

Exporting SAS/GRAPH® Output to Other Applications

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For various reasons, you may find it convenient to export output from SAS/GRAPH software to other graphics, spreadsheet, or word processing applications. Some reasons you may want to do this include:

- to include SAS/GRAPH output in a document produced by a word processing package
- to add clip art or images to SAS/GRAPH output
- to manipulate or edit SAS/GRAPH output (if the SAS/GRAPH graphics editor is not supported on your device or you need capabilities that the editor does not provide)

This paper gives an overview of the methods for exporting SAS/GRAPH output to other packages in releases 6.08 and 6.09 of the SAS system, and presents new exporting capabilities available with Release 6.10.

Overview of Exporting

To export SAS/GRAPH output to another application you must have SAS/GRAPH produce a graphics file in a format that can be imported by the target application. There are several graphics formats that can be transferred between applications. Some common formats include:

CGM	Computer Graphics Metafile
HPGL	Hewlett-Packard Graphics Language
PS, EPS	PostScript
TIFF	Tag Image File Format
GIF	Graphics Interchange Format
BMP	Microsoft Windows Bitmap
WMF	Microsoft Windows Metafile
MET	OS/2 Metafile
PBM	Portable Pixmap

Releases 6.08 and 6.09 of SAS/GRAPH software can produce CGM, HPGL, PostScript, and TIFF files. In 6.08 BMP and MET files can be created by copying SAS/GRAPH output to the Windows and OS/2 clipboards, respectively. Release 6.10 can produce all the above formats, as well as GIF, WMF, TGA and several other bitmap formats.

Which Format Should I Use?

The first consideration in selecting an export file format is to determine what file format the target application can import. Almost all graphics, word processing and spreadsheet applications can import CGM files, and most can import most of the other formats.

If your target application can import more than one of the formats that SAS/GRAPH can produce, your next consideration should be the ease of importing and manipulating graphics. CGM and HPGL are vector-based formats, while TIFF, GIF, and BMP are bitmap formats. Vector-based formats are generally easier to manipulate, because the graph can be broken down into individual objects that can be moved, scaled, and modified on an individual or grouped basis. For example, if you create a bar chart with SAS/GRAPH software and export it in CGM format to another application, in most cases you can manipulate the individual components of the graph (bars or labels, for example) once it has been imported into the target application. With bitmap formats, the entire graph is treated as a single object when imported into the target application; you can move an entire bar chart around, but you cannot manipulate the individual bars or text. Generally, you will find that a vector format provides much more flexibility.

Of the vector formats, the CGM format provides the richest set of capabilities. By taking advantage of hardware fills, hardware text, and binary format, a CGM file is also likely to be smaller in size than an HPGL or PostScript file. Because of these advantages, we recommend using CGM as an export format whenever possible.

Using CGM Drivers in Releases 6.08 and 6.09

Several different CGM drivers are available with Releases 6.08 and 6.09 of SAS/GRAPH software. Each driver is tailored to a specific target package. For example, the CGMBQA driver can be used to create a CGM file to export to Borland Quattro for

DOS, and the CGMFL2C driver can be used to create a CGM file for Lotus Freelance for Windows.

If you have a version of a graphics, spreadsheet, or word processing package that was released after Releases 6.08 and 6.09 of SAS/GRAPH software became available, you can create CGM drivers for these products by using PROC GDEVICE to modify existing CGM drivers. Complete instructions for creating drivers and importing their output into specific packages are available as a series of SAS Technical Support Notes (TS-Docs), which can be obtained by contacting SAS Institute Technical Support. Appendix A contains a list of all packages for which CGM drivers are available or for which they can be created.

To export SAS/GRAPH output to another package, simply create a graphics stream file using the appropriate CGM device driver. On some operating systems, additional GOPTIONS may be required to set record length, carriage control, or character encoding. Here are some examples of statements that can be used on various systems to create a CGM file that can be exported to WordPerfect 5.2 for Windows. For other packages, simply change the driver name; all other options and statements remain the same.

Creating a CGM file under MVS

Use the following statements to create a CGM file under MVS:

```
filename fileref 'logonid.filename'
  lrecl=137 recfm=vb space=(prim,sec);
goptions device=cgmwpwa gsfname=fileref
  gsfmode=replace gsflen=80
  gprotocol=sasgpasc;
```

Note that the option GPROTOCOL=SASGPASC causes the output to be written in ASCII format. Note also that the output file must be created with a record format of VB.

Creating a CGM file under CMS

Use the following statements to create a CGM file under CMS:

```
filename fileref 'fn fm ft';
goptions device=cgmwpwa gsfname=fileref
  gsfmode=replace gsflen=80
  gprotocol=sasgpasc;
```

Note that the option GPROTOCOL=SASGPASC causes the output to be written in ASCII format.

Creating a CGM file under VMS

Use the following statements to create a CGM file under VMS:

```
filename fileref 'filename.cgm'
  gsfcc=none;
goptions device=cgmwpwa gsfname=fileref
  gsfmode=replace gsflen=80;
```

On the FILENAME statement, the option GSFCC=NONE causes no carriage control characters to be added to the graphics stream file.

Creating a CGM file under UNIX

Use the following statements to create a CGM file under UNIX:

```
filename fileref '/path/filename.cgm';
goptions device=cgmwpwa gsfname=fileref
  gsfmode=replace;
```

Creating a CGM file under Windows and OS/2

Use the following statements to create a CGM file under Windows or OS/2:

```
filename fileref 'filename.cgm';
goptions device=cgmwpwa gsfname=fileref
  gsfmode=replace;
```

Transferring the CGM File

If you are transferring your CGM file to a computer other than the one on which you created it, you must ensure that no translation is done, and no carriage control characters are used. To do this, always use a binary file transfer. Note that when creating a CGM file on MVS or CMS, you must specify GPROTOCOL=SASGPASC in your SAS program, thus creating an ASCII file. When transferring the file to an ASCII based system such as UNIX or a PC, a binary file transfer prevents translation from taking place.

Importing the CGM File into your Application

The specific method that you use to import the CGM file created by SAS/GRAPH into your target application depends on the particular graphics, spreadsheet, or word processing program that you are using. For details on importing into a particular package, refer to the Technical Support Note for the SAS/GRAPH CGM driver for your package. A list of Technical Support Notes can be found in Appendix A. The Technical Support Notes also describe

limitations and "quirks" in the target packages, and list GOPTIONS that can be used in your SAS/GRAPH program to bypass potential problems.

Some Tips for Creating CGM Files

In some cases, the CGM files created by SAS/GRAPH can be quite large. However, you can reduce the size of your CGM file by doing the following:

- Use the HWCGMxxx series of "hardware" fonts wherever possible.* If you use SAS/GRAPH filled software fonts (such as SWISS or CENTB), each character is stored as a series of moves and draws required to draw the character. If your graph contains a great deal of text, using a filled software font can result in a huge CGM file--in some cases larger than the target application can accept.

Each of the SAS/GRAPH CGM drivers has available