graph from a Simple GTL Template

Sample library member: GSGRENDER

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.



#### Create the Statgraph Template.

```
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.**

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

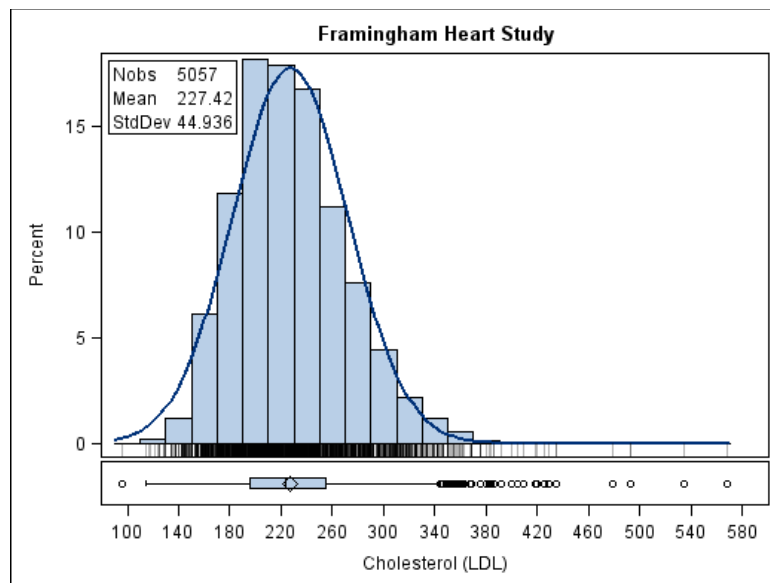
## Example 2: Defining Dynamic Variables

**Procedure features:** DYNAMIC Statement

**Sample library member:** GSGREND1

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:

**Create the Statgraph Template.**

```
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;

```

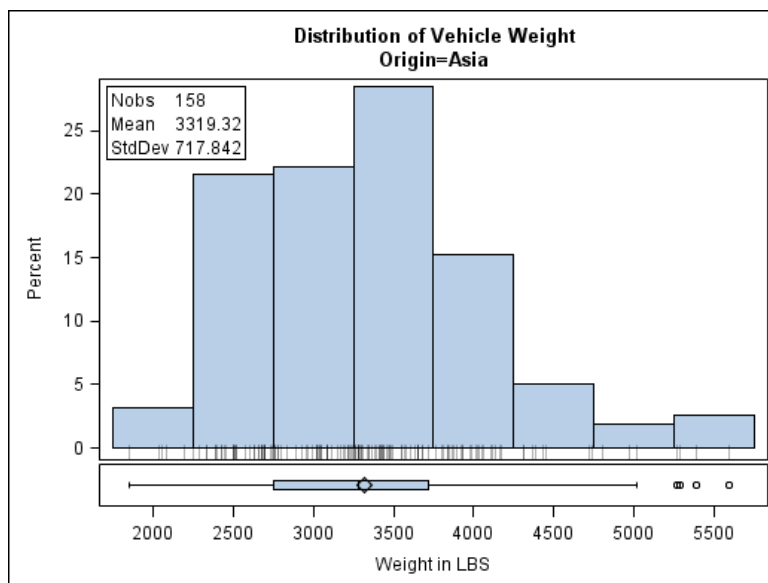
**Generate the first graphics output from the template using the SASHELP.HEART data set.** The DYNAMIC statement defines dynamic variables in the template.

```

proc sgrender data=sashelp.heart template=distribution;
    dynamic var="cholesterol" varlabel="Cholesterol (LDL)" normal="yes"
           title="Framingham Heart Study";
run;

```

The second PROC SGRENDER statement generates multiple graph for the CARS data set by using BY grouping. The first graph is displayed here.



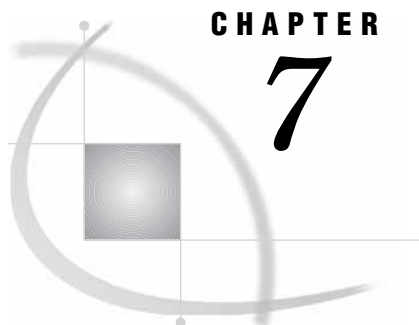
**Sort the SASHELP.CARS data set.** The data set must be sorted by the same variable that the following PROC SGRENDER block uses in its BY statement.

```
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.

```
proc sgrender data=cars template=distribution;
  by origin;
  dynamic var="weight" varlabel="Weight in LBS"
         title="Distribution of Vehicle Weight";
run;
```





## CHAPTER

## 7

# The SGDESIGN Procedure

---

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<i>Concepts</i>	<b>264</b>
<i>General Concepts</i>	<b>264</b>
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---

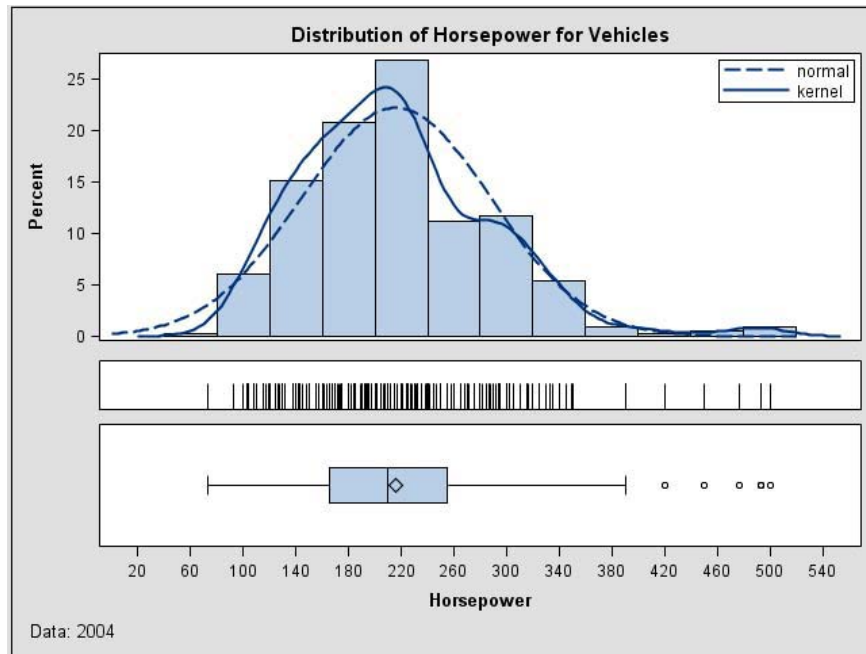
## Overview

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/GRAPH ODS Graphics Designer application.

You can render the graph to any ODS destination. For example, the following code generates HTML output for a graph named CarsLattice.sgd.

```
ods html file="CarsLattice.html";
proc sgdesign sgd="CarsLattice.sgd";
run;
ods html close;
```

Figure 7.1 CarsLattice Output



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

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 265.

## Concepts

### 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 defined in 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 on page 269.

*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 265. △

- 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.

- 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. The SGDESIGN procedure also supports the ODS GRAPHICS statement, which can be applied anytime.

For an example that uses the WHERE statement, see Example 1 on page 269.

---

## 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 the *SAS/GRAPH: Graph Template Language Reference* and the *SAS/GRAPH: Graph Template Language User's Guide*.

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.

$\triangle$

$\triangle$

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 the *SAS/GRAPH: ODS Graphics Designer User's Guide*.

---

## Procedure Syntax

```
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.**

**Requirements:** 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

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

## 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.

## Options

### **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.

### **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.

### **CONTENT**

outputs important information about the SGD file into the SAS log, including 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.  $\Delta$

### **OLDSGD**

enables users to run SGD files that were created with the preproduction release of the ODS Graphics Designer. This option is for backward compatibility.

---

## 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.**

**Featured in:**    Example 3 on page 270 and Example 4 on page 270

---

## Syntax

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

## Required Arguments

### *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 265.

#### *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 it replaces. For example, if *V1* is a numeric type column, then the column name 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 successfully execute this SGD file with a 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 265.

---

## Examples

---

### Example 1: Create a Graph and Subset the Data

**Procedure features:**   WHERE statement, ODS output

---

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.

