

CHAPTER

6

Doing More with Graphics

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Introduction

This chapter extends the concepts introduced in the “Graphics” chapter of *Getting Started with the SAS System Using SAS/ASSIST Software*. Included are discussions of advanced options for bar charts, pie charts, plots, and maps, and how to change the background color of a graphic.

For most of the tasks presented here, you must have SAS/GRAPH software licensed and installed. If you do not have SAS/GRAPH software licensed, you can perform some of the tasks using low-resolution graphics, but many of the advanced options are not available.

You are encouraged to explore and experiment with the different options. Use the online help for additional information.

Additional Information

For additional information on creating high-resolution graphics, refer to *SAS/GRAPH Software: Reference*. For additional information on creating low-resolution graphics, refer to the *SAS Procedures Guide*.

Doing More with Bar Charts

You can use **Bar Charts** on the Graphics menu to create horizontal or vertical simple bar charts, stacked bar charts, grouped bar charts, and grouped and stacked bar charts. In the “Graphics” chapter of *Getting Started with the SAS System Using SAS/ASSIST Software*, you learned how to create a bar chart. This section describes some of the more advanced options available when generating bar charts.

Generating a Bar Chart with the Mean Displayed

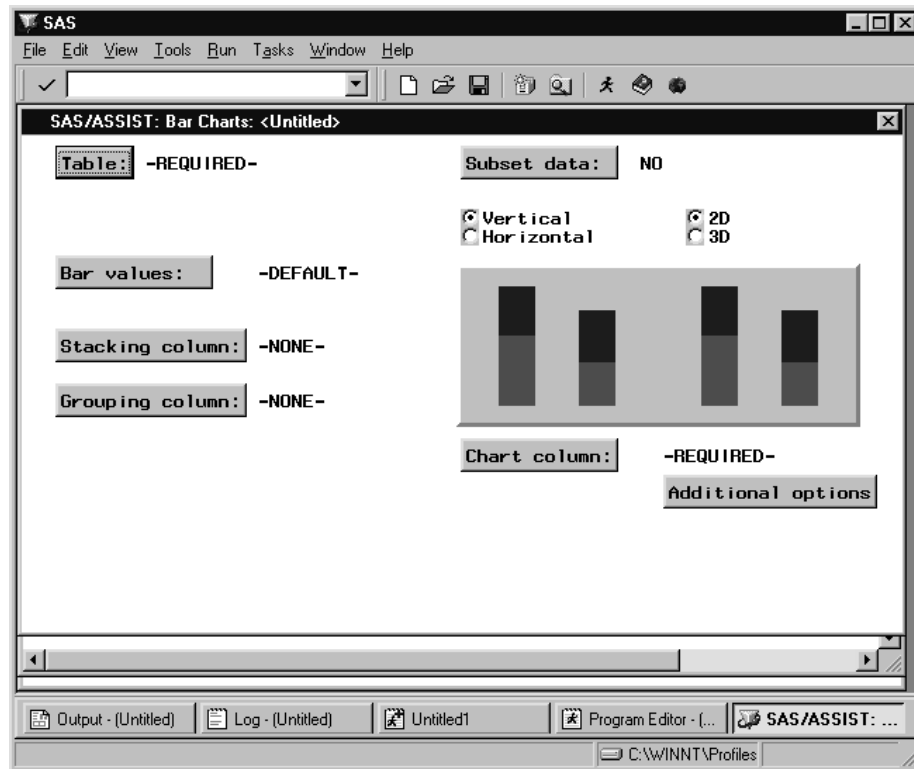
In this section you create a vertical bar chart showing the mean weight by age in the CLASS data set. You choose to have the mean of each bar displayed above the bar, adjust the fill patterns of the bars, add a title to the chart, and change the font of the title.

Setting Up the Bar Chart

- 1 To display the Bar Charts window, follow this selection path:

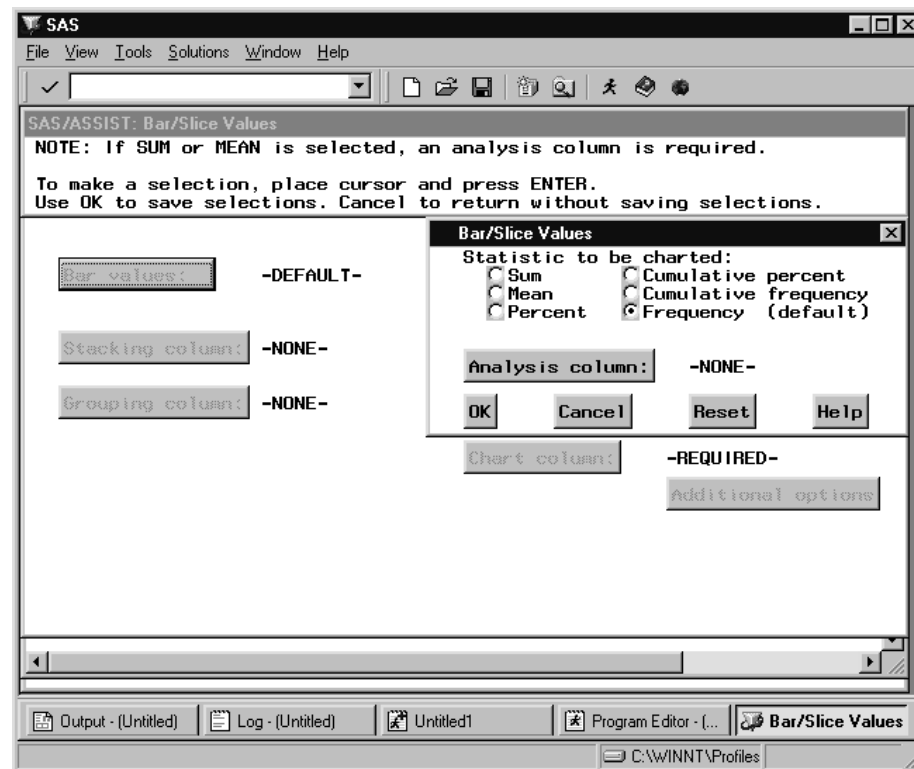
Tasks ►
 Graphics ►
 Bar Charts

The Bar Charts window appears.

Display 6.1 Bar Charts Window

- 2 Select **vertical** and **2D**.
- 3 Use the **Table** button to select the SASUSER.CLASS table.
- 4 Select **Bar values**. The Bar/Slice Values window appears.

Display 6.2 Bar/Slice Values Window

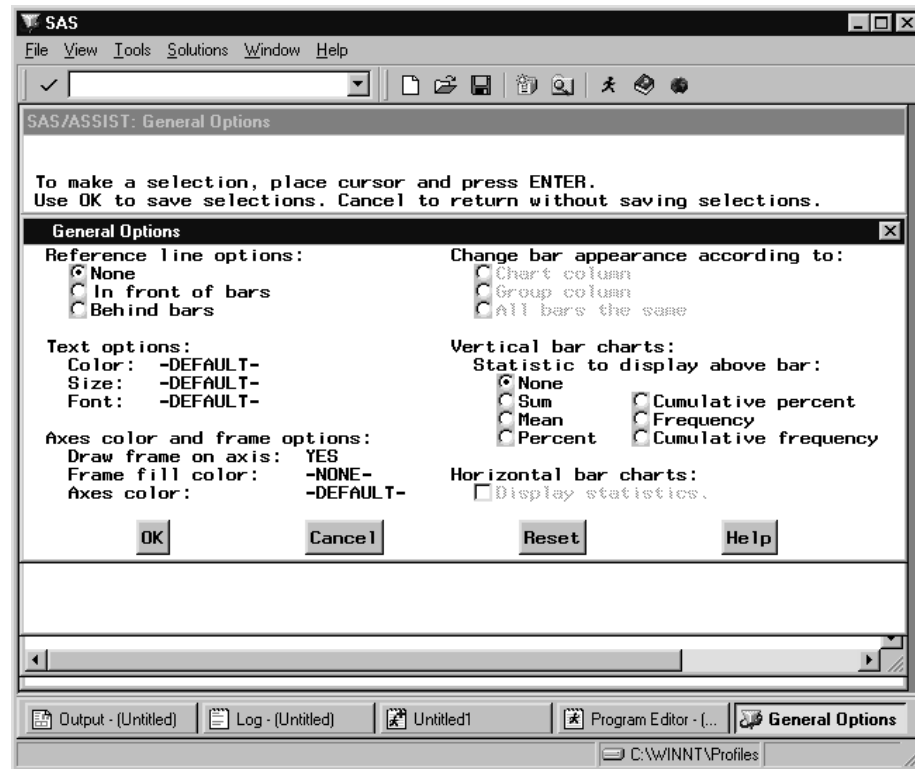


- 5 Select **Mean** as the statistic you want the bars to represent. By selecting **Mean**, each bar represents the mean of the analysis variable. You must select an analysis column if you select **Sum** or **Mean** as the bar value.
- 6 Use the **Analysis column** button to select the WEIGHT column.
- 7 Select **OK** to return to the Bar Charts window.
- 8 Use the **Chart column** button to select the AGE column.

