

Web Compatible SAS/GRAPH® Output the Easy Way

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ABSTRACT

This paper describes some concepts and analyses required to create SAS/GRAPH images for use in WEB pages. It deals with an automated SAS/AF® Frame system designed to create and print a number of graphs and produce suitable graph image files for inclusion on WEB pages. Topics discussed include drill-down design, programming techniques for creating GIF files, and the creation of custom SAS Device Drivers.

INTRODUCTION

SAS software is a major leader in information and management systems. It has powerful features that support the creation of customized hard copy output that includes both data and graphic output. Until now, SAS custom graphs could not take their place in the Web world because of:

- Sophistication of SAS custom graphs
- True portability across platforms
- Interactive way to create and process graphs

This paper focuses on an In-depth analysis of these problem areas.

ANALYSIS

Design Issue

Hard copy of SAS/GRAPH images depends on the resolution available on the printable media and display device respectively. In order to display graphs as images on a WEB page, you need to consider the following:

- Height and width of the viewable screen or WEB browser. Usually, 1 inch of viewable area is almost equal to 95 pixels. Proper use of pixels in the image will improve the quality of the image.
- Should the displayed image be permitted to extend beyond the viewable screen? If the answer is 'yes,' then the quality of the image could be improved by using SAS/GRAPH software. This way the hard copy version of the image will be an exact match of the Web counterpart. Otherwise, a compressed image will be produced, and it will not match the hard copy version of the graph in either size or quality.
- Selection of an image format such as GIF. This paper uses GIF as the standard image format for SAS/GRAPH.
- The final image, which consists of multiple superimposed graphs, should be separately analyzed, because these images lose their original shape and quality because SAS device drivers compress them to make one image. Thus, the image radically distorted. Rather than SAS/GRAPH software super-imposing the multiple graphs into one graph, multiple graphs would be tracked as a separate entity, and then combined in the internet in case the superimposed image is distorted.
- SAS/GRAPH text should be limited to a minimum because the GIF device driver tends to use proportional fonts that tend to produce different results when the image is moved from one medium to another.

- Proper use of colors is a must to make the image attractive.
- If there is an option to print the image, a PostScript™ file needs to be tagged along with the image which will keep the usual form of the printed output
- In order to print a hard copy of the graph from the internet, a PostScript color or black and white with minimum of 0.5 X 0.5 inch margin should be selected. Most Hewlett Packard™ printers satisfy the requirements.

A user-friendly SAS/AF Frame system needs to be created to perform the following functions:

- Interactive or batch process to create images.
- Support the selection of device drivers to print or transport postscript or GIF file.
- Automatically add HTML code to create Web-ready graph images

Device Drivers

A GIF device driver is needed for SAS software to create a GIF Image file of the graph. The IMG GIF device driver is a SAS Institute device driver, available in the SASHELP.DEVICES catalog. Figure 1 shows the Detail window for the Institute provided IMG GIF driver.

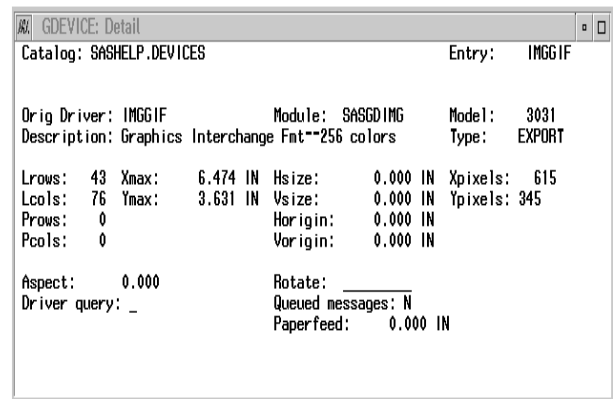


Figure 1: Detail Window for IMG GIF Driver

In the Gdevice: Detail window, XMAX value of 6.474 inches and YMAX value of 3.631 inches are the dimensions of the browser where images, created from SAS/GRAPH software, will be displayed. Because 1 inch of the actual physical length is represented by 95 pixels approximately XPIXELS=615 and YPIXELS=345 are justified. It has been found that using this device will dramatically distort customized graphs. Because graphs created in the hard copy format have XMAX=8.5 inch and YMAX=11.0 inch, having XMAS=6.474 inch and YMAX=3.631 inch significantly compress the image. Thus the original appearance is lost.