```
ods html file="CarsLattice.html";
proc sgdesign sgd="CarsLattice.sgd"
  data=sashelp.cars;
  where Origin="Asia";
run;
ods html close;
```

*Note:* 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. △

---

### Example 2: Create a Graph That Uses a Different Data Set

**Procedure features:**   subset data, ODS output

---

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. The following example creates a new data set with the same variables as the original data set. This example assumes the existence of a graph named CarsLattice.sgd that was created based on the SASHELP.CARS data set.

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

ods html file="CarsLattice.html";
proc sgdesign sgd="CarsLattice.sgd" data=sedans;
run;
ods html close;
```

*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 265. △

---

## Example 3: Use the DYNAMIC Statement to Specify a Column

Procedure features: DYNAMIC statement

---

This example substitutes a different column by setting the dynamic V1 variable. The example assumes the following:

- the existence of a shared-variable graph named SVHistogram.sgd that was created based on the SASHELP.CARS data set
- in the SGD file, the shared variable V1 is set to MPG\_HIGHWAY

First, create the graph using the default data. You generate this graph only for comparison purposes.

```
proc sgdesign sgd="SVHistogram.sgd";  
run;
```

Now create the graph and specify a different column for the dynamic variable.

```
proc sgdesign sgd="SVHistogram.sgd";  
    dynamic V1="MPG_City";  
run;
```

When you use the SGDESIGN procedure to substitute columns, the columns can be different as long as they are the same type. In the example, both MPG\_City and MPG\_HIGHWAY are numeric columns.

You can also create the graph using a different data set.

```
proc sgdesign sgd="c:\SVHistogram.sgd"  
    data=sashelp.heart;  
    dynamic V1="Cholesterol";  
run;
```

The third instance of the procedure uses a different data set that has different variables. In the example, Cholesterol is a numeric column.

---

## Example 4: Use the DYNAMIC Statement to Specify a Column and a Character String

Procedure 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 SVDistribution.sgd that was created based on the SASHELP.CARS data set
- in the SGD file, the shared variable V1 is set to HORSEPOWER
- in ODS Graphics Designer, the title of the graph is *Distribution of dyn(DDISTRIBUTE)*

First, create the graph using the default data.

```
proc sgdesign sgd="SVDistribution.sgd";
  dynamic DDISTRIBUTE="MPG City";
run;
```

Though this example uses the default value for the shared variable, there is no default value for the dyn(DDISTRIBUTE) 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 previous code.

In the output, the title becomes *Distribution of MPG City*. The “Distribution of” portion of the title was defined in the SGD file. The “MPG City” portion was generated by using the DYNAMIC option.

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.

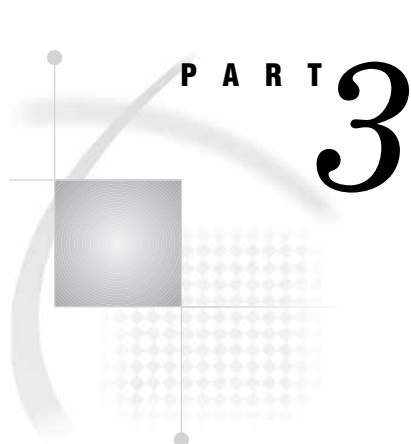
```
proc sgdesign sgd="SVDistribution.sgd"
  data=sashelp.heart;
  dynamic V1="cholesterol" DDISTRIBUTE="Cholesterol";
run;
```

In the example, the second instance of the SGDESIGN procedure uses a different data set that has different variables. Both MPG\_City and Cholesterol are numeric variables. In the output, the title is *Distribution of Cholesterol*.

You can instead specify the dynamic variables in multiple DYNAMIC statements. The following code produces the same output as the previous code.

```
proc sgdesign sgd="SVDistribution.sgd"
  data=sashelp.heart;
  dynamic V1="cholesterol";
  dynamic DDISTRIBUTE="Cholesterol";
run;
```

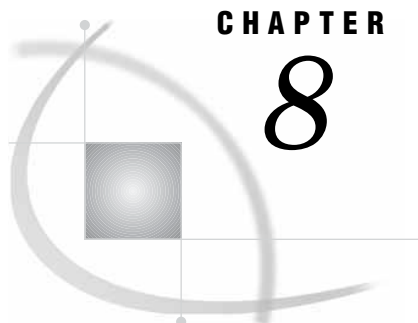




## Customizing ODS Graphics

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## CHAPTER

## 8

# Controlling The Appearance of Your Graphs

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## 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:

- ☐ Provide maximum contrast between backgrounds and data
- ☐ Provide for ease of discrimination between different groups
- ☐ Provide equal emphasis for data with equal importance

These default styles are used to produce professional looking graphics without the need for further modification. 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 information about how to specify styles and the default style for each destination, see “Specifying a Style” on page 276. For information about permanently changing the default style, see “Changing the Default Style in the SAS Registry” on page 280.

You can customize your graphical output at three levels. The following table shows the three levels of customization.

**Table 8.1** Levels of Customization

Method	Description	Level of Complexity
Change the style template. See “Specifying a Style” on page 276.	Specify a style template with the <code>STYLE=</code> option to change the appearance of the entire graph. Requires no further modification.	low
Use Appearance options. See “Using the Statistical Graphics Procedures Options” on page 281.	Specify an appearance option in the SG procedure to change various aspects of your graph. Appearance options override the corresponding defaults from the current style. Note that not all appearance attributes can be specified in this way.	low
Modify individual style elements. See “Modifying Styles” on page 285.	Specify or change style attributes in order to modify a style element. This requires the use of <code>PROC TEMPLATE</code> style statements.	high

---

## Specifying a Style

---

### About Style Templates

An ODS style is a collection of named style elements that provides specific visual attributes for the presentation aspects (color, font face, font size, and so on) of your graphical and tabular SAS output. Each style element is a named collection of style attributes such as color, marker symbol, line style, font face, as well as many others. The style elements of a style are designed to ensure the goals of effective graphics. The colors used for drawing the markers in a scatter plot are designed to contrast well against the data wall color. 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, simplest way of changing a graphic’s appearance. Changing the current style requires only the use of the `STYLE=` option on an ODS destination statement.

*Note:* The style that a destination uses is applied to tabular output as well as graphical output.  $\triangle$

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.

If your program does not specify a style to use, then the following styles are in effect:

**Table 8.2** Default Style Templates

ODS Destination	Default Style Name
DOCUMENT	(not applicable)
LISTING	Listing
OUTPUT	(not applicable)
HTML	Default
LATEX	Default
PRINTER	ColorPrinter for PDF and PS, monochromePrinter for PCL
RTF	RTF
Measured RTF	RTF

*Note:* You can change the default style template for each destination by modifying the SAS registry. See “Changing the Default Style in the SAS Registry” on page 280.  $\triangle$

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 8.3** Recommended Style Templates

Desired Output	Recommended Styles	Additional
Full Color	Default	gray background, optimized for HTML output
	Analysis	yellow background
	Statistical	white background, colored fills
	Listing	white background, optimized for color format on white paper
	Printer	optimized for PS and PDF output
Gray Scale	Journal	interior filled areas are gray scale
Black and White	Journal2	interior filled areas have no color

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 Default 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 an item store, such as **Sashelp.Tmplmst**, to expand the list of directories where ODS templates are stored. The templates that SAS provides are in the item store **Sashelp.Tmplmst**.
- 3 To view the style definitions that SAS provides, double-click the **Styles** item store.
- 4 Right-click the style definition, such as **Journal**, and select **Open**. The style definition is displayed in the Template Browser window.

---

## Changing the Current Graph Style by Using the STYLE= Option in ODS Destination Statements

Each ODS destination has a default style that is set by SAS. By specifying only `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 template 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 or close the destination or start a new SAS session.

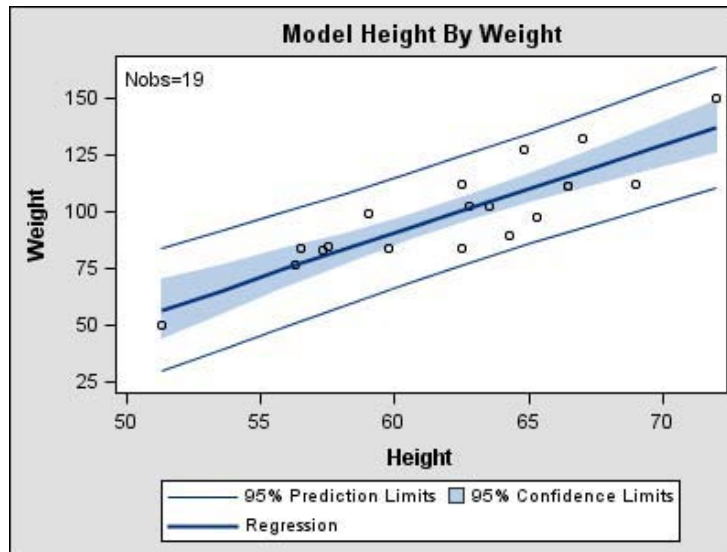
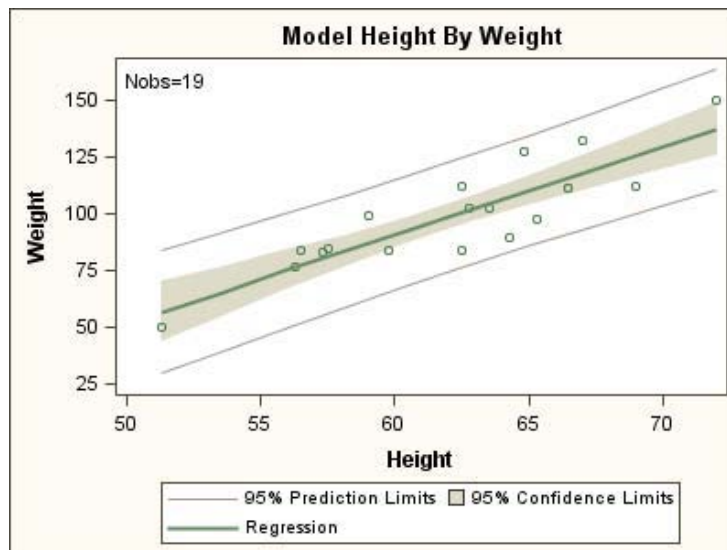
To view the supplied ODS styles, open the Template window, and navigate to **Templates ► Sashelp.Tmplmst ► Styles**. You can open the Template window by specifying `ODSTEMPLATE` in the command line or from the Results window. To open the Template window from the Results window, open the Results window, select the Results folder. Right-click and select **Templates**.