Customizing the Bar Chart with Additional Options and Titles

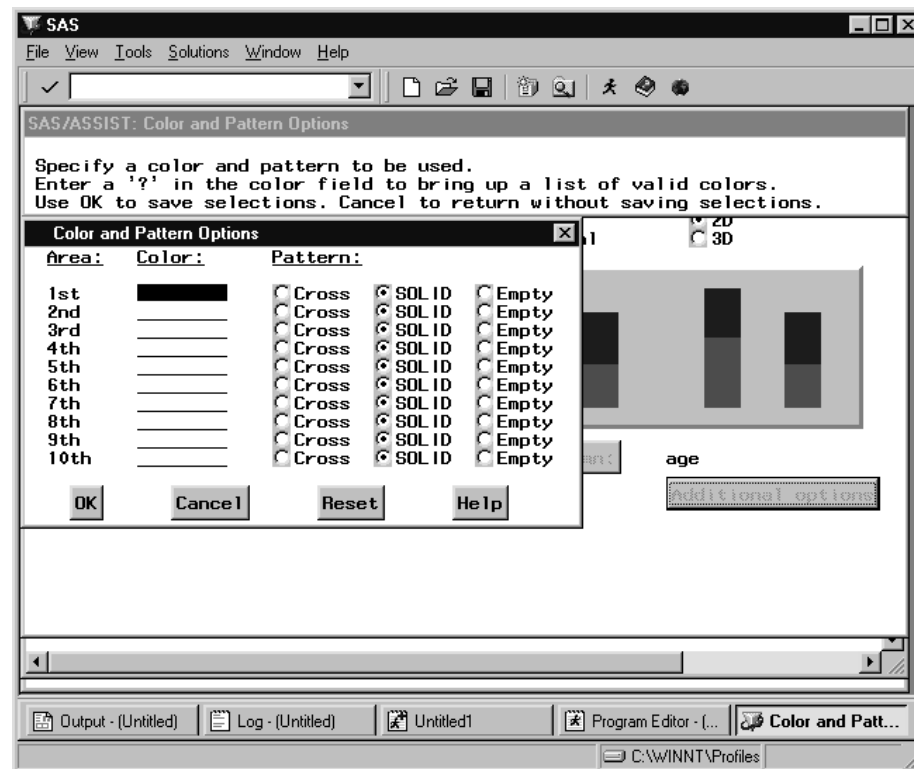
- 1 Select **Additional options**. The Additional Options window appears.
- 2 Select **General options**. The General Options window appears.

Display 6.3 General Options Window



- 3 Select **Mean** as the statistic to display above the bars for the vertical bar chart.
- 4 Select **OK** to return to the Additional Options window.
- 5 Select **Color and pattern options**. The Color and Pattern Options window appears.

Display 6.4 Color and Pattern Options Window



- 6 For the **1ST** and **4TH** areas, select **Cross** as the pattern.

For the **2ND** and **5TH** areas, leave the pattern as **Solid**.

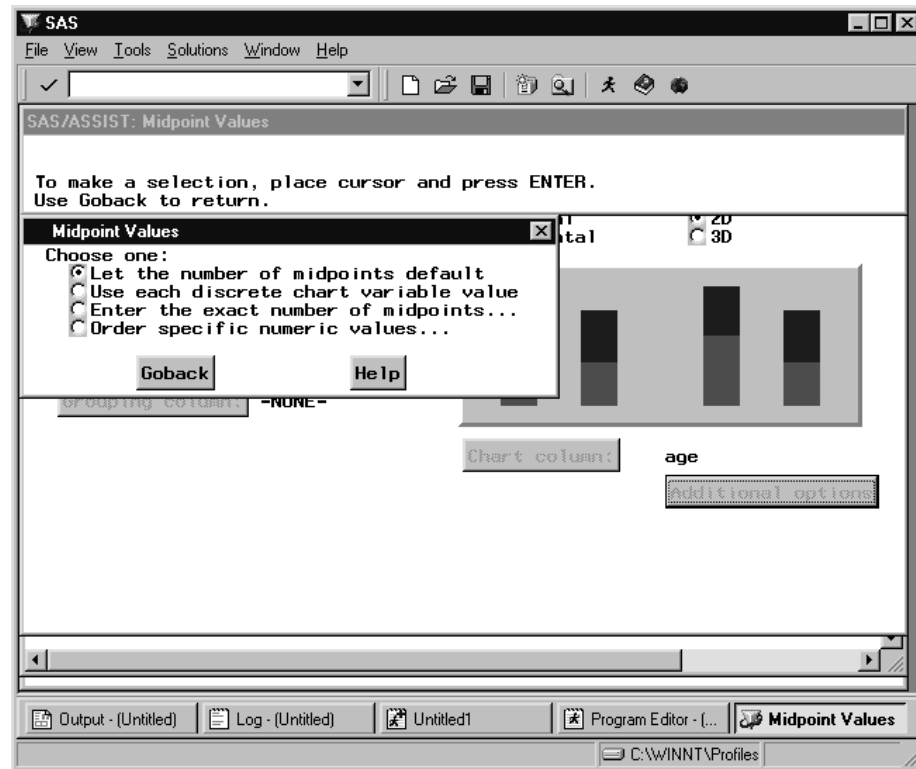
For the **3RD** and **6TH** areas, select **Empty** as the pattern.

The pattern selected by default for the bars is **Solid**. If you print a black and white graphic as shown in this book, you can use the pattern options to distinguish one bar from another.

If you print a color graphic, you can use colors to distinguish one bar from another. To display a list of valid colors, type ? in the first position of the **Color** field and press ENTER. Select the color you want to use.

- 7 Select **OK** to return to the Additional Options window.
- 8 Select **Number of bars**. The Midpoint Values window appears.

Display 6.5 Midpoint Values Window



- 9 Select **Use each discrete chart variable value**. The Additional Options window reappears.

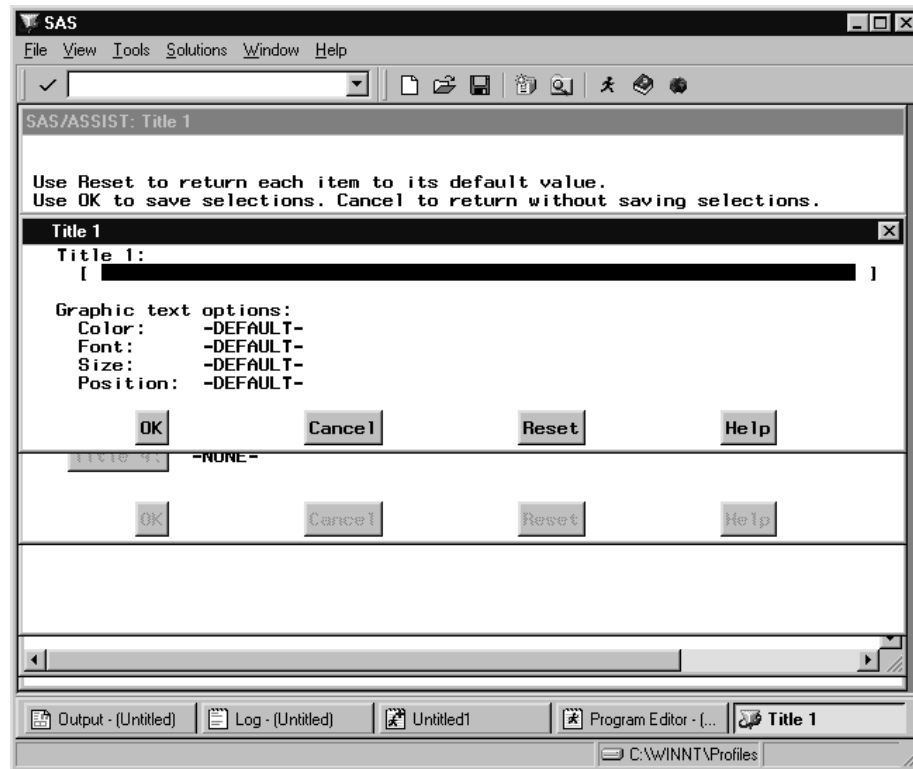
You select **Use each discrete chart variable value** to display one bar for each age represented in the CLASS data set (11, 12, 13, 14, 15, and 16). The default for the number of bars is **Let the number of midpoints default**, which lets the procedure determine the number of midpoints (bars) for the chart column. Each midpoint represents a median of a range of values. In this example, if you use **Let the number of midpoints default**, the bars represent the midpoints of the AGE variable (11.4, 12.6, 13.8, 15, and 16.2).

The window that appears when you select **Number of bars** is different for numeric and character chart columns.

- 10 Select **Goback** to return to the Bar Charts window.

- 11 To display the Title 1 window, follow this selection path starting from the Bar Charts window:

Edit ► Titles ► Title 1

Display 6.6 Title 1 Window

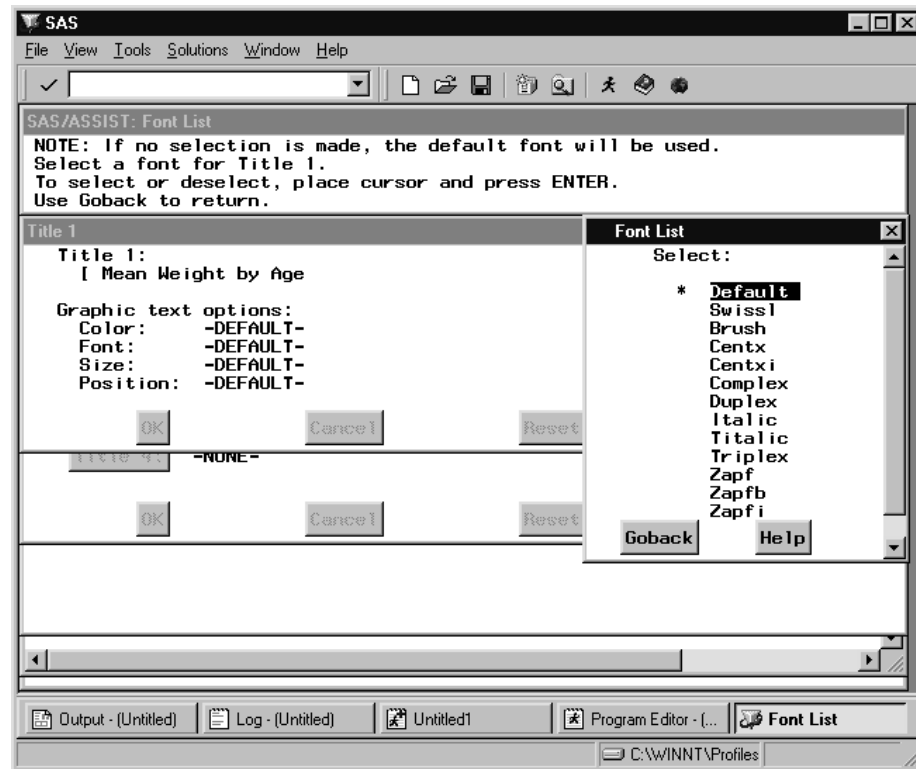
12 Type `Mean Weight by Age` as the title for the plot.