PostScript printer with 0.5 X 0.5 inch margin has been used throughout this paper. All graphs are customized to use the above graphics output area. In order to use the same output area in GIF images, edit the Institute-supplied IMG GIF driver.

Copy the IMGGIF driver from SASHELP.DEVICES catalog to a libref of GDEVICE0 and rename it as IMGGIF3. GDEVICE0 is assigned by you, and it should have a catalog called DEVICES. Note: device drivers in SASHELP.DEVICES catalog cannot be copied or edited. Figure 3 shows the Detail window for IMGGIF3 with edited specification suited for our purpose. This way the customized image will not be distorted and closely resembles the hard copy version of the graph.

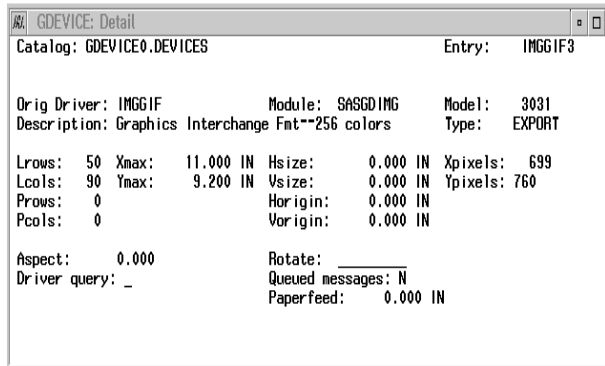


Figure 2: Detail Window for IMGGIF3 Driver

As shown in Figure 2, XMAX and YMAX values closely resemble the size of a PostScript printer. The PostScript printer will have XMAX=8.5 inch and YMAX=11.0 inch with resolution of 95 pixels per inch. Although there is a lower resolution for XPIXELS and YPIXELS for IMGGIF3 driver, this specification produces better images and closely resembles PostScript printout. PostScript hard copy, as previously mentioned, has an 8.0 X 10.5 inch graphics output area.

The Institute-supplied PSLEPSFC encapsulated PostScript device drivers with 0.5 X 0.5 inch margins obtain good hard copy. If this type of file is sent with the GIF images, you can click on a Hypertext Link on the Web page to download the PostScript file to your printer. Server or browser will associate application to save and browse the file. Usually, the GIF image created by SAS/GRAPH software does not produce well on the PostScript printer. This is why a copy of a PostScript file should be printed on the PostScript printer. See the Detail window for PSLEPSFC driver in Figure 3.

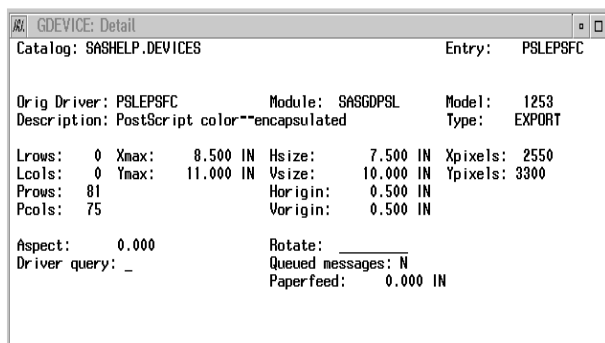


Figure 3: Detail Window for PSLEPSFC Driver

The PSLEPSFC driver is available in SASHELP.DEVICES catalog. Note: You can not display a graph when DEVICE=PSLEPSFC is set in the GOPTIONS statement.

For general purposes, model QMS® 1000 printer is used for hard copy. Because there is no driver called QMS 1000 and

it does not match closely with the QMSCOLOR driver, the QMSCOLOR driver is copied to GDEVICE0.DEVICES and edited with QMS 1000 printer specification. This new Device is called MAGICOL3 driver. The specifications are shown in Figures 4 and Figure 5, respectively.