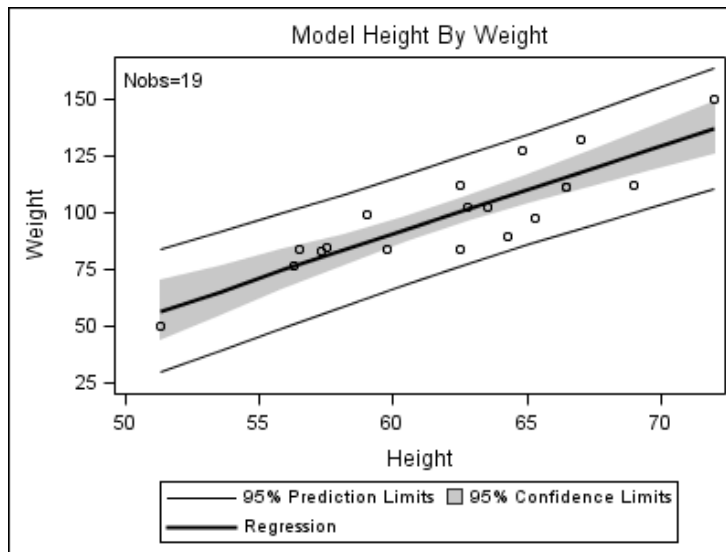
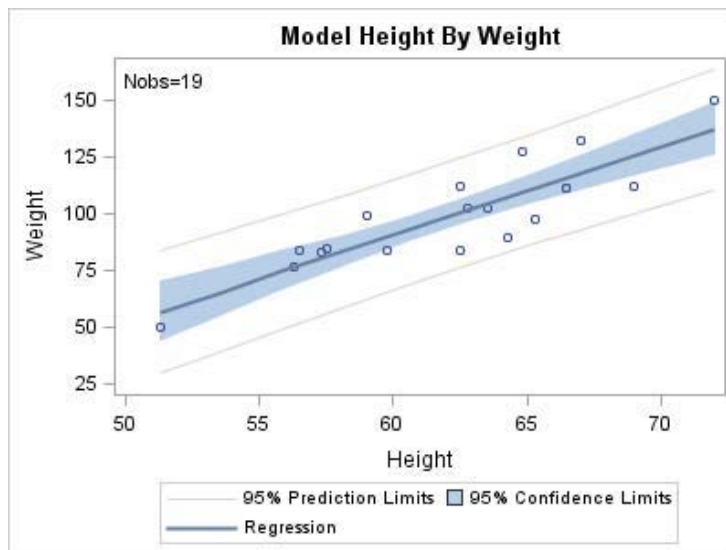
Style templates are created and modified with the `TEMPLATE` procedure. For more information, refer to *SAS Output Delivery System: User's Guide*.

---

## Examples of Style Templates

SAS provides styles that are recommended for use with statistical graphics. Each of the following graphs was created using a different style, with the HTML destination:

**Display 8.1** HTML Output Using the Default Style**Display 8.2** HTML Output Using the Analysis Style

**Display 8.3** HTML Output Using the Journal Style**Display 8.4** HTML Output Using the Statistical Style

## Changing the 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. The default style for each destination can be different. For example, the default style for the PRINTER destination is “Printer” while the default style for the RTF destination is “RTF”. To permanently change the default style, you can change the setting of Selected Style in the SAS registry. For more information about ODS and the SAS registry, see *Changing SAS Registry Settings for ODS in SAS Output Delivery System: User’s Guide*.

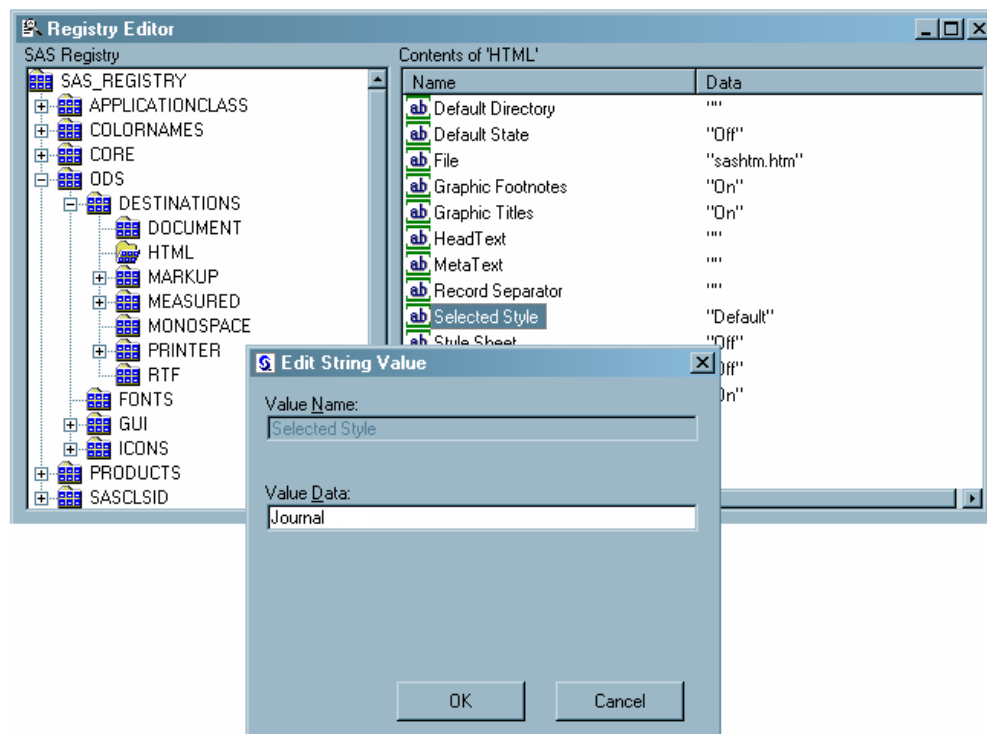
To permanently change the default style for a particular destination:

- 1 Select **Solutions ► Accessories ► Registry Editor**, or issue the command REGEDIT in the command line.
- 2 Select **ODS ► Destinations**
- 3 Select the destination you want to change the default style for.
- 4 Select Selected Style, click the right mouse button, and select Modify. The Edit String Value window appears.
- 5 Type the style in the Value Data text box and select OK.

**CAUTION:**

If you make a mistake when you modify the SAS registry, then your system might become unstable or unusable. △

**Display 8.5** SAS Registry Showing Selected Style Setting




---

## Using the Statistical Graphics Procedures Options

---

### Overview of the Appearance Options

ODS styles control the overall appearance of the graphs. Visual attributes of various elements of the graph are derived from specific style elements within the style unless explicitly specified in your procedure code. You can make a specific appearance change

to one or more aspects of your graph without making changes to the overall style by using appearance options in your procedure options.