Note: Titles carry over from one report or graphic to another. If you do not type a title and a title was selected previously in the current SAS/ASSIST session, the previous title automatically appears on this graphic. △

13 Select `Font`.

The Font List window appears.

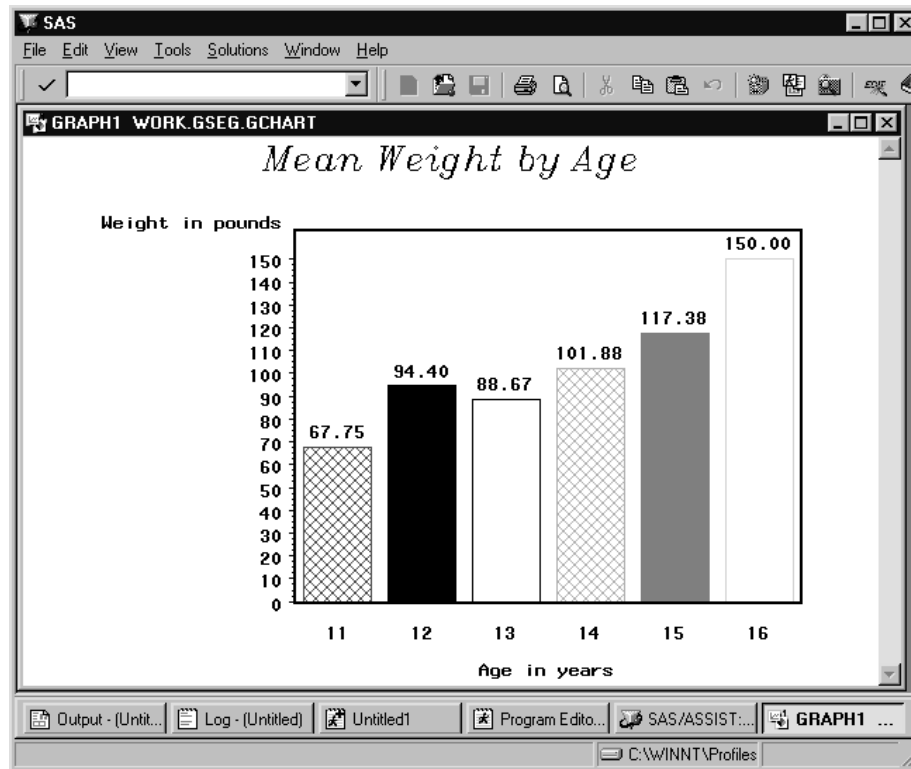
Display 6.7 Font List Window



- 14 Select **Italic** as the font for Title 1; the Title 1 window reappears.
Select **OK** twice to return to the Bar Charts window.

Running the Bar Chart

- 1 Select **Submit** from the **Run** menu. The bar chart appears in the GRAPH window.

Display 6.8 Bar Chart Output

- 2 To return to the Bar Charts window from the GRAPH window, follow this selection path:

File ► Close

Other Bar Chart Options

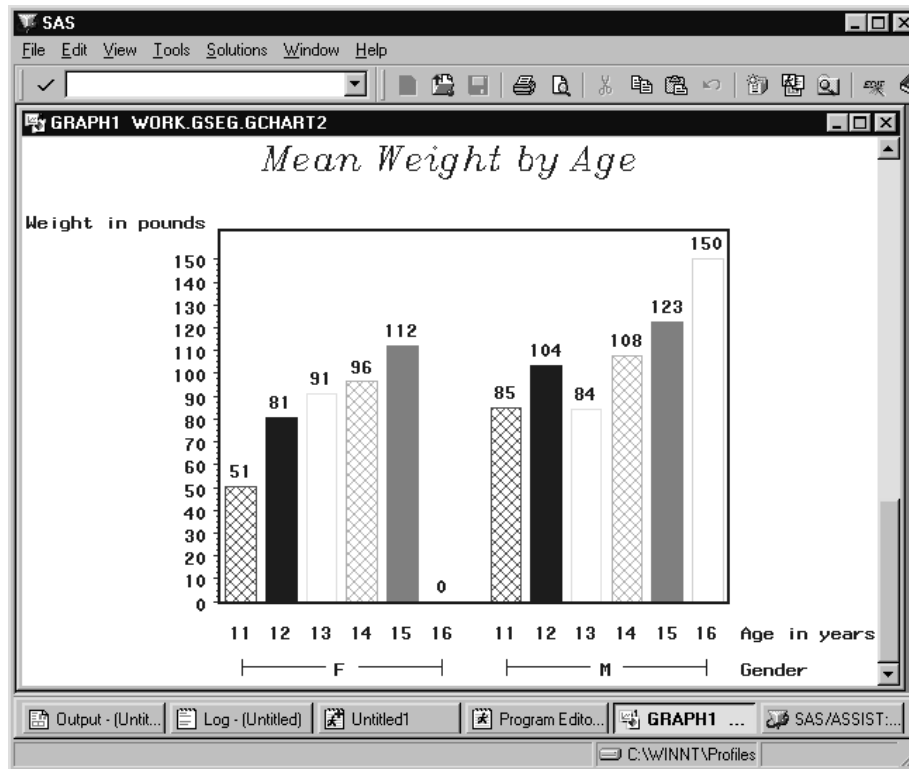
Three-dimensional Bar Charts

By selecting **3D** in the Bar Charts window, you can create three-dimensional bar charts, as shown in the following example.

Display 6.9 Three-dimensional Bar Chart Output

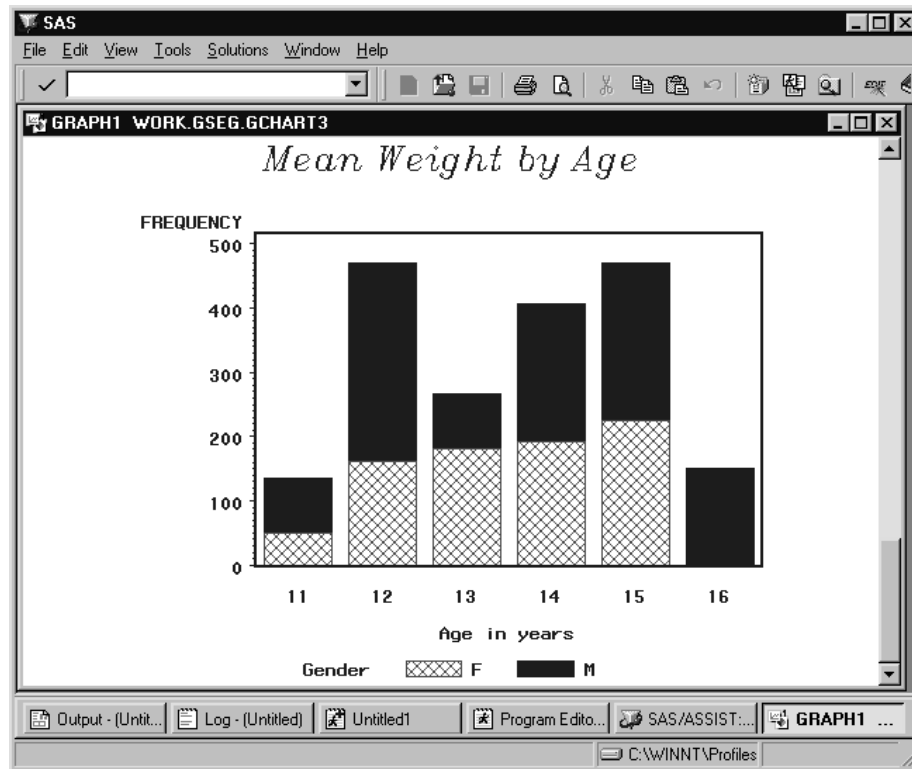
Grouping and Stacking

By assigning a column to **Stacking column** or **Grouping column**, you can create bar charts that show more interesting relationship in your data. For example, if you assign the SEX column to **Grouping column** in the previous example, you create a bar graph that separates the data for males and females:

Display 6.10 Grouped Bar Chart Output

Similarly, if you assign the SEX column to **stacking column** and use frequency for **Bar values**, you can create a bar chart with males and females distinguished in the same bar for each age:

Display 6.11 Stacked Bar Chart Output

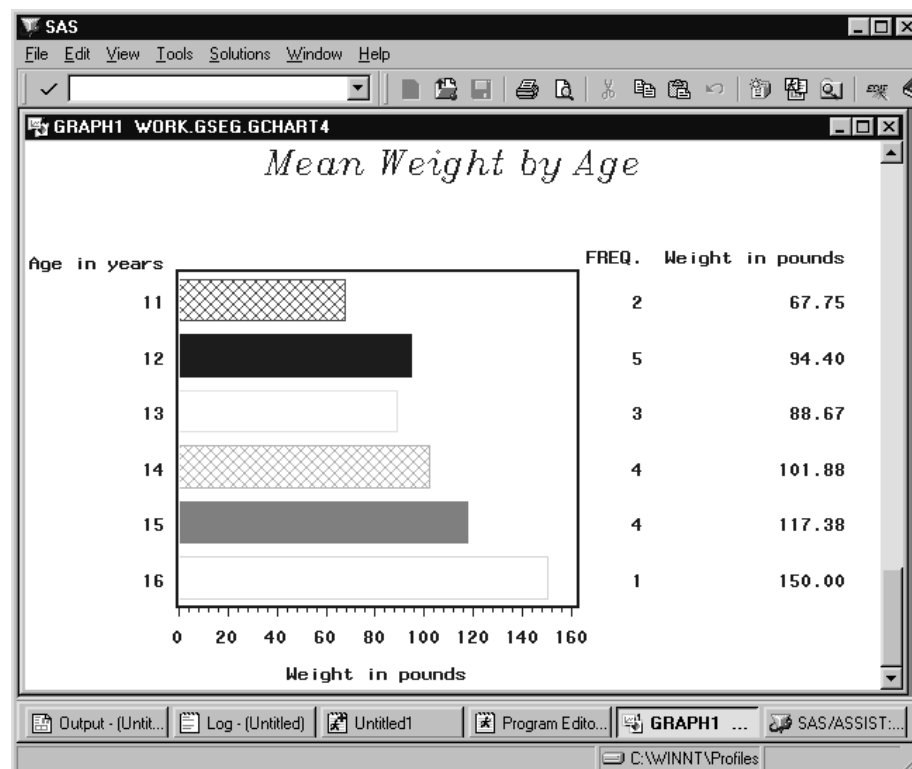


You can also combine stacking and grouping to create grouped stacked bar charts.

