

SAS/GRAPH and PROC GREPLAY: The Art of Creating Multiple Plots Per Page

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Abstract

The GREPLAY procedure in SAS/GRAPH® can be used to create multiple plots per page, or to produce a single plot per page in a specific location on the page. There are four basic steps in this process:

- create plots and save them in a graphics catalog
- design a template to specify the location of each plot on the page and save it in a template catalog
- replay each plot in the desired panel on the template
- obtain a hard copy of the final product

This paper describes the four-step process and provides suggestions and helpful commands throughout.

Audience

This paper is for SAS® users who are able to produce plots using SAS/GRAPH software.

For simplicity, the examples are shown using SAS in interactive mode.

Outline

To illustrate this process, I will generate two plots from PROC GPLOT and a footnote from PROC GSLIDE and save the output in a graphics catalog. Next, I will create a template catalog, design a template to display the graphs, replay the plots onto the

template, and generate a hard copy. The finished product will be one portrait-style page with two stacked plots and a global footnote.

Create a Graphics Catalog

A graphics catalog contains plots which the user creates and saves in a catalog; it may contain one plot or many plots. The GOUT statement is used in the graphics procedure to specify the name and location of the graphics catalog.

Example: Create two plots and a footnote. Bold-face type indicates commands which are important for this application. Check with the SAS/GRAPH manual to establish the appropriate device and targetdevice for your machine.

```
LIBNAME SAVE '~/PROJ4421';
GOPTIONS DEVICE=XCOLOR TARGETDEVICE=PICASSO
          ROTATE=LANDSCAPE other_favorite_options;
```

```
** any necessary code prior to gplot (axes, symbols,...) **;
```

```
PROC GPLOT DATA=SAVE.KM1 GOUT=SAVE.PLOTS;
  TITLE1 H=0.23IN 'A. Survival';
  PLOT SURV * FUP = 1
    LL * FUP = 2
    UL * FUP = 2 / OVERLAY FRAME VAXIS=AXIS1
    HAXIS=AXIS2 NAME='SURV' DES='SURVIVAL';
```

```
PROC GPLOT DATA=SAVE.KM2 GOUT=SAVE.PLOTS;
  TITLE1 H=0.23IN 'B. Event-Free Survival';
  PLOT SURV * FUP = 1
    LL * FUP = 2
    UL * FUP = 2 / OVERLAY FRAME VAXIS=AXIS1
    HAXIS=AXIS2 NAME='EFSURV';
```

```
PROC GSLIDE GOUT=SAVE.PLOTS NAME='FNOTE'
  DES='FOOTER';
  TITLE1;
  FOOTNOTE1 J=L H=0.14IN
    'Figure 1. Survival with 95% Confidence Limits';
RUN;
```

The GOUT command must be specified. In this example, I defined a permanent graphics catalog, as opposed to a temporary catalog. The catalog created, PLOTS.SCT, contains three plots: SURV, EFSURV, and FNOTE. The names are defined by the NAME command; if they are not specified, SAS assigns default names. Two of the three plots have user-defined descriptions; the third is not defined to illustrate the SAS default description. The SCT extension on PLOTS indicates that it is a graphics catalog.

The name (NAME) command, which is optional, must be 8 characters or less. The description (DES) command, also optional, must be 40 characters or less.

View and Manipulate Catalog Contents

To view the contents of the graphics catalog, submit the following code:

```
LIBNAME SAVE '~\PROJ4421';
GOPTIONS DEVICE=XCOLOR TARGETDEVICE=PICASSO
          ROTATE=PORTRAIT other_favorite_options;
PROC GREPLAY;
```

When SAS is run interactively, it is not necessary to resubmit the LIBNAME statement; otherwise, it is. A run statement is not required. The final output will be portrait-style, thus the rotation option is changed to portrait in the above code.

Submitting this code accesses the **PROC GREPLAY** screen:

Command ==>

```
IGOUT:_____ GOUT:_____ Device: XCOLOR
TC: _____ Template:_____ Scroll: PAGE
CC: _____ Cmap:_____
```

Sel	Name	Type	Description	Created
---	SURV	I	SURVIVAL	06/15/95
---	EFSURV	I	PLOT OF SURV * FUP	06/15/95
---	FNOTE	I	FOOTER	06/15/95

IGOUT indicates the location of the graphics

catalog. To show the list of plots which are in our catalog, type "SAVE.PLOTS" <Enter> on the command line. This will bring up the following information:

Command ==>

```
IGOUT:SAVE.PLOTS GOUT:_____ Device: XCOLOR
TC:_____ Template:_____ Scroll: PAGE
CC:_____ Cmap:_____
```

Sel	Name	Type	Description	Created
---	SURV	I	SURVIVAL	06/15/95
---	EFSURV	I	PLOT OF SURV * FUP	06/15/95
---	FNOTE	I	FOOTER	06/15/95

View Plots: To view a plot in the catalog, move the cursor to the select (Sel) field on the line next to the plot you want to view, and type "s" <Enter>. The plot will replay on the screen. To return to the PROC GREPLAY screen, hit <Enter>.