Many SG procedure statements have options and suboptions that control the appearance of different parts of a graph. For example, the option `LINEATTRS=`, the suboption `PATTERN=`, and the suboption `COLOR=` in the following `DENSITY` statement specify that the density curve has a blue dashed line, no matter what style is being used:

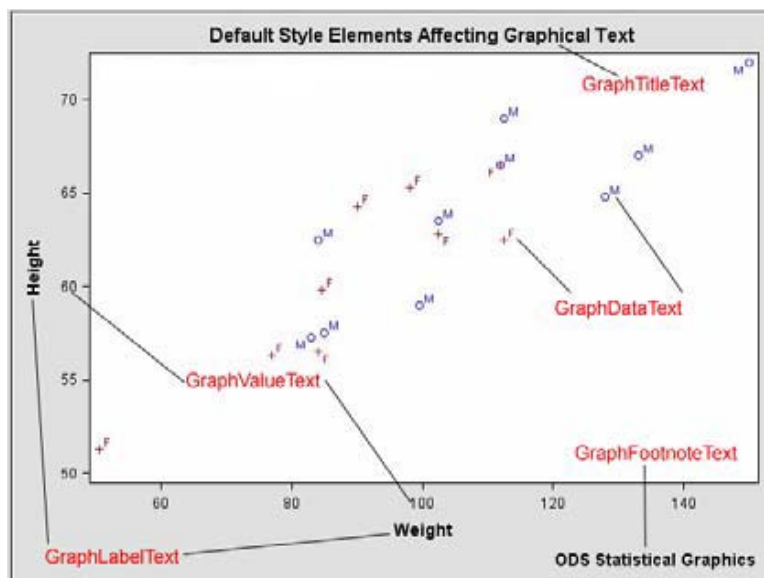
```
density xvar / lineattrs=(pattern=dash color=blue);
```

*Note:* Although you can hardcode values with appearance options, it is not always appropriate to do so. See “Specifying Hardcoded Values” on page 284 for more information.   △

The appearance options and their values are specific to each statement. For complete documentation for the statements and their options, see the syntax section for the appropriate procedure and statement.

## Specifying Appearance Option Values

Default visual attributes of various graphical elements of a graph are derived from the specific style elements of the active style. For example, the text of the markers of a non-grouped scatter plot derive their visual attributes from the `GraphDataText` style element. Although there are many graphical elements that derive their visual attributes from specific style elements, the following figure shows the style elements that affect graphical text:



However, you can explicitly specify the visual attributes to be used for the various graphical style elements by using the appropriate appearance option for the statement. For example, the `MARKERATTRS=` appearance option controls the attributes of markers for the `SCATTERPLOT` statement. All appearance options have suboptions that control a specific aspect of the graphical element. For example, for markers, the `MARKERATTRS=` option has the suboptions `SYMBOL=`, `COLOR=`, and `SIZE=`, which control those aspects of the marker.

You can specify values for appearance options by using three different methods. The first method uses style element references to set visual attributes. The second method uses hardcoded values. The third method combines the first two methods. It is strongly recommended that you use style references to ensure that your graphs are stylistically robust. Use the hardcoded method only when absolutely necessary. The methods are:

- specifying a style element reference with an appearance option
- specifying hardcoded values with an appearance option
- specifying a style element, but overriding an attribute with a hardcoded value.

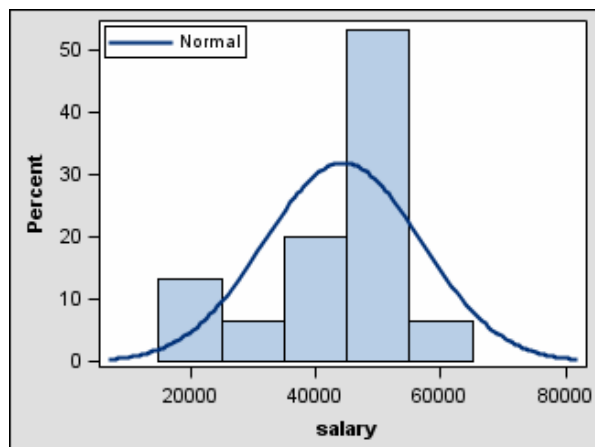
It is recommended that you use style references with appearance options. This is because the style attributes that are referenced by the style element reference are chosen to provide consistency and appropriate emphasis based on display principles for statistical graphics. If you hardcode a value into a style element, you are overriding the style and you might create a graph that is inconsistent with the style. For a table of valid style elements to use with ODS statistical graphics, see “Style Elements for Use with ODS Statistical Graphics” on page 285.

## Specifying Style Element References

You can change the visual attributes used for a graphical element of your plot by using the relevant appearance option for a specific statement. You can use style elements as values for any appearance option. Style elements are a collection of style attributes that apply to a particular part of the graph. For example, a style element might contain instructions for the presentation of marker, such as color, symbol, and size. They are contained within the style. For more information about style elements, see the chapter on creating styles in *SAS Output Delivery System: User's Guide*. When you reference a style element, all of the attributes in that element are used to modify the visual attributes of the graphical feature.

For example, the graph shown in Display 8.6 on page 283 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.

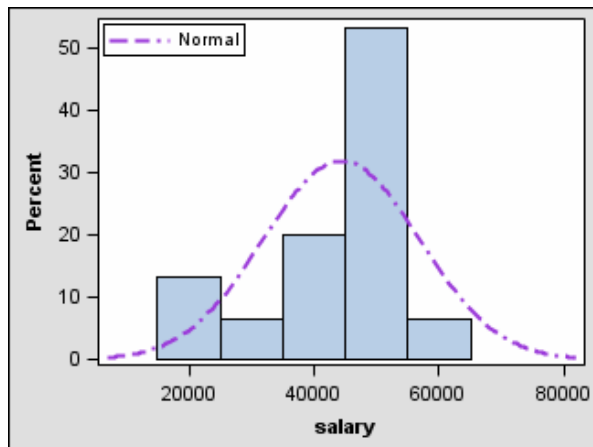
**Display 8.6** Histogram with Default Density Curve



You can use the `LINEATTRS=` option in the first `DENSITY` statement to change the style element that is used for the line attributes. For example, when you are using the Default style, specifying the `GraphData5` style element causes the density curve line to use the `DashDashDot` line pattern and the color blue.

```
density salary / lineattrs=graphdata5;
```

**Display 8.7** Histogram with Density Curve, Using a Specific Style Reference



In general, it is recommended to specify the entire style element this way to derive all of the relevant visual attributes. In this case, the line pattern and color are both derived from the specified style element.

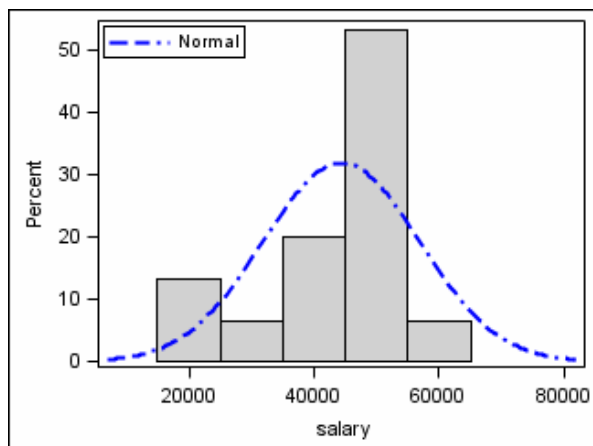
## Specifying Hardcoded Values

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. In the above example from “Specifying Style Element References” on page 283, you could have used the following statement to set the density curve attributes:

```
density / lineattrs=(pattern=dashdashdot color=blue);
```

However, if you use the `STYLE=` option to change the overall style to `Journal`, which only uses gray scale colors, the color for this curve is still blue:

**Display 8.8** Using Hardcoded Values with the Journal Style



Also, a hardcoded color could be exactly the same color as the wall color of another style, and become indistinguishable from the wall.

---

## Modifying Styles

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:

```
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:

```
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 *TEMPLATE Procedure: Creating a Style Definition in SAS Output Delivery System: User's Guide*.

For a list of the style elements that you can use with ODS Statistical Graphics, see "Style Elements for Use with ODS Statistical Graphics" on page 285.

---

## Style Elements for Use with ODS Statistical Graphics

The following style elements affect statistical graphics and can be specified by GTL appearance options or used in styles.

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. The table below lists each style element, the portion of the graph it affects or was created to use with, and the default attribute values. Attribute values can be changed with PROC TEMPLATE, as stated above.