Horizontal Bar Charts

By selecting **Horizontal** on the Bar Charts window, you can create bar charts with the bars running horizontally rather than vertically. Grouping and stacking options are also available for horizontal bar charts. Instead of being able to display a particular statistic for each bar (as in the vertical bar chart example earlier in this section), you can select **Display statistics** on the General Options window, which causes statistics to be displayed to the right of the bar chart.

Display 6.12 Horizontal Bar Chart Output



Other Options

By choosing items on the Additional Options menu, you can add a reference line to your bar chart; change the color, size, and font of the label text; change the appearance of the axes; and change the appearance of the legend.

Doing More with Pie Charts

In the “Graphics” chapter of *Getting Started with the SAS System Using SAS/ASSIST Software*, you learned how to create a simple pie chart. This section describes some of the more advanced options available when generating pie charts.

Creating a Pie Chart

In this section you create a pie chart that shows what portion of the CLASS table falls into each age group. You select the pattern, labeling, and header options, and explode a slice.

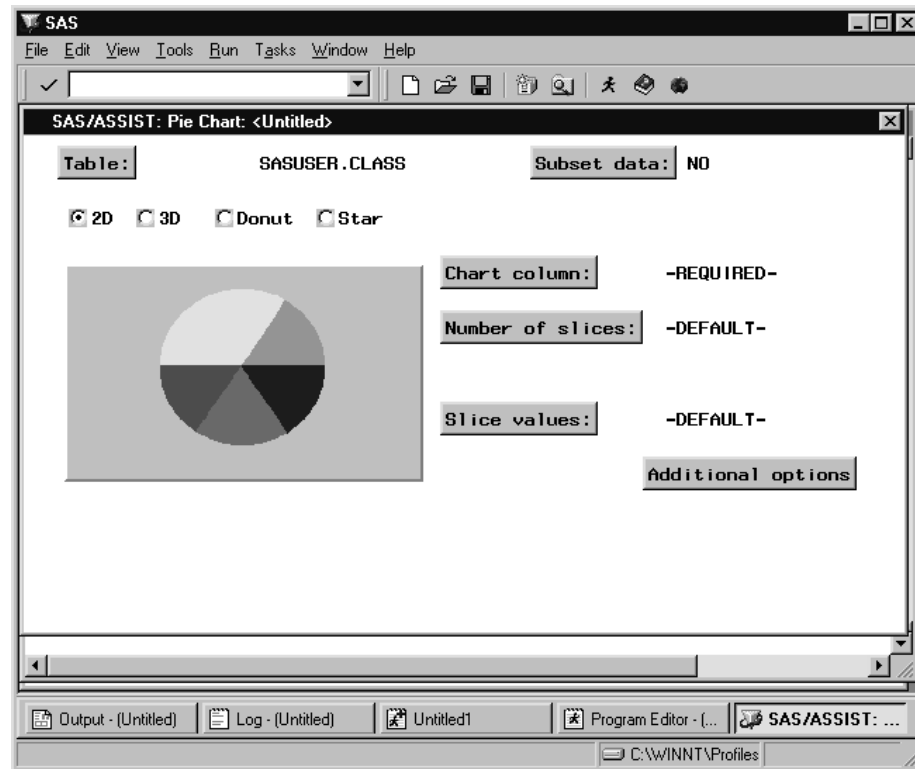
Setting Up the Pie Chart

- 1 To display the Pie Chart window, follow this selection path starting from the WorkPlace menu:

Tasks ► Graphics ► Pie chart

The Pie Chart window appears.

Display 6.13 Pie Chart Window



- 2 Use the **Table** button to select the CLASS table.
- 3 Use the **Chart column** button to select **AGE** as the column you want the pie to represent.
- 4 Select **2D** if it is not already selected.
- 5 Select **Number of slices**. The Midpoint Values window appears. The Midpoint Values window is the same for pie charts and bar charts.

The sizes of the slices are determined by the values of the chart column. If you have any slices that represent four percent or less of the total pie, these slices are grouped together automatically into one slice labeled **OTHER**.

- 6 Select **Use each discrete chart column value**; the Pie Chart window reappears.

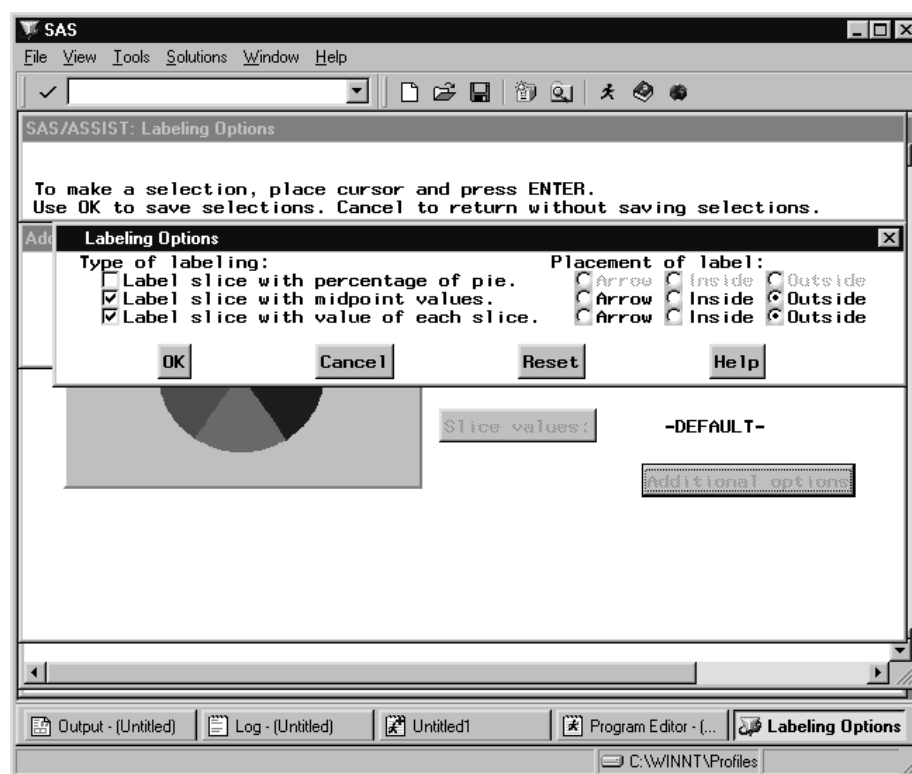
You select **Use discrete chart column value** to display one slice of pie for each age represented in the CLASS table, that is 11, 12, 13, 14, 15, and 16. The default for the number of bars is **Let the number of midpoints default**, which lets the procedure determine the number of midpoints (pie slices) for the chart column. Each midpoint represents a median of a range of values. In this example, if you use **Let the number of midpoints default**, the pie slices represent the midpoints of the AGE column, that is 11.4, 12.6, 13.8, 15, and 16.2.

The window that appears when you select **Number of slices** is different for numeric and character chart columns.

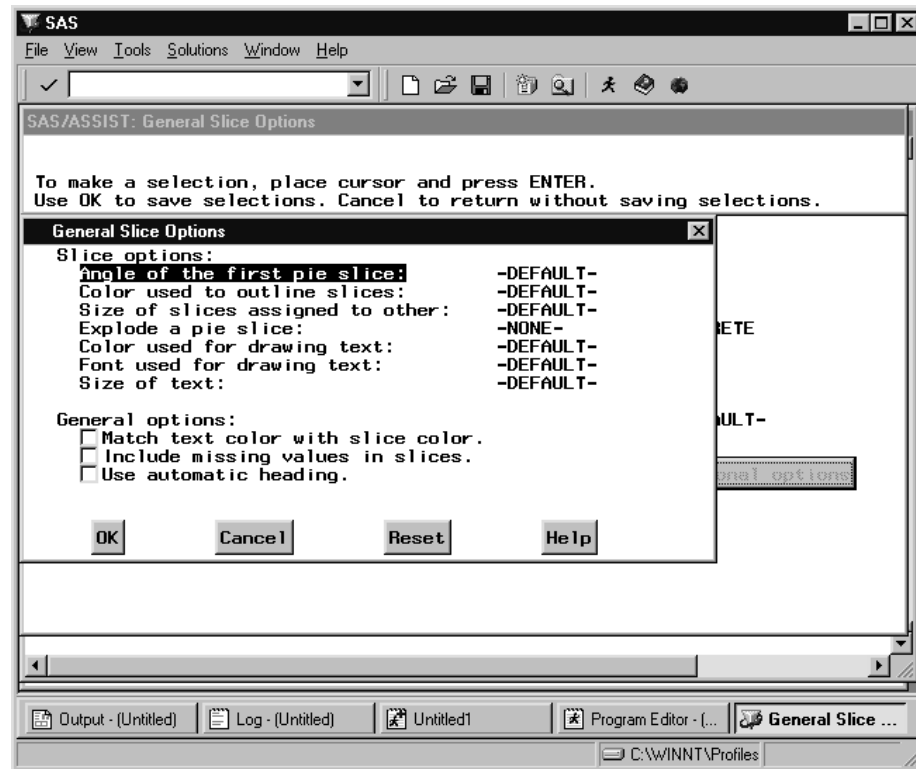
Setting Additional Options

- 1 Select **Additional options**; the Additional Options window appears.
- 2 Select **Color and pattern options**. The Color and Pattern Options window appears. The Color and Pattern Options window is the same for pie charts and bar charts.
- 3 For the **1ST** and **4TH** areas, select **Cross** as the pattern.
 For the **2ND** and **5TH** areas, leave the pattern as **Solid**.
 For the **3RD** and **6TH** areas, select **Empty** as the pattern.
 The pattern selected by default for the pie slices is **Solid**. If you print a black and white graphic as shown in this book, you can use the pattern options to distinguish one pie slice from another.
 If you print a color graphic, you can use colors for the various pie slices to distinguish one pie slice from another. To display a list of valid colors, type ? in the first position of the **color** field and press ENTER. Select the color you want to use.
- 4 Select **OK** to return to the Additional Options window.
- 5 Select **Labeling options**. The Labeling Options window appears.