Delete Plots: To delete a plot from the catalog, type "del" <Enter> in the select field next to the plot you want to delete. You will **not** be asked to verify the deletion.

Modify Plot Names or Descriptions: If the plot name or description is not specified when creating the plot, a default name or description is supplied. To modify either one, go to the command line and type "modify" <Enter>. The screen will change color and modifications can be made by typing over the old name or description. After making the desired changes, type "modify" <Enter> on the command line; this will save the changes.

Create a Template Catalog

The template catalog contains all of the templates created and saved by the user. To create a template catalog, enter the name of the catalog on the TC (template catalog)

template will be shown on the screen, and you can see if the coordinates are defined in the proper order. If not, the templates may look very strange! Hit <Enter> to clear the template from the screen and return to the template design screen. If the template is not correct, type new coordinates over the old coordinates and preview the template again. Note that the way this template is defined, Panel 1 is the top panel, Panel 2 is the bottom panel, and Panel 3 is the entire 100 x 100 box. It is important to remember the panel numbers when replaying graphs so they will plot in the expected location.

Save the template: Once the template is correct, type "save" <Enter> on the command line; this will save the template in the template catalog. Type "end" <Enter> on the command line to return to the template directory screen, which now looks like this:

```
-----
GREPLAY: DIRECTORY SAVE.TEMPLATE (E) =====
Command ==>
```

Name	Type	Description	Updated
___ PLOT2F	TEMPLATE	2 panels + footer	06/15/95

To return to the PROC GREPLAY screen, type "end" <Enter> on the command line. At this point, we have a graphics catalog called PLOTS.SCT which contains SURV, EFSURV, and FNOTE and a template catalog which contains the template PLOT2F.

PROC GREPLAY Screen Functions

Create a new template: As previously mentioned, to create a new template type "modify *template_name*" <Enter> on the command line and enter the coordinates.

Select templates: To preview or modify a

template, move the cursor to the line beside the template and select it by typing "s" <Enter>. This will access the template design screen, where modifications can be made to the coordinates, or the template can be previewed.

Copy templates: To copy PLOT2F to NEW2, type "COPY PLOT2F.TEMPLATE NEW2.TEMPLATE" <Enter> on the command line. Next, select NEW2 and modify the coordinates as desired.

Delete templates: To delete a template, move the cursor to the field before the name of the template you want to delete and type "d" <Enter>. On this screen, you will be asked to verify the deletion by typing "v" <Enter> in the field.

Replay Plots onto the Template

First, specify the name of the template in the "Template" field, and also IGOUT and TC if they are not already specified. Put SURV in panel #1, EFSURV in panel #2, and the footnote in the 100 x 100 box (panel #3). To do this, type the desired panel number next to the appropriate plot then hit <Enter>. To save the replayed information in the graphics catalog with the individual plots, type "SAVE.PLOTS" on the GOUT line before putting in the panel specifications:

```
-----
Command ==>
```

```
IGOUT:SAVE.PLOTS  GOUT: SAVE.PLOTS  Device: XCOLOR
TC:SAVE.TEMPLATE  Template:PLOT2F    Scroll: PAGE
CC:_____  Cmap:_____
```

Sel	Name	Type	Description	Updated
1	SURV	I	SURVIVAL	06/15/95
2	EFSURV	I	PLOT OF SURV * FUP	06/15/95
3	FNOTE	I	FOOTER	06/15/95

If you save the replayed information in the

same graphics catalog, the screen will now look like this:

Command ==>

IGOUT:SAVE.PLOTS GOUT: SAVE.PLOTS Device: XCOLOR
TC:SAVE.TEMPLATE Template:PLOT2F Scroll: PAGE
CC:_____ Cmap:_____

Sel	Name	Type	Description	Updated
---	SURV	I	SURVIVAL	06/15/95
---	EFSURV	I	PLOT OF SURV * FUP	06/15/95
---	FNOTE	I	FOOTER	06/15/95
---	TEMPLATE	I	TEMPLATE GRAPH	06/15/95
			PRODUCED BY GREPLAY	

Note 1: When typing in panel numbers, do not hit <Enter> until all of the numbers are specified; otherwise, the plot will be incomplete.

Note 2: In the above PROC GREPLAY screen, the default name assigned to the plot containing the two survival graphs and footnote is "TEMPLATE". This can be changed using the modify command. For the remainder of the example, we assume this default name was not changed.