**Table 8.4** Graph Style Elements: General Graph Appearance

Style Element	Portion of Graph Affected	Recognized Attributes	Attribute Values in DEFAULT Style
Graph	Graph size and outer border appearance	OutputWidth OutputHeight BorderColor BorderWidth CellPadding CellSpacing	Not set Not set Inherited Inherited 0 Inherited
GraphAnnoLine	Annotation lines	ContrastColor LineStyle LineThickness	GraphColors("gcdata") 1 1px
GraphAnnoShape	Annotation closed shapes such as circles, and squares	Color ContrastColor LineThickness LineStyle Transparency	GraphColors("gcdata") GraphColors("gcdata") 2px 1 Not set
GraphAnnoText	Annotation text	Font or <i>font-attributes</i> * Color	GraphFonts("annofont") Not set GraphColors("gtext")
GraphAxisLines	X, Y and Z axis lines	ContrastColor LineStyle LineThickness TickDisplay	GraphColors("gaxis") 1 1px "Outside"
GraphBackground	Background of the graph	Color Transparency	Colors("docbg") Not set
GraphBorderLines	Border around graph wall, legend border, borders to complete axis frame	ContrastColor LineThickness LineStyle	GraphColors("gborderlines") 1px 1
GraphDataText	Text font and color for point and line labels	Font or <i>font-attributes</i> * Color	GraphFonts("GraphDataFont") Not set GraphColors("gtext")
GraphFootnoteText	Text font and color for footnote(s)	Font or <i>font-attributes</i> * Color	GraphFonts("GraphFootnoteFont") Not set GraphColors("gtext")

Style Element	Portion of Graph Affected	Recognized Attributes	Attribute Values in DEFAULT Style
GraphGridLines	Horizontal and vertical grid lines drawn at major tick marks	ContrastColor LineStyle LineThickness Transparency DisplayOpts	GraphColors("ggrid") 1 1px Not set "Auto"
GraphHeaderBackground	Background color of the legend title	Color Transparency	Colors("gheader") Not set
GraphLabelText	Text font and color for axis labels and legend titles	Font or <i>font-attributes</i> * Color	GraphFonts("GraphLabelFont") Not set GraphColors("glabel")
GraphLegendBackground	Background color of the legend	Color Transparency	Colors("glegend") Not set
GraphOutlines	Outline properties for fill areas such as bars, pie slices, box plots, ellipses, and histograms	Color ContrastColor LineStyle LineThickness	GraphColors("goutlines") GraphColors("goutlines") 1 1px
GraphReference	Horizontal and vertical reference lines and drop lines	ContrastColor LineStyle LineThickness	GraphColors("greferencelines") 5 1px
GraphTitleText	Text font and color for title(s)	Font or <i>font-attributes</i> * Color	GraphFonts("GraphTitleFont") Not set GraphColors("gtext")
GraphUnicodeText	Text font for unicode values	Font or <i>font-attributes</i> * Color	GraphFont("GraphUnicodeFont") Not set GraphColors("gtext")
GraphValueText	Text font and color for axis tick values and legend values	Font or <i>font-attributes</i> * Color	GraphFonts("GraphValueFont") Not set GraphColors("gtext")
GraphWalls	Vertical wall(s) bounded by axes	Color Transparency FrameBorder LineThickness LineStyle ContrastColor	GraphColors("gwalls") Not set On 1px 1 GraphColors("gaxis")

\* *Font-attributes* can be one of the following: FONTFAMILY=, FONTSIZE=, FONTSTYLE=, FONTWEIGHT=.

**Table 8.5** Style Elements Affecting Graphical Data Representation

Style Element	Portion of Graph Affected	Recognized Attributes	Attribute Values in DEFAULT Style
GraphBoxMean	Marker for mean	ContrastColor MarkerSize MarkerSymbol	GraphColors("gcdata") 9px "Diamond"
GraphBoxMedian	Line for median	ContrastColor LineStyle LineThickness	GraphColors("gcdata") 1 1px
GraphBoxWhisker	Box whiskers and serifs	ContrastColor LineStyle LineThickness	GraphColors("gcdata") 1 1px
GraphConfidence	Primary confidence lines and bands, colors for bands and lines	ContrastColor Color MarkerSize MarkerSymbol LineStyle LineThickness	GraphColors("gcconfidence") GraphColors("gconfidence") 7px "Diamond" 2 1px
GraphConfidence2	Secondary confidence lines and bands, color for bands, and contrast color for lines	ContrastColor Color MarkerSize MarkerSymbol LineStyle LineThickness	GraphColors("gcconfidence2") GraphColors("gconfidence2") 7px "Triangle" 41 1px
GraphConnectLine	Line for connecting boxes or bars	ContrastColor LineStyle LineThickness	GraphColors("connectLine") 1 1px
GraphDataDefault	Primitives related to non-grouped data items, colors for filled areas, markers, and lines	Color ContrastColor MarkerSymbol MarkerSize LineStyle LineThickness StartColor NeutralColor EndColor	GraphColors("gdata") GraphColors("gcdata") "circle" 7px 1 1px GraphColors("gramp3cstart") GraphColors("gramp3cneutral") GraphColors("gramp3cend")
GraphError	Error line or error bar fill, ContrastColor for lines, Color for bar fill	ContrastColor Color LineStyle Transparency	GraphColors("gerror") GraphColors("gerror") 5 Not set

Style Element	Portion of Graph Affected	Recognized Attributes	Attribute Values in DEFAULT Style
GraphFit	Primary fit lines such as a normal density curve	ContrastColor Color MarkerSize MarkerSymbol LineStyle LineThickness	GraphColors("gcfit") GraphColors("gfit") 7px "Circle" 1 2px
GraphFit2	Secondary fit lines such as a kernel density curve	ContrastColor Color MarkerSize MarkerSymbol LineStyle LineThickness	GraphColors("gcfit") GraphColors("gfit") 7px "X" 5 2px
GraphMissing	Properties for graph items representing missing values	ContrastColor Color MarkerSymbol MarkerSize LineStyle LineThickness Transparency	GraphColors("gcmisssing") GraphColors("gmisssing") "square" 7px 1 1px Not set
GraphOutlier	Outlier data for the graph	ContrastColor Color MarkerSize MarkerSymbol LineStyle LineThickness	GraphColors("goutlier") GraphColors("gcoutlier") 7px "Circle" 42 2px
GraphPrediction	Prediction lines	ContrastColor Color LineStyle LineThickness MarkerSize MarkerSymbol	GraphColors("gcpredict") GraphColors("gpredict") 4 2px 7px "Plus"
GraphPredictionLimits	Fills for prediction limits	ContrastColor Color MarkerSize MarkerSymbol	GraphColors("gcpredictlim") GraphColors("gpredictlim") 7px "Chain"

Style Element	Portion of Graph Affected	Recognized Attributes	Attribute Values in DEFAULT Style
GraphSelection	For interactive graphs, visual properties of selected item. Color for selected fill area, ContrastColor for selected marker or line	ContrastColor Color MarkerSymbol MarkerSize LineStyle LineThickness	GraphColors("gcdata") GraphColors("gdata") "Square" 11px 1 5px
ThreeColorAltRamp	Line contours, markers, and data labels with segmented range color response	StartColor NeutralColor EndColor	GraphColors("gconramp3start") GraphColors("gconramp3neutral") GraphColors("gconramp3end")
ThreeColorRamp	Gradient contours, surfaces, markers, and data labels with continuous color response	StartColor NeutralColor EndColor	GraphColors("gramp3cstart") GraphColors("gramp3cneutral") GraphColors("gramp3cend")
TwoColorAltRamp	Line contours, markers, and data labels with segmented range color response	StartColor EndColor	GraphColors("gconramp2cstart") GraphColors("gconramp2cend")
TwoColorRamp	Gradient contours, surfaces, markers, and data labels with continuous color response	StartColor EndColor	GraphColors("gramp2cstart") GraphColors("gramp2cend")

**Table 8.6** Graphical Style Elements: Data Related (Grouped)

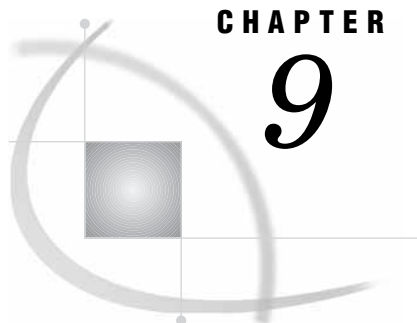
Style Element	Portion of Graph Affected	Recognized Attributes	Attribute Values in DEFAULT Style
GraphData1	Primitives related to 1st grouped data items. Color applies to filled areas. ContrastColor applies to markers and lines.	Color ContrastColor MarkerSymbol LineStyle	GraphColors("gdata1") GraphColors("gcdata1") "Circle" 1
GraphData2	Primitives related to 2nd grouped data items	Color ContrastColor MarkerSymbol LineStyle	GraphColors("gdata2") GraphColors("gcdata2") "Plus" 4
GraphData3	Primitives related to 3rd grouped data items	Color ContrastColor MarkerSymbol LineStyle	GraphColors("gdata3") GraphColors("gcdata3") "x" 8
GraphData4	Primitives related to 4th grouped data items	Color ContrastColor MarkerSymbol LineStyle	GraphColors("gdata4") GraphColors("gcdata4") "Triangle" 5