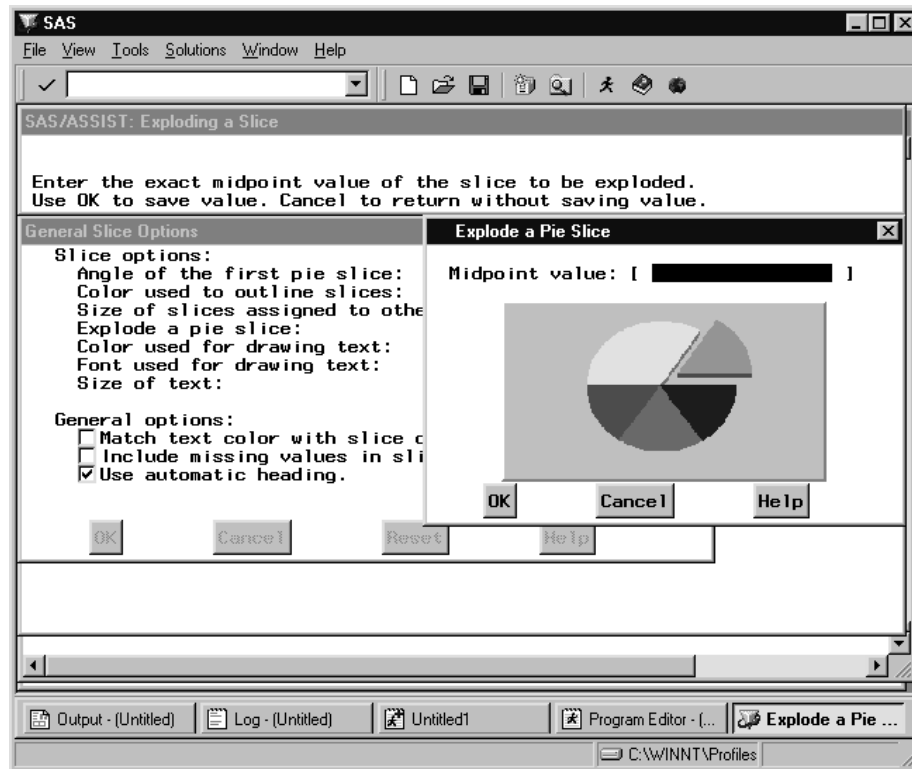
Display 6.14 Labeling Options Window



- 6 Select **Label slice with percentage of pie**, and de-select **Label slice with value of each slice**.
 You choose the label selections as indicated so that the percent of students in each age group is shown on the pie. If you leave **Label slice with value of each slice** selected, the number of students in each age group (rather than the percentage) is shown on the pie.
- 7 Select **OK** to return to the Additional Options window.
- 8 Select **General slice options**. The General Slice Options window appears.

Display 6.15 General Slice Options Window

- 9 Select **Use automatic heading** to generate an automatic title for the chart.
- 10 To emphasize the slice representing 13-year-olds from the rest of the slices, select **Explode a Pie Slice**. The Explode a Pie Slice window appears.

Display 6.16 Explode a Pie Slice

11 In the **Midpoint value** field, type

13

and select **OK**.

12 Select **OK** and then **Goback** to return to the Pie Chart window.

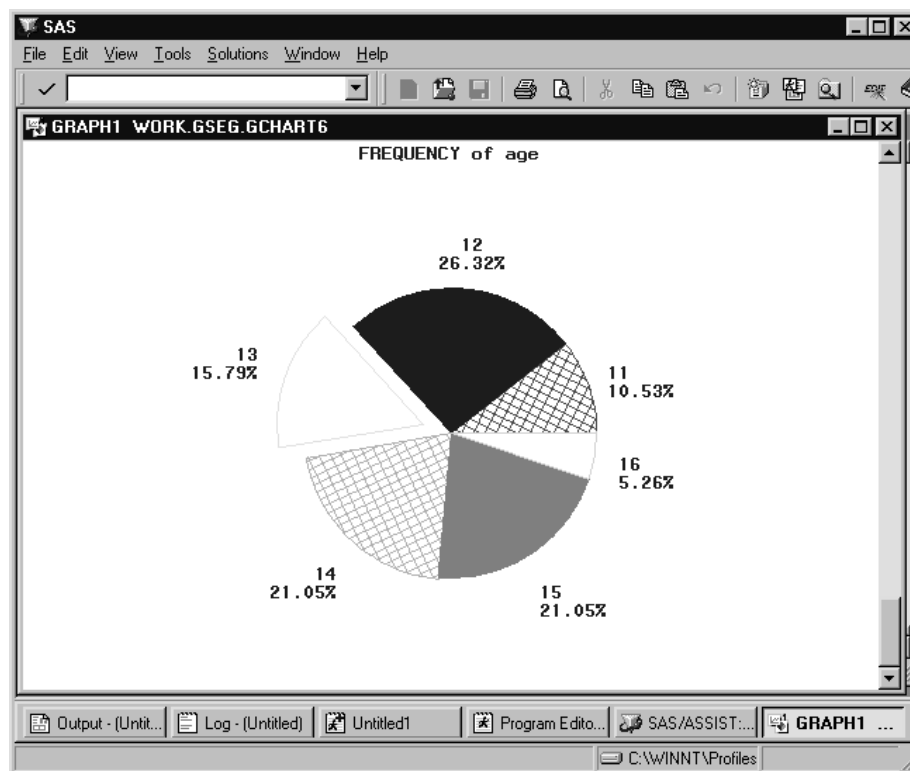
Running the Pie Chart

1 Follow this selection path:

Run ► **Submit**

The pie chart appears in the GRAPH window.

Display 6.17 Pie Chart Output



Note: Titles carry over from one report or graphic to another. If you do not type a title and a title was selected previously in the current SAS/ASSIST session, the previous title automatically appears on this graphic.

If the title **Mean Weight by Age** appears at the top of the chart, this title carried over from the chart created in the previous section. To delete the title, from the Pie Chart window, select **Edit, Titles, and Reset**. △

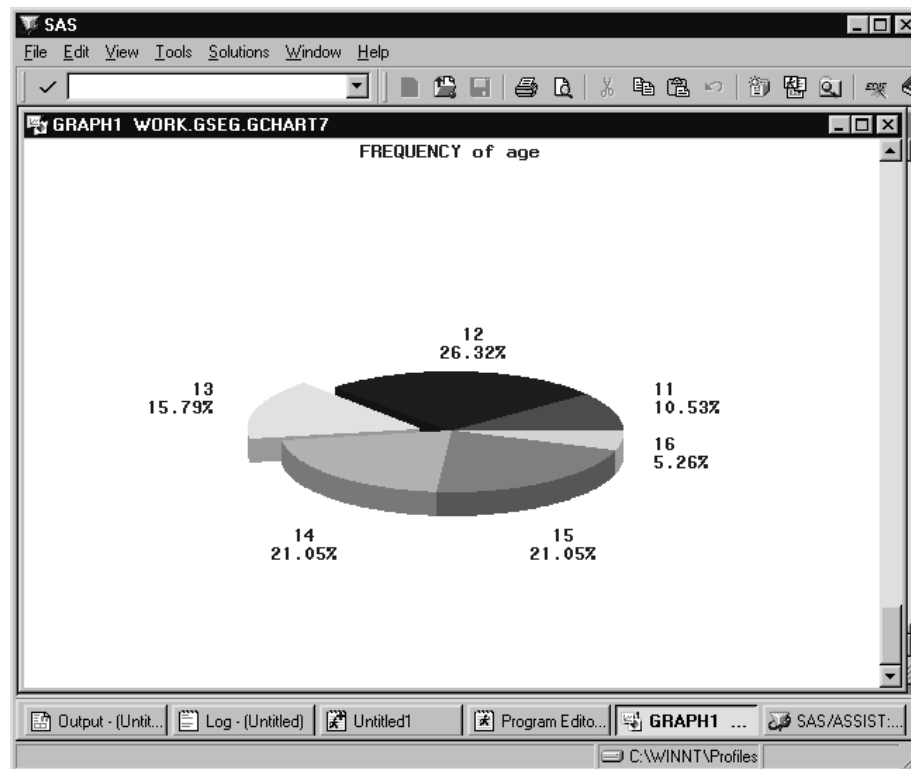
- 2 To return to SAS/ASSIST software from the GRAPH window, follow this selection path:

File ► Close

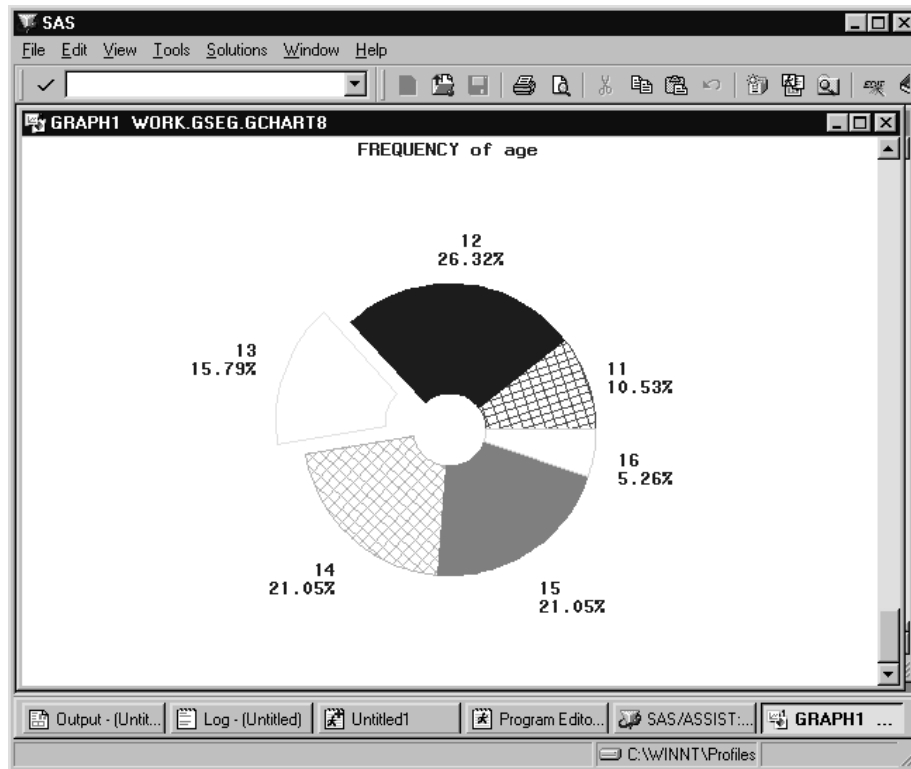
Other Pie Chart Options

Pie Chart Display Options

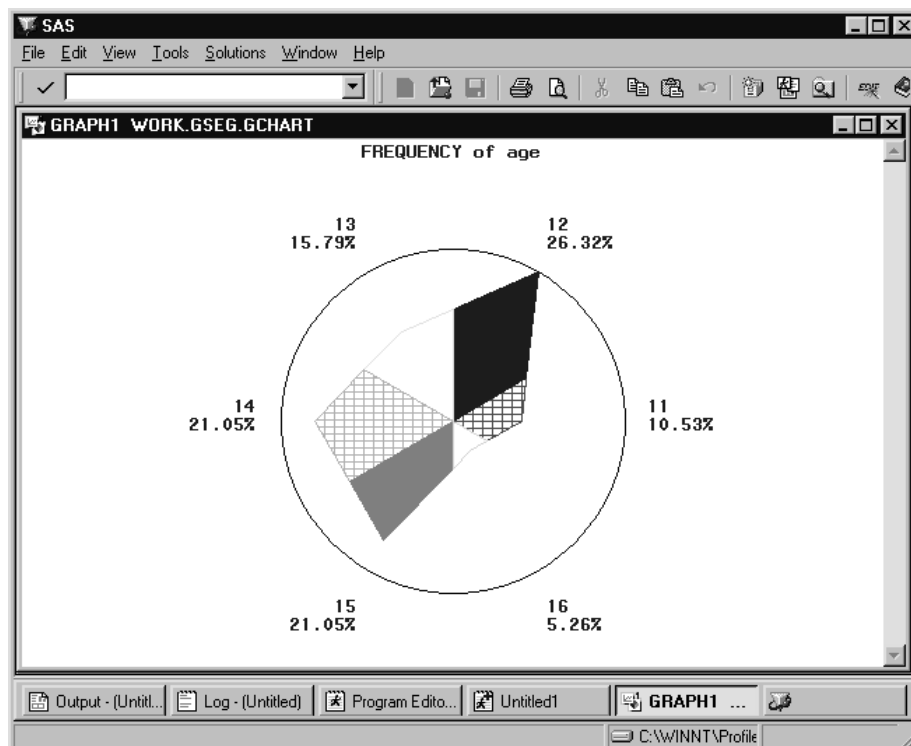
By default, pie charts are two dimensional. However, you can select **3D**, **Donut**, or **Star** to produce pie charts as shown in the following examples.

Display 6.18 Three-dimensional Pie Chart Output

Display 6.19 Donut Pie Chart Output



Display 6.20 Star Pie Chart Output



Slice Values

By default, pie slices represent the frequency of each value of the chart column. By selecting **slice values**, however, you can make the slices represent one of several statistics on analysis column for each value of the chart column. For example, using the CLASS table, you could select the WEIGHT column as an analysis column and **sum** as a statistic; the slices would then represent the total weight of the children of each age as a percentage of the total weight of all the children.

Additional Options

By Selecting **Additional Options**, you can

- ☐ specify the angle of the first pie slice
- ☐ specify the color used to outline the pie slices
- ☐ specify the size of the slice assigned to OTHER
- ☐ specify the color, size, and font of the labels
- ☐ match the label color with the slice color
- ☐ include missing values as a legitimate value for generating a slice.

Doing More with Plots

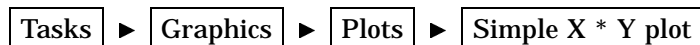
You can use **Plots** on the Graphics menu to create simple X * Y plots, X * Y plots by category, or multiple plots on one set of axes. In the “Graphics” chapter of *Getting Started with the SAS System Using SAS/ASSIST Software*, you learned how to produce a simple line plot. This section describes some of the more advanced plotting options.

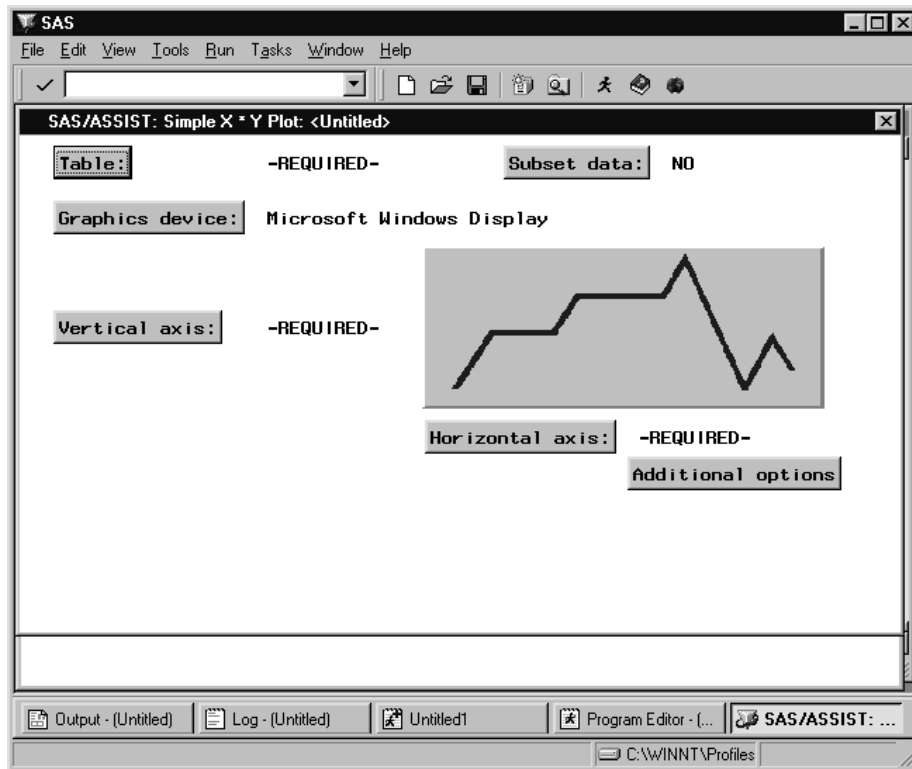
Creating a Scatter Plot with the Regression Line Superimposed

In this section you create a plot showing the relationship between the height and the age of students in the CLASS table, and you leave the points on the plot unconnected. Additionally, you plot the fitted regression line and upper and lower 95% confidence limits for an individual prediction.

Setting Up the Plot

- 1 To display the Simple X * Y Plot window, follow this selection path starting from the WorkPlace menu:

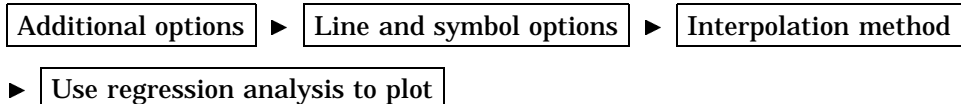


Display 6.21 Simple X * Y Plot Window

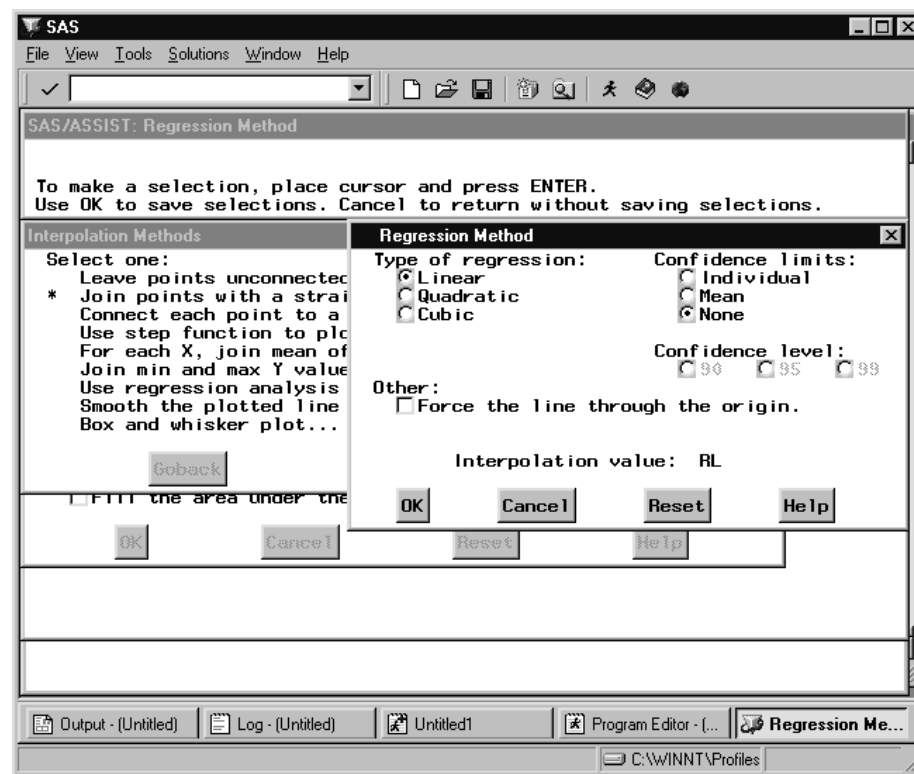
- 2 Use the **Table** button to select the SASUSER.CLASS table.
- 3 Use the **Vertical axis** button to select HEIGHT as the vertical axis column.
The default label associated with the vertical axis column, **Height in inches**, is used as the vertical axis label.
- 4 Use the **Horizontal axis** button to select AGE as the horizontal axis column.
The default label associated with the horizontal axis column, **Age in years**, is used as the horizontal axis label.

Adding a Regression Line and a Title

- 1 Follow this selection path to display the Regression Method window:



Display 6.22 Regression Method Window



The **Additional options** item displays different windows depending on the type of plot you select.

- 2 Leave the **Type of regression** as **Linear**.
- 3 Select **Individual** for the **Confidence limits**, and leave the **Confidence level** as **95**.
- 4 Select **OK** twice, and then **Goback**.
- 5 Follow this selection path to display the Title 1 window:

Edit

 \blacktriangleright

Titles

 \blacktriangleright

Title 1
- 6 Type **Height by Age** as the title for the plot.
Note: Titles carry over from one report or graphic to another. If you do not type a title and a title was selected previously in the current SAS/ASSIST session, the previous title automatically appears on this graphic. Δ
- 7 Select **OK** twice and then **Goback** to return to the Simple X * Y Plot window.

Running the Plot

- 1 Follow this selection path:

Run

 \blacktriangleright

Submit

The plot of the regression line with the actual data points and the upper and lower 95% confidence limits for an individual prediction appears in the GRAPH window.

Display 6.23 X * Y Plot Output



- 2 To return to the SAS/ASSIST software from the GRAPH window, follow this selection path:

File ► Close

Additional Plot Options

X * Y Plot by Category

By choosing **X * Y Plot by Category** instead of **Simple X * Y Plot**, you can add an extra dimension to your plot. For example, using the SASUSER.CLASS table, and plotting HEIGHT versus WEIGHT, you can choose AGE as a category column. Each point on the plot is a different color depending on the age of the child represented by the data point. You can choose different line and symbol options for each value of the category column.

Multiple Plots Per Axes

By choosing **Multiple Plots Per Axes** instead of **Simple X * Y Plot**, you can specify up to four columns for the vertical axis. For example, using the SASUSER.CLASS table, you can plot both HEIGHT and WEIGHT versus AGE. For each plot, you can specify different line and symbol options.

Other Plot Options

By selecting **Additional Options**, you can

- Change the color, width, length, style, label, and tick marks for each axis
- Change the range of values for each axis
- Change the symbol, line style, and color of each plot
- Fill in the area under the curve
- Add vertical and horizontal reference lines
- Change the color, size, and font of the text
- Change the plot frame style and fill color
- Change the placement and configuration of the legend (Multiple Plots and Category Plots)
- Add a second vertical axis.

Doing More with Maps

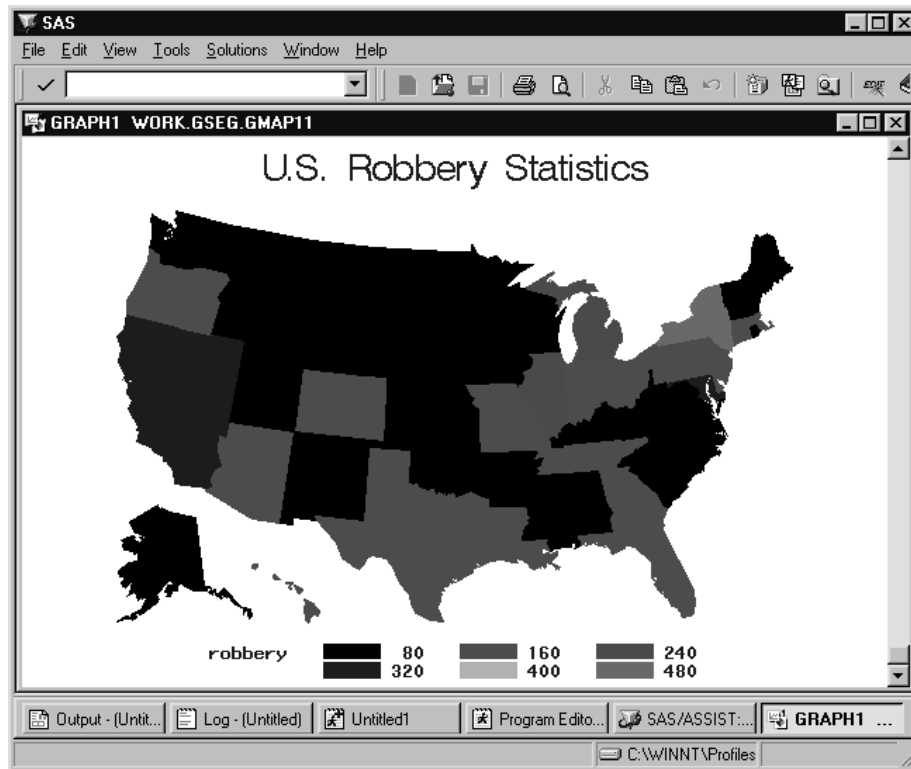
By using the **Maps** item on Graphics menu, you can produce two-dimensional maps, three-dimensional block and prism maps, and surface maps. The “Graphics” chapter in *Getting Started with the SAS System Using SAS/ASSIST Software* showed how to create a two-dimensional map. This chapter describes in more detail the different types of maps and the available advanced options. You must have SAS/GRAPH software licensed to create maps; there is no low-resolution equivalent.

Note: Under some operating systems such as OS/2 and UNIX, the maps in the SAS data library are in a compressed format and need to be decompressed before you use them. See the SAS Software Consultant at your site for more information. △

Types of Maps

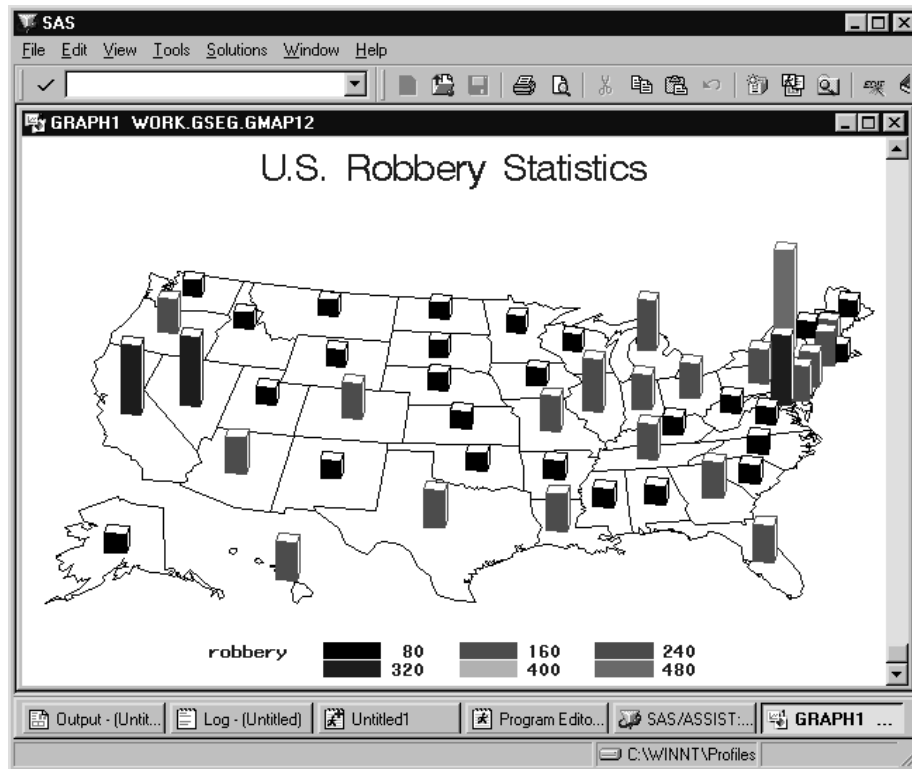
Two-dimensional Maps

Two-dimensional maps are flat maps. The analysis column is divided into ranges, and each region of the map is colored according to what range its value falls into.

Display 6.24 Two-dimensional Map Output

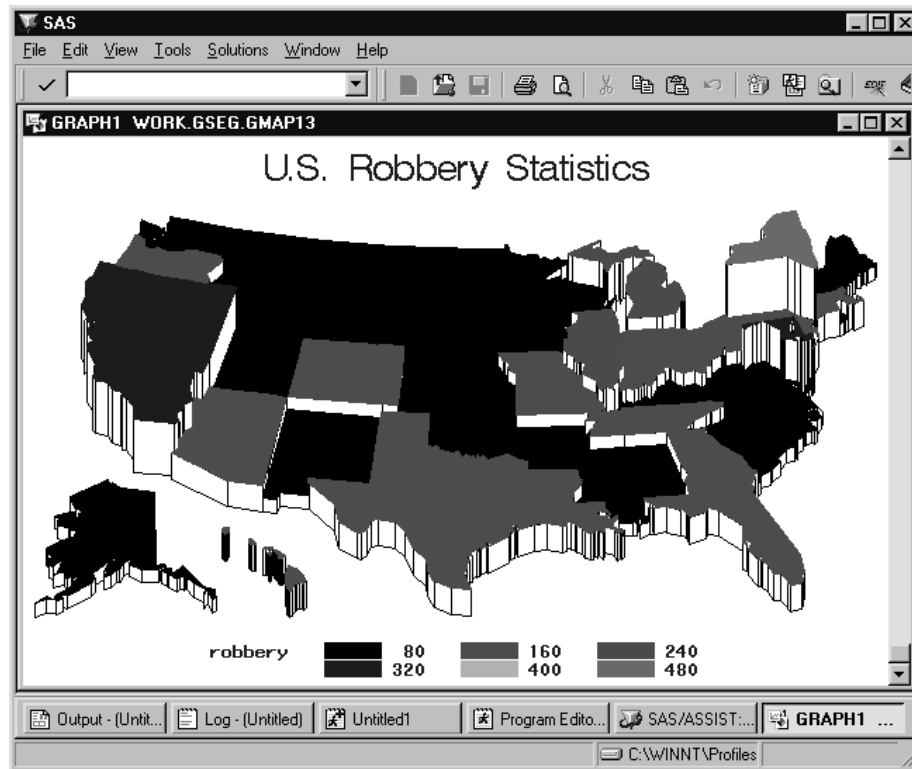
Block Maps

Block maps are like flat maps, except that blocks are superimposed on each region of the map. Each block's height and color represents the range in which the value of the analysis column for that region falls.