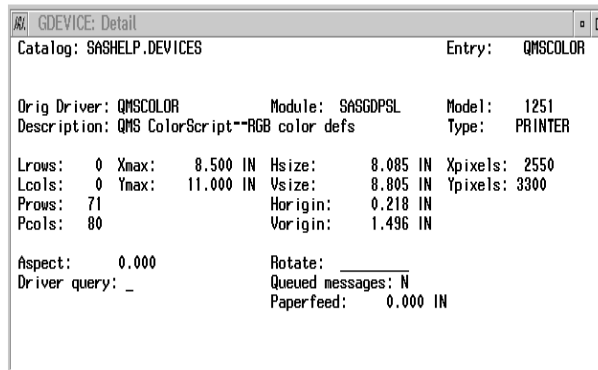


Figure 4: Detail Window for QMSCOLOR Driver

Use the following code to edit device drivers:

```
/* code to edit device driver*/
proc gdevice c=gdevice0.devices;
run;
```

Values for PROWS and PCOLS are automatically calculated by SAS software, accommodated by a warning in the SAS log. However, the values can be estimated using the following formula.

```
calculations for PROWS values
PROWS=(old PROWS)*(new VSIZE)/(old VSIZE)
e.g.PROWS=71*10.610/8.805~81
calculations for PCOLS values
PCOLS=(old PCOLS)*(new HSIZE)/(old HSIZE)
e.g.PCOLS=70*8.110/8.085~86
```

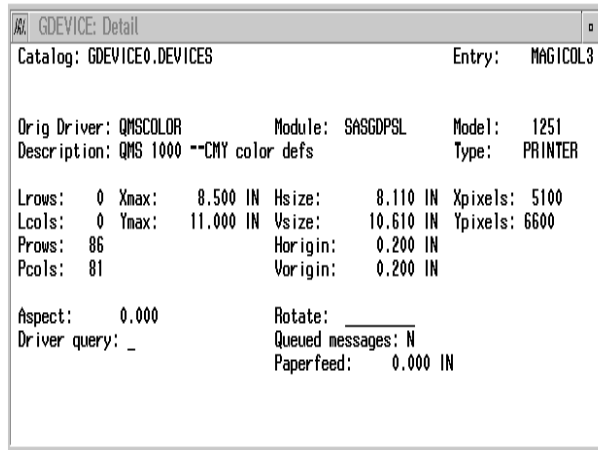


Figure 5: Detail Window for MAGICOL3 Driver

IMPLEMENTATION

Graphics Stream File

A macro is created to an export encapsulated PostScript file, GIF, or any other common export files. This macro is used before creating of the graph or graph procedure.

```

%macro gif(namefl=); /create a image file **/

%if %substr(&mprint,1,5)=CGMFL %then %do;
  filename gsf "c:\sasfiles\&namefl..cgm";
  goptions gsfname=gsf gsfmode=replace;
%end;

%if %substr(&mprint,1,6)=CGMCOR %then %do;
  filename gsf "c:\sasfiles\&namefl..cgm";
  goptions gsfname=gsf gsfmode=replace;
%end;

%if %substr(&mprint,1,3)=IMG %then %do;
  filename gsf "c:\sasfiles\&namefl..gif";
  goptions gsfname=gsf gsfmode=replace;
%end;

%if %substr(&mprint,1,4) =PSLE |
  %substr(&mprint,1,3) =PSE
  %then %do;
  filename gsf "c:\sasfiles\&namefl..eps";
  goptions gsfname=gsf gsfmode=replace;
%end;
run;
%mend gif;

```

Front-End Application

A user-friendly SAS/AF frame system is needed to guide the system user to choose among the Encapsulated, GIF, and PostScript QMS 1000 driver. On the other hand the system can select printer driver like MAGICOL3 or QMSCOLOR. Figure 6 shows the an interface allowing the user to select a device driver along with other things. The code used to create a customized SAS/GRAPH resides in the SAS/AF SOURCE entry. Figure 7 shows that all the SOURCE entry shows up as a CHECK box. For each selected CHECK box, the corresponding graph's source code will be coded to the 'PREVIEW' window. When the system user clicks on GOBACK ICON, all the code in the PREVIEW will be submitted.