Style Element	Portion of Graph Affected	Recognized Attributes	Attribute Values in DEFAULT Style
GraphData5	Primitives related to 5th grouped data items	Color ContrastColor MarkerSymbol LineStyle	GraphColors("gdata5") GraphColors("gcdata5") "Square" 14
GraphData6	Primitives related to 6th grouped data items	Color ContrastColor MarkerSymbol LineStyle	GraphColors("gdata6") GraphColors("gcdata6") "Asterisk" 26
GraphData7	Primitives related to 7th grouped data items	Color ContrastColor MarkerSymbol LineStyle	GraphColors("gdata7") GraphColors("gcdata7") "Diamond" 15
GraphData8	Primitives related to 8th grouped data items	Color ContrastColor LineStyle	GraphColors("gdata8") GraphColors("gcdata8") 20
GraphData9	Primitives related to 9th grouped data items	Color ContrastColor LineStyle	GraphColors("gdata9") GraphColors("gcdata9") 41
GraphData10	Primitives related to 10th grouped data items	Color ContrastColor LineStyle	GraphColors("gdata10") GraphColors("gcdata10") 42
GraphData11	Primitives related to 11th grouped data items	Color ContrastColor LineStyle	GraphColors("gdata11") GraphColors("gcdata11") 2
GraphData12	Primitives related to 12th grouped data items	Color ContrastColor	GraphColors("gdata12") GraphColors("gcdata12")

**Table 8.7**   Display Style Elements

Style Element	Portion of Graph Affected	Recognized Attributes	Possible Values
GraphAltBlock	Alternate fill color for block plots	Color	GraphColors("gablock")
GraphBand	Display options for confidence bands	DisplayOpts	"Fill "
GraphBox	Display options for box plots	DisplayOpts CapStyle Connect	"Fill caps mean Median outliers " "Serif" "Mean"

Style Element	Portion of Graph Affected	Recognized Attributes	Possible Values
GraphBlock	Fill color for block plots	Color	GraphColors("gblock")
GraphEllipse	Display options for confidence ellipses	DisplayOpts	"Outline"
GraphHistogram	Display options for histograms	DisplayOpts	"Fill outline"



## CHAPTER

## 9

# Managing Your Graphics With ODS

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## 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/GRAPH Statistical Graphics Procedures and many SAS Analytical procedures use the Statistical Graphics Framework (SGF) for creation of the graphs. The ODS destination statements and the ODS GRAPHICS statement provide options for control of many relevant features.

This describes techniques for managing this graphical output in the following sections:

- “Specifying a Destination” on page 294
- “Using the ODS GRAPHICS Statement” on page 296

## Specifying a Destination

### Overview

For creation of these graphs, a valid ODS destination must be active. By default, the Listing destination is active. You can use an ODS destination statement, such as ODS HTML, to specify where you want your output to be displayed and where you want your image files to be stored. You can also specify some appearance options for the graphics output such as image DPI, width, height, and style. For more information about this topic, see “Using the ODS GRAPHICS Statement” on page 296.

The following ODS HTML statement specifies that the Journal style is used, the output is sent to the HTML destination, and images are stored in the folder “C:\myfiles\images”. For the complete program, see Example Code 9.1 on page 297.

```
ods html file="BoxPlot-Body.html"
      gpath=
      "C:\myfiles\images" style=journal;

... SAS statements ...

ods html close;
```

The output is written to the file **BoxPlot-Body.html**, which is saved in the SAS current folder. At start up, the SAS current folder 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 folder is displayed in the status bar at the bottom of the main SAS window. Images created by the output are stored in the folder “C:\myfiles\images”. The STYLE= option changes the style from Default.Styles to Journal.Styles. For more information about changing the appearance of your graphics, see Chapter 8, “Controlling The Appearance of Your Graphs,” on page 275. The ODS HTML CLOSE statement closes the HTML destination, which enables you to see your output.

If you do not specify a filename for your output, then SAS provides a default file that is determined by the ODS destination. This file is saved in the SAS current folder. You can check the SAS log to verify the name of the file in which your output is saved.

The following table lists the ODS destinations and the type of output that results from each destination.

**Table 9.1** Relevant Destination Table

Destinations	Results	Default Style	Default ImgFmt	Default DPI
DOCUMENT	ODS document	(not applicable)	(not applicable)	(not applicable)
LISTING <sup>1</sup>	SAS output listing	Listing	PNG	100
OUTPUT	SAS data set	(not applicable)	(not applicable)	(not applicable)
HTML	HTML file for online viewing	Default	PNG	100
LATEX <sup>2</sup>	LaTeX file	Default	PostScript	200

Destinations	Results	Default Style	Default ImgFmt	Default DPI
PRINTER	printable output in one of three different formats: PCL, PDF, or PS (PostScript)	Printer for PDF and PS, monochromePrinter for PCL	Embedded PNG	150
RTF	output written in Rich Text Format for use with Microsoft Word 2000	RTF	Embedded PNG	200
Measured RTF		RTF	Embedded	200

- 1 Beginning with SAS 9.2, the ODS LISTING destination allows the use of ODS Graphics Editor. See the *SAS/GRAPH: ODS Graphics Editor User's Guide* for more information.
- 2 LATEX is an experimental tagset. Do not use this tagset in production jobs.

Graphs rendered to the Listing destination are not automatically displayed in the output window or in the Graph window. To view these graphs go to the Results window and select the desired graph to view.

For complete documentation on ODS destinations, see *SAS Output Delivery System: User's Guide*.

## ODS Destination Statement Options

There are several destination statement options that you can use to control where your files or graphics should be written, as well as specifying a new style, and specifying the appropriate image resolution in DPI for your output images. For example, the following ODS HTML statement:

- ☐ opens the HTML destination
- ☐ specifies that images be written to the file "**C:\myfiles\images**"
- ☐ specifies that other output types be written to the file "**C:\myfiles**"
- ☐ specifies an image resolution of 150
- ☐ changes the style to Journal

```
ods html path="c:\myfiles"
        gpath="c:\myfiles" (url="images/")
        image_dpi=150
        style=journal;
```

These options are specified on ODS destination statements, using the following form:

**ODS destination** <option(s);>

- GPATH= option** specifies the location for all graphics output that is generated while the destination is open. You can specify an external file, a fileref, or use the URL= suboption to specify a URL. The GPATH= option is valid for the Listing destination and the Markup family of destinations. If the GPATH option is not specified, the images are written to the location specified by the PATH option. For complete documentation on GPATH= option, see the ODS LISTING statement

and the ODS MARKUP statement in *SAS Output Delivery System: User's Guide*.

PATH= option	specifies the location of an external file or a SAS catalog for all markup files. You can specify an external file, a fileref, or use the URL= suboption to specify a URL. The PATH= option is valid for the RTF, Measured RTF, and Markup family of destinations. If the PATH option is not specified, images are written to the current working directory. For complete documentation on PATH= option, see the ODS LISTING statement, ODS MARKUP statement, or TAGSET.RTF statement in <i>SAS Output Delivery System: User's Guide</i> .
IMAGE_DPI=   DPI= options	specifies the image resolution in DPI for the output images. Each ODS destination has a default DPI that is appropriate for output format. If a DPI is specified, then the image is scaled linearly from a baseline DPI of 100. The IMAGE_DPI= option is valid for the Listing, RTF, Markup family, and Measured RTF destinations. The DPI= option is valid for Printer family destinations. For complete documentation for the IMAGE_DPI= option, see the valid ODS destination statement in <i>SAS Output Delivery System: User's Guide</i> .
STYLE= option	specifies a style to be used for the output. Each ODS destination has a default style for the formatting of output. The style specifies a collection of visual attributes that are used for the rendering of the output. The STYLE= option is valid for all ODS destinations except the Document destination and the Output destination. For complete documentation for the STYLE= option, see the ODS statements in <i>SAS Output Delivery System: User's Guide</i> . For more information about using the STYLE= option with GTL based graphics, see Chapter 8, "Controlling The Appearance of Your Graphs," on page 275.

---

## Using the ODS GRAPHICS Statement

---

### Introduction

You can use the ODS GRAPHICS statement options to control many aspects of your graphics. The settings 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/GRAPH Statistical Graphics procedures, the ODS GRAPHICS is always ON. However, you can use the ODS GRAPHICS statement to control 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:

**ODS GRAPHICS** < OFF | ON> </ option(s)>;

For a table of options for the ODS GRAPHICS statement, see "ODS GRAPHICS Statement Options" on page 302.