Display 6.25 Block Map Output

Prism Maps

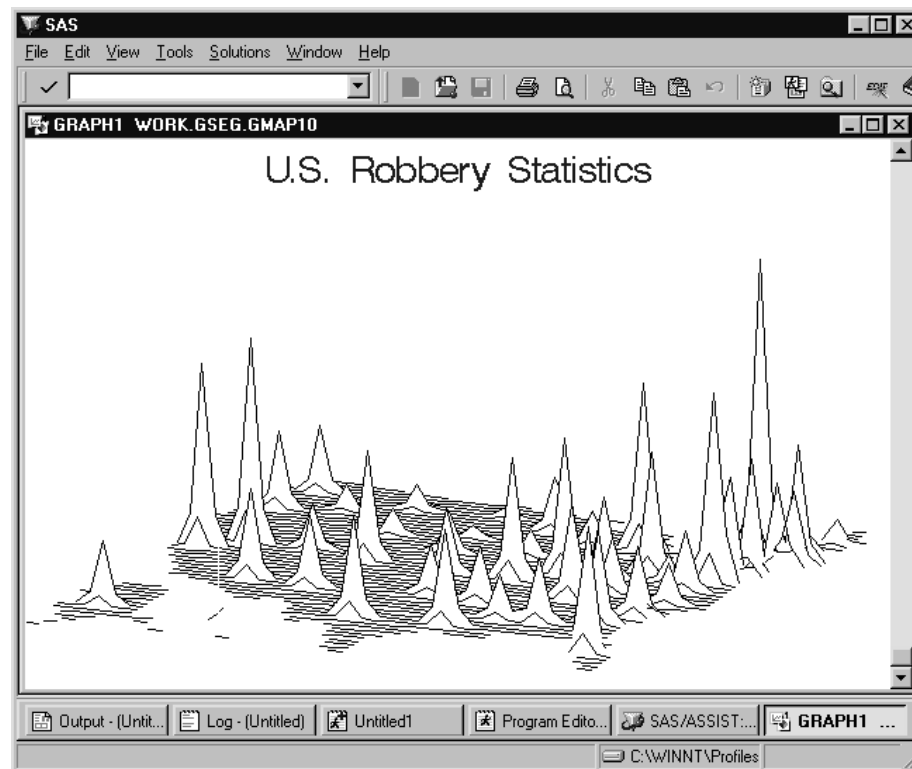
Prism maps are three-dimensional maps. Each region is colored and “raised” above “sea level” to a height representing the range in which the value of the analysis column for that region falls.

Display 6.26 Prism Map Output

Surface Maps

Surface maps are another type of three-dimensional map. The values of the analysis column are not divided into ranges; instead, a “spike” is placed on each region of the map. The height of each spike represents the value of the analysis column for that region.

Display 6.27 Surface Map Output



Number of Levels

For two-dimensional, block, and prism maps, the analysis column is divided into ranges or levels. By default, these levels are calculated automatically. However, by selecting **Number of levels**, you can specify how levels are calculated. The three options are **Default number of levels** (as described above), **Discrete number of levels**, and **Enter number of levels (1-12)**.

- When you select **Discrete number of levels**, the analysis column is not divided into ranges. Each region on the map has its own color, and the height of each region's prism or block is determined by the value of the analysis column for that region.
- When you select **Enter number of levels (1-12)**, you enter a whole number from 1 to 12; SAS/ASSIST software divides the analysis column into that number of ranges.

Additional Map Options

Each type of map has a slightly different set of additional options. Select **Additional Options** to access the Additional Options menu.

Pattern and Legend Options

For two-dimensional, block, and prism maps, you can specify the pattern and color for each level, and determine the placement and configuration of the legend.

2-D and Prism Options

For two-dimensional and prism maps, you can specify the text and boundary colors, the vertical and horizontal size of the map, treat missing values as a valid level for the analysis column, and exclude internal political boundaries,

Block Options

For block maps, you can specify the color and pattern of the map surface and blocks, the size of the blocks (thin, medium, or wide), and all of the options listed for “2-D and Prism Options.”

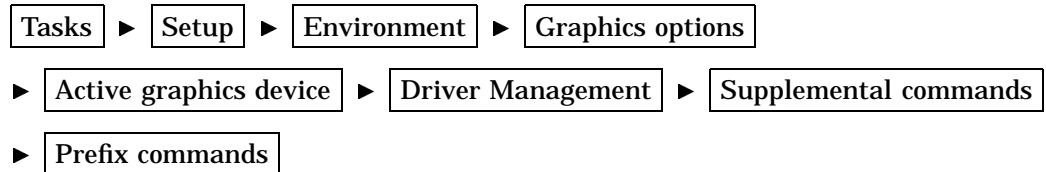
Surface Options

For surface maps, you can specify the surface color, the angle of rotation and tilt of the map, and the vertical and horizontal size of the map.

Changing the Background Color for Graphs

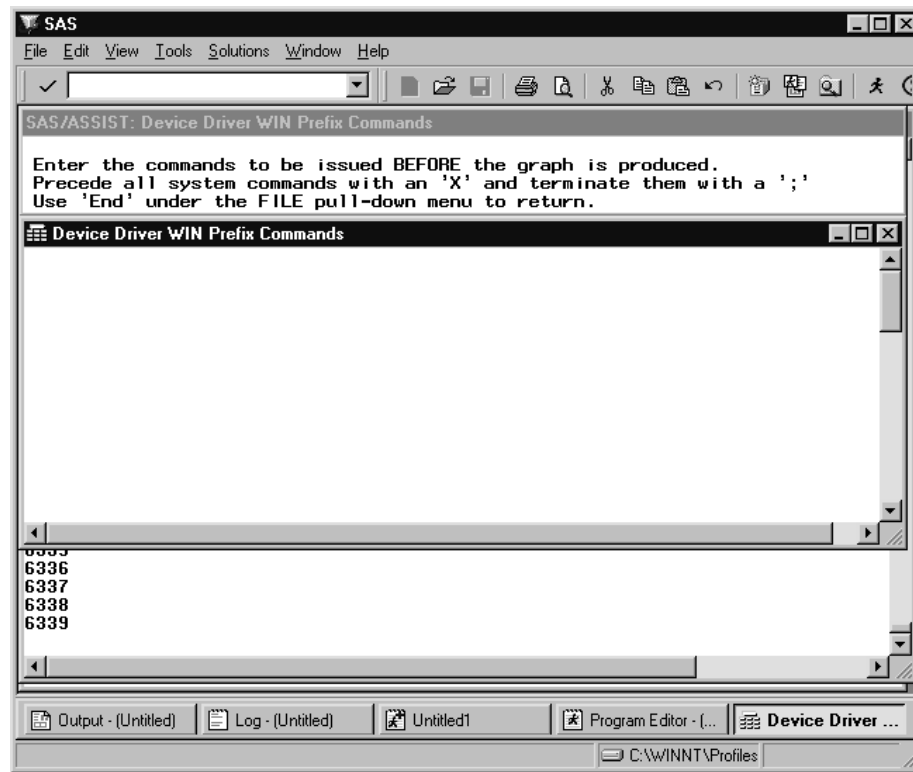
To change the background color and add various other features to graphs, you use prefix and suffix commands as described in these steps.

- 1 To display the Device Driver Prefix Commands window, follow this selection path:



The Prefix Commands window appears.

Display 6.28 Prefix Commands Window



2 Type

```
options cback=color;
```

where *color* is one of the following:

black	lilac	rose
blue	lime	salmon
brown	magenta	steel
charcoal	maroon	tan
cream	olive	violet
cyan	orange	white
gold	pink	yellow
gray	purple	
green	red	

In the Prefix Commands window, you type the SAS statements or system-specific commands that you want to use. In this step, you use a prefix command to change the background color of your graphic. In the next step, you use a suffix command to reset the color to the default after the chart has been displayed and printed.

The prefix and suffix commands remain in effect and are associated with the active graphics device until you change them, even after you end your SAS session. Therefore, if you change the background color for a graph, each graph you

create with that driver uses the new background color until you change the prefix command.

When you set up prefix and suffix commands, a catalog entry of *dev.SOURCE* is created for prefix commands, and a catalog entry of *dev.OUTPUT* is created for suffix commands, where *dev* is the device driver. If the GDEVICE0 libref has been assigned to your personal device driver catalog, the catalog entries are created in your SASUSER.PROFILE catalog and the catalog is referenced by GDEVICE0. If GDEVICE0 has not been assigned, the entries are created only in your SASUSER.PROFILE catalog.

- 3 Follow this selection path:



A prompt appears asking if you want to save the changes; select **Yes**.

- 4 Select **Suffix commands**; the Device Driver Suffix Commands window appears.

- 5 Type

```
goptions cback=;
```

to reset the background color to the default. Resetting the background color ensures that when you select different drivers in the same SAS session, the prefix commands of any previously selected drivers are not in effect.

- 6 Follow this selection path:



A prompt appears asking if you want to save the changes; select **Yes**.

- 7 Select **Goback** twice, then **OK** to return to the WorkPlace menu.

Note: To clear the prefix and suffix commands, access the Device Driver Prefix Commands window and Device Driver Suffix Commands window as described above. Delete the commands, then select **Close** from the **File** menu for each window. △

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