Obtain a Hard Copy

From the PROC GREPLAY screen: Change the device name on the PROC GREPLAY screen to the name of your printer. You then have two options:

- select the plot named "TEMPLATE" if you saved your efforts in the graphics catalog, hit <Enter>, and the file will route to the printer
- re-specify the panels for SURV, EFSURV, and FNOTE, hit <Enter>, and the output will route to the printer.

Comment: On my machine, the plots will not route to the printer until I exit out of the PROC GREPLAY screen and return to the program editor.

From the Program Editor: Type "end" <Enter> to return to the program editor from the PROC GREPLAY screen. Submit the following SAS code:

```
LIBNAME SAVE '~/PROJ4421';
GOPTIONS DEVICE=devicename ROTATE=PORTRAIT;
PROC GREPLAY NOFS TC=SAVE.TEMPLATE
    TEMPLATE=PLOT2F IGOUT=SAVE.PLOTS;
TREPLAY 1:SURV 2:EFSURV 3:FNOTE;
RUN;
```

or, if the replayed plots were saved in the graphics catalog under the default name of "TEMPLATE":

```
LIBNAME SAVE '~/PROJ4421';
GOPTIONS DEVICE=devicename ROTATE=PORTRAIT;
PROC GREPLAY NOFS IGOUT=SAVE.PLOTS;
REPLAY TEMPLATE;
RUN;
```

See the Appendix for the finished plot.

Useful GOPTIONS

There are approximately one hundred GOPTIONS, which can be found in the SAS/GRAPH manual. To date, I have only used approximately a dozen. The ones I have found most helpful are:

DEVICE=driver_name, the graphics device you are using to view the plots.

TARGETDEVICE=target_device_name, the name of the device you will use to obtain a hard copy of the plots.

COLORS=(color_list), specifies the colors used to produce the output. I specify black always, because sometimes I have had printing problems if I do not.

ROTATE=LANDSCAPE, for landscape orientation.

ROTATE=PORTRAIT, for portrait orientation.

AUTOFEED, tells the printer to automatically feed the paper if there is more than one plot.

FTEXT=*font* and FTITLE=*font*, specifies the font of the text and title, respectively.

NODISPLAY, so the output is not displayed on the screen. This is useful if you are very confident the plots are correct without viewing them first!

Comments and Suggestions

1. A library of templates is included with SAS/GRAPH software. See your SAS manual for more details.
2. The <Page Up> and <Page Down> keys can be used in the various GREPLAY screen to maneuver around.
3. In GREPLAY screens, "end" <Enter> returns you to the previous screen.
4. When A=90 and R=0 are used to orient labels for the vertical axis and the finished product will have a PORTRAIT orientation, the labels may not resolve well. If this happens, try using A=-90 R=90.
5. When replaying plots into a smaller area, it is best to use fonts which are not too thick. My favorites are SIMPLEX and SWISSL (both sans serif) and ZAPFL (serif). See the SAS/GRAPH manual for available fonts.

5. Even if you do not need to produce multiple plots per page, the GREPLAY procedure provides a simple way to view or print plots.

6. The resolution of titles, symbols, values, and labels on the screen is not always indicative of what you will see on a hard copy. Experience will help you choose good value, label, title and symbol sizes for replayed plots.

Conclusions

The GREPLAY procedure can be used to easily re-position SAS graphics. With some experience, it is relatively simple to choose font styles and sizes which produce professional results.