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 298
- “Adding Data Tips and Other Features” on page 300
- “Accessing Graphs as Separate Files” on page 300

**Example Code 9.1** Controlling Graphics with the ODS GRAPHICS Statement

```

❶ods graphics on /
    ❷width=3.25in
    ❸imagefmt=gif
    ❹imagemap=on
    ❺imagenname="MyBoxplot"
    ❻border=off;

ods html file="Boxplot-Body.html" style=journal gpath="your-file-path";

proc sgplot data=sashelp.heart;
    title "Cholesterol Distribution by Weight Class";
    hbox cholesterol / category=weight_status;
run;
ods html close;

❷ods graphics on / reset=all imagenname="MyResetplot";

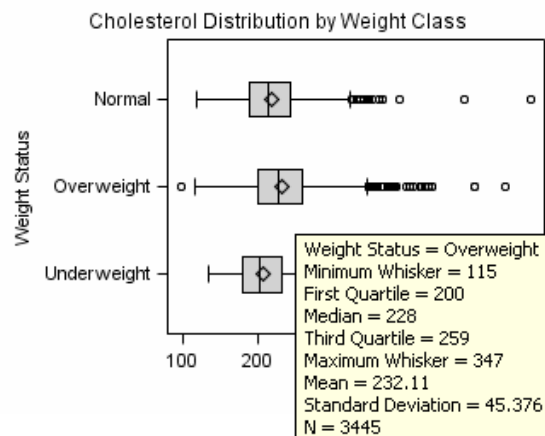
ods html file="BoxPlotReset-Body.html" style=journal gpath="your-file-path";

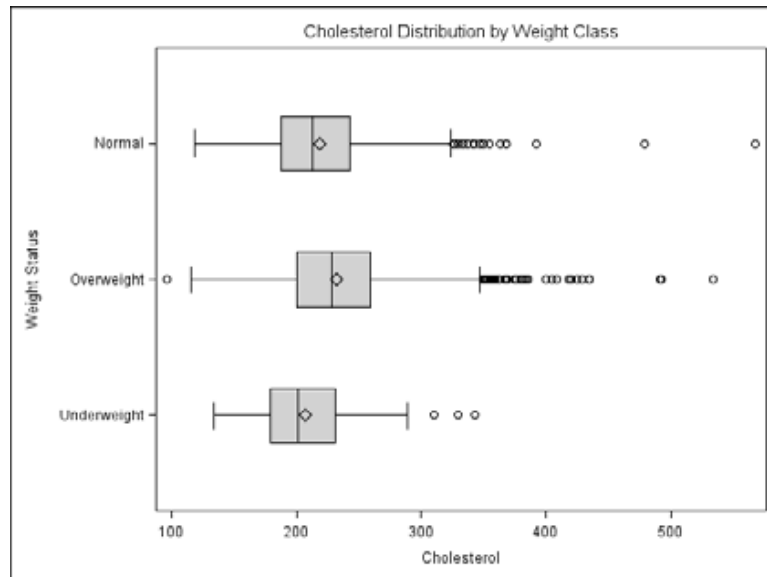
proc sgplot data=laborforce;
    hbox unemplrate / category=state datalabel=year;
run;

ods html close;

```

**Display 9.1** 3.25 Inch Graph with Data Tips and No Border



**Display 9.2** Graph with Options Set Back to Defaults

The numbers in the following sections correspond to numbers in the program above.

## 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 as 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, as specified by the IMAGE\_DPI= or DPI= options
- User specified settings for width and height, as 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 1280 by 960 pixels. 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.

## 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 100. All graphical elements such as marker size, line thickness, font sizes, and gutters are also scaled.

## 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 9.1 on page 297, the `WIDTH=` option (❷) changes the width of the graph to 3.25 inches:

```
ods graphics on /
  ❷width=3.25in
  imagefmt=gif
  imagemap=on
  imagename="MyBoxplot"
  border=off;
```

## Retaining Aspect Ratio

Although you can use the ODS GRAPHICS statement to specify the `WIDTH=` option, the `HEIGHT=` option, or both, 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 the size of a graph is changed by specifying 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 of DPI of 100. 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=ON` option in the ODS GRAPHICS statement.

## Tip For Embedding 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 9.1 on page 297, the BORDER=OFF option (❸) specifies that there be no border around the graph and the IMAGEMAP=ON (❹) option enables the generation of data tips and any drill downs:

```
ods graphics on /
  width=3.25in
  imagefmt=gif
  ❹imagemap=on
  imagename="MyBoxplot"
  ❸border=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 you can use to control other aspects of your graphics. See “ODS GRAPHICS Statement Options” on page 302 for a table of ODS GRAPHICS statement options.

---

## Resetting ODS GRAPHICS Options

You can specify the RESET option to change the values for these options back to their defaults. In Example Code 9.1 on page 297, the second ODS GRAPHICS statement (❶) uses the RESET=ALL option to set all options back to their defaults for a new graph:

```
❶ods graphics on / reset=all imagename="MyResetplot";
```

You can also reset ODS GRAPHICS options individually. For a list of values valid for the RESET= option, see “ODS GRAPHICS Statement Options” on page 302.

*Note:* When you specify the RESET= option, ensure that it is the first option specified in the ODS GRAPHICS statement. Otherwise, you might reset some of other options in the statement. △

For the complete documentation on all ODS GRAPHICS statement options, see “ODS GRAPHICS Statement Options” on page 302.

---

## Accessing Graphs as Separate Files

### Overview

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 IMAGEFMT= option to specify a different image file format. The type of image allowed

is dependent on the destination you have specified. See “Supported Image File Types for Output Destinations” on page 301 for a table of ODS destinations and their valid file types.

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 9.1 on page 297, the `IMAGEFMT=` option (❸) specifies that the file type is a **GIF**, and the `IMAGENAME=` option (❺) specifies that the name of the image is “**MyBoxplot**”:

```
ods graphics on /
    width=3.25in
    ❸ imagefmt=gif
    imagemap=on
    ❺ imagename="MyBoxplot"
    border=off;
```

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 second ODS GRAPHICS statement (❷) specifies the filename “**MyBoxplot**” for the second image. However, because the `RESET=ALL` option is used, the file type is PNG, which is the default file type for the HTML destination:

```
❷ods graphics on / reset=all
    imagename="MyBoxplot";
```

For the ODS destinations that generate graphic image files, these image files are saved by default into the SAS current working directory. You can use the `GPATH=` option to specify a directory for saving your graphics image files. For example, in Example Code 9.1 on page 297 the `GPATH=` option on both of the ODS HTML statements specifies that all images be saved in the directory **C:\myfiles\images**.

For more information about ODS destinations, see *SAS Output Delivery System: User's Guide*.

## Supported Image File Types for Output Destinations

The following table lists all of the supported image file types for ODS output destinations.

Output Destination	Supported Image File Types
HTML	PNG (default), GIF, JPEG, JPG
Listing	PNG (default), BMP, DIB, EMF, EPSI, GIF, JFIF, JPEG, JPG, PBM, PDF, PS, SASMF, STATIC, TIFF, WMF
LATEX	PS(default), EPSI, GIF, PNG, PDF, JPG
Printer Family	PNG(default), JPEG, JPG, GIF
RTF	PNG(default), JPEG, JPG, JFIF
Markup Tagsets	All Markup family tagsets have the default <i>imagefmt</i> value built in.

## Description of Supported Image File Types

Image File Type	Description
BMP (Microsoft Windows Device Independent Bitmap)	Supports color-mapped and true color images that are stored as uncompressed or run-length encoded data.
DIB (Microsoft Windows Device Independent Bitmap)	See the description of BMP. DIB is supported only under the OS/2 operating system.
EMF (Microsoft NT Enhanced Metafile)	Supported only under Windows 95, Windows 98, and Windows NT.
EPSI (Microsoft NT Enhanced Metafile)	An extended version of the standard PostScript (PS) format. Files that use this format can be printed on PostScript printers and can also be imported into other applications. Notice that EPSI files can be read, but PS files cannot be read.
GIF (Graphics Interchange Format)	Supports only color-mapped images.
JFIF (JPEG File Interchange Format)	Supports JPEG image compression.
JPEG or JPG (Joint Photographic Experts Group)	A file format that is used for storing noninteractive images.
PBM (Portable Bitmap Utilities)	Supports gray, color, RGB, and bitmap files.
PDF (Portable Document Format)	A file format for electronic distribution and exchange of documents.
PNG (Portable Network Graphic)	Supports true color, gray-scale, and 8-bit images.
PS (PostScript Image File Format)	The Image classes use only PostScript image operators. A level II PS printer is required for color images.
SASEMF (Enhanced Metafile)	EMF image tuned for RTF output.
STATIC	Chooses the best image format for the current ODS destination.
TIFF (Tagged Image File Format)	Internally supports a number of compression types and image types, including bitmapped, color-mapped, gray-scaled, and true color.
WMF (Microsoft Windows Metafile)	Supported only under Microsoft Windows operating systems.

## ODS GRAPHICS Statement Options

The following options can be used with the ODS GRAPHICS statement.

**Table 9.2** ODS GRAPHICS Option Summary Table

Task	Option
Specify whether anti-aliasing is applied to the rendering of the line and markers in any graph.	ANTIALIAS=   ANTIALIAS   NOANTIALIAS
Specify the maximum number of markers or lines to be anti-aliased before anti-aliasing is disabled.	ANTIALIASMAX=
Specify whether to draw a border around each graph.	BORDER=   BORDER   NOBORDER
Specify the maximum number of discrete values to be shown in any graph.	DISCRETEMAX=
Specify the maximum number of group values to be shown in any graph.	GROUPMAX=
Specify the height of any graph.	HEIGHT=
Specify the image format used to generate image files.	IMAGEFMT=
Specify whether data tips are generated.	IMAGEMAP=   IMAGEMAP   NOIMAGEMAP
Specify the base image filename.	IMAGENAME=
Specify the maximum number of labeled areas before labeling is disabled.	LABELMAX=
Specify an integer that is interpreted as the maximum percentage of the overall graphics area that a legend can occupy.	MAXLEGENDAREA=
Specify the maximum number of cells in a graph panel where the number of cells is determined dynamically by classification variables.	PANELCELLMAX=
Reset one or more ODS GRAPHICS options to its default.	RESET   RESET=
Specify whether the content of any graph is scaled proportionally.	NOSCALE   SCALE   SCALE=
Specify the maximum number of distinct mouse—over areas allowed before data tips are disabled.	TIPMAX=
Specify the width of any graph.	WIDTH=

**ANTIALIAS= | ANTIALIAS | NOANTIALIAS**

specifies whether anti-aliasing is applied to the rendering of the line and markers in any graph. Anti-aliasing smooths the appearance of diagonal lines and some markers. Text displayed in the graph is always anti-aliased. For graphical displays that plot large numbers of points it is recommended that **ANTIALIAS=OFF** be specified for performance considerations.

**ANTIALIAS= OFF | ON**

specifies whether anti-aliasing is applied to the rendering of the line and markers in the graph.

**OFF**

does not smooth jagged edges of components other than text in the graph.

**Alias:** NO

ON smooths jagged edges of all components in the graph.

**Alias:** YES

ANTIALIAS

smooths jagged edges of all components in the graph.

NOANTIALIAS

does not smooth jagged edges of components other than text in the graph.

**Default:** ON

**Restriction:** If the number of markers or curve points in the plot exceeds the number specified by the ANTIALIASMAX= option, then the ANTIALIAS option is turned off, even if you specify the option ANTIALIAS=ON or ANTIALIAS.

ANTIALIASMAX=*n*

specifies the maximum number of markers or lines to be anti-aliased before anti-aliasing is disabled. For example, if there are more than 400 scatter point markers to be anti-aliased and ANTIALIASMAX=400, then no markers are anti-aliased.

*n*

specifies a positive integer.

**Default:** 600

BORDER= | BORDER | NOBORDER

specifies whether to draw a border around any graph.

BORDER= OFF | ON

specifies whether to draw the graph with a border on the outermost layout.

ON

specifies to draw a border around the graph.

**Alias:** YES

OFF

specifies not to draw a border around the graph.

**Alias:** NO

BORDER

specifies to draw a border around the graph.

NOBORDER

specifies not to draw a border around any graph.

**Default:** BORDER or BORDER=ON

DISCRETEMAX=*n*

specifies the maximum number of discrete values to be shown in any graph. Bar charts and box plots are examples of affected plot types. Scatter plots and other plot types might be affected if the data to be plotted is discrete or the axis is discrete.

*n*

specifies a positive integer.

**Default:** 1000

**Tip:** Some plot layers might be unaffected by the DISCRETEMAX= option, and those layers are still rendered. If all layers are affected, then a blank graph is rendered.

**Tip:** If the value specified by the DISCRETEMAX= option is exceeded by any plot layer in the graph, that layer is not drawn and a warning message is issued.

GROUPMAX=*n*

specifies the maximum number of group values to be shown in any graph. Any graph that supports the GROUP= option is affected.

*n*

specifies a positive integer.

**Default:** 1000

**Tip:** If the value specified by the GROUPMAX= option is exceeded by any plot layer in the graph, that layer is rendered ignoring the GROUP= option and a warning message is issued.

HEIGHT=*dimension*

specifies the height of any graph.

*dimension*

is a nonnegative number.

**See:** *dimension on page 308*

**Default:** The value of the SAS registry entry “ODS > STATISTICAL GRAPHICS > Design Height” or the value of the DesignHeight= option in a STATGRAPH template. Typically, the value is 480px.

IMAGEFMT= *image-file-type* | STATIC

specifies the image format to be used. If the image format is not valid for the active output destination, the format is automatically changed to the default image format for that destination.

*image-file-type*

is the image format to be generated. See “Supported Image File Types for Output Destinations” on page 301.

STATIC

uses the best quality static image format for the active output destination. This is the default.

**Default:** STATIC

IMAGEMAP= | IMAGEMAP | NOIMAGEMAP

controls data tips generation. Data tips are pieces of explanatory text that appear when you mouse-over the data portions of a graph contained in an HTML page.

IMAGEMAP= ON | OFF

controls data tips generation.

OFF

specifies not to generate data tips.

**Alias:** NO

ON

specifies to generate data tips.

**Alias:** YES

IMAGEMAP

specifies to generate data tips.

NOIMAGEMAP

specifies not to generate data tips.

**Default:** OFF or NOIMAGEMAP

**Restriction:** This option applies only when the ODS HTML destination is used.

IMAGENAME=*“filename”*

specifies the base image filename.

If more than one image is generated, each is assigned filename as a base name followed by a number in order to create unique names. This numbering can be

reset with the RESET=INDEX option. Path information (if needed) can be set with the GPATH= option in the ODS destination statement. The default path is the current output directory. A file extension for filename is automatically generated based on the IMAGEFMT= option.

**Requirement:** You must enclose *filename* in quotation marks.

**Restriction:** *filename* must be a single name. It must not include any path specification or image-format name extension.

**Default:** The name of the output object.

LABELMAX= *n*

specifies the maximum number of labeled areas before labeling is disabled. For example, if there are more than 50 points to be labeled and LABELMAX=50, then no points are labeled.

*n*

specifies a positive integer.

**Default:** 200

MAXLEGENDAREA= *n*

specifies an integer that is interpreted as the maximum percentage of the overall graphics area that a legend can occupy.

*n*

specifies a positive integer.

**Default:** 20

**Tip:** To turn off the legend, specify MAXLEGENDAREA=0. No warning is issued when the legend is turned off in this way.

PANELCELLMAX=*n*

specifies the maximum number of cells in a graph panel where the number of cells is determined dynamically by classification variables.

*n*

specifies a positive integer.

**Default:** 10000

**Tip:** If the value specified by the PANELCELLMAX= option is exceeded by either of these layouts, an empty graph is rendered and a warning message is issued.

RESET | RESET= *option*

resets one or more ODS GRAPHICS options to its default.

RESET

resets all of the *options* to their defaults.

RESET=

resets one of the following to its default:

ALL

resets all of the *reset-options* to their defaults.

ANTIALIAS

resets the ANTIALIAS option to its default.

ANTIALIASMAX

resets the ANTIALIASMAX option to its default.

BORDER

resets the BORDER= option to its default.

**IMAGEMAP**

resets the IMAGEMAP= option to its default.

**INDEX**

resets the index counter that is appended to static image files.

**HEIGHT**

resets the HEIGHT= option to its default.

**IMAGEMAP**

resets the IMAGEMAP= option to its default.

*Note:* Not all output destinations support this feature.  $\triangle$

**LABELMAX**

resets the LABELMAX= option to its default.

**SCALE**

resets the SCALE= option to its default.

**TIPMAX**

resets the TIPMAX= option to its default.

**WIDTH=**

resets the WIDTH= option to its default.

**NOSCALE | SCALE | SCALE=**

specifies whether the content of any graph is scaled proportionally.

**NOSCALE**

does not scale the components of graph proportionally.

**SCALE**

scales the components of graph proportionally.

**SCALE=**

specifies whether the content of the graph is scaled proportionally.

**OFF**

does not scale the components of graph proportionally.

**Alias:** NOSCALE

**Alias:** NO

**ON**

scales the components of graph proportionally.

**Alias:** YES

**Default:** ON or SCALE

**TIPMAX=*n***

specifies the maximum number of distinct mouse-over areas allowed before data tips are disabled. For example, if there are more than 400 points in a scatter plot, and TIPMAX=400, then no data tips appear.

*n*

specifies a positive integer.

**Default:** 500

**WIDTH=*dimension***

specifies the width of any graph.

*dimension*

is a nonnegative number.

**Default:** The value of the SAS registry entry “ODS > STATISTICAL GRAPHICS > Design Width” or the value of the DesignWidth= option in a STATGRAPH template. Typically, this value is 640px.

**See:** *dimension on page 308*

*dimension* is a nonnegative number, which can be followed by one of these units of measure:

cm	centimeters
in	inches
mm	millimeters
pt	a printer's point
px	pixels

# Glossary

---

**cell**

a distinct rectangular subregion of a graph that can contain plots, text, or legends.

**classification panel**

a multi-cell graph in which the cell layout is subset by one or more classification variables. The number of the cells and their layout are 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 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 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, 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. In the ODS Graphics context, plot is a generic term for the graphical element or

elements drawn by a plot statement. 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, the GraphTitleText style element specifies the color and font properties of title text and possibly other text in the graph. See also style attribute.

**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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