Minor SCL Detail

Beofore the graph/s get submitted, system will check the value of MPRINT macro which resolves the current device driver. If the current device driver is CGM, EPS or GIF driver, then output of the graphics would be sent to a graphics stream file determined by the macro GIF. Otherwise SAS/GRAPH would be displayed on the display device or sent to a PostScript printer if batch process is requested.

When multiple graphs are superimposed, superimposed graph is kept and rest of them get deleted except when the device driver is GIF, CGM or EPS. So, if the image of the superimposed graph is distorted, application user can combine the single images together to create the final image in the Internet. Rest of the cases superimposed graph could be used.

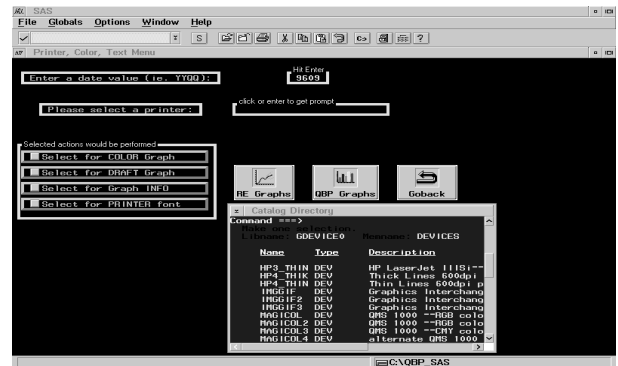


Figure 6: Selection of Device Drivers

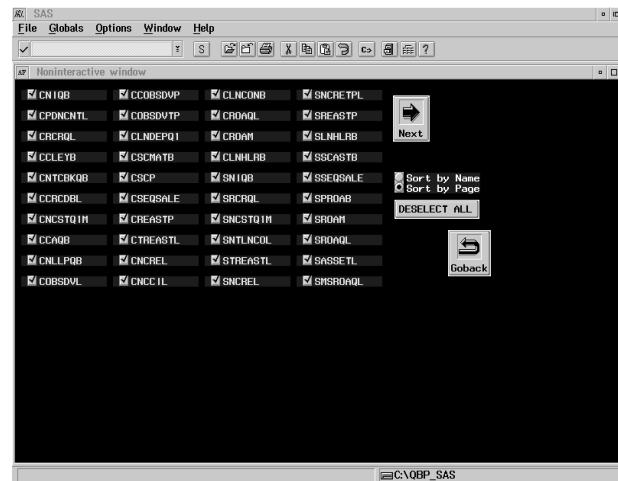


Figure 7: Selection of Graphs

HTML code

To display the SAS/GRAPH images via a Web page, the name of the image file must be contained within the HTML code. There is no modification to the original GIF file, which is created by the SAS device driver. Within the HTML code are commands to print the encapsulated postscript file. Load the HTML document to view the GIF image. The few modifications with HTML code will make the WEB page attractive. The following example illustrates a simple Web page that displays a GIF image.

```

<HTML>
<HEAD>
<TITLE>SAS Graph on WEB Page</TITLE>
<!-- HTML File Name : test.html -->
</HEAD>

<BODY bgcolor = "#FFFFFF">
<CENTER>
<H3>
<B>test</B>
</H3>
</CENTER>
<HR>
<CENTER>
<IMG width=615 height=345 border=0 hspace=0
SRC=""c:\sasfiles\test.gif">
</CENTER>
</BODY>

```

</HTML>

As previously INSTRUCTED, use the same pixel value as in the device driver for height and width.

CONCLUSION

SAS software has proved that it can create exceptional quality printed reports and tables that can easily be placed on WEB pages. Its capabilities approach those of other products more commonly used to create Web graphics, but the limited number of colors (256) and the inability to specify fonts other than default limit the versatility of SAS software for this use

REFERENCES

SAS Institute Inc.(1994), SAS/GRAPH Software: Reference, Version 6, First Edition, Cary, NC: SAS Institute Inc.

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