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Contact Information

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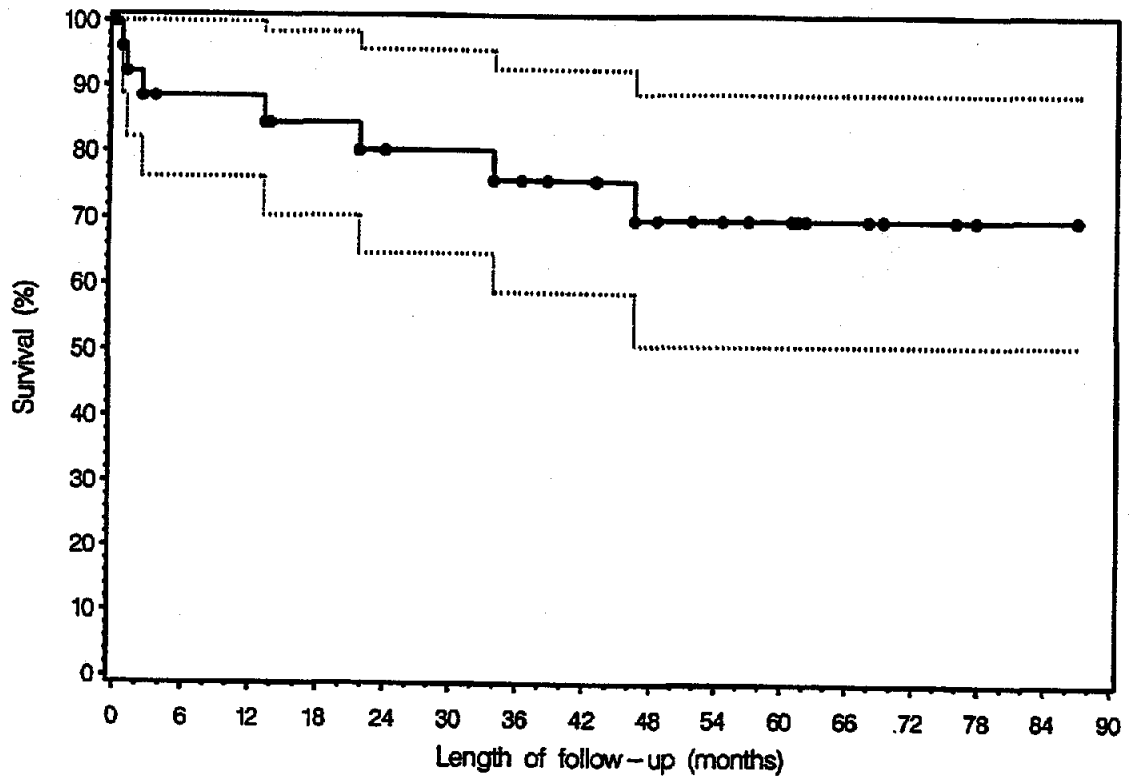
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Appendix

A. Survival



B. Event-Free Survival

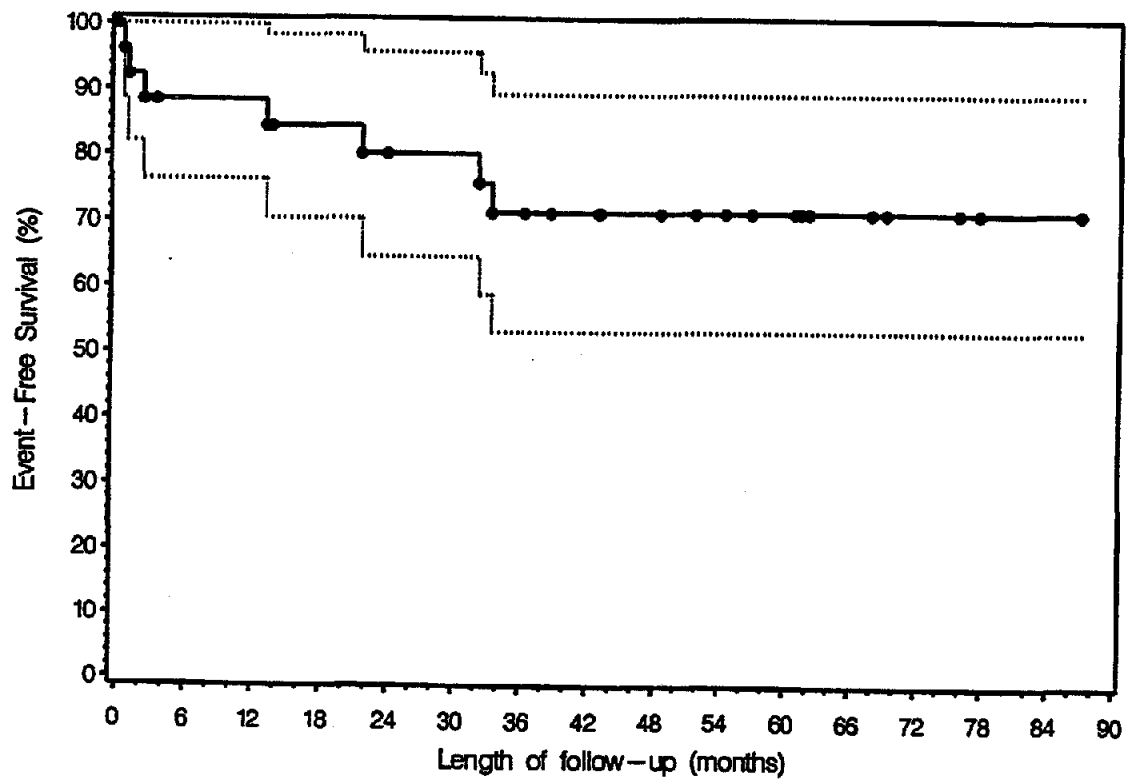


Figure 1. Estimated Survival with 95% Confidence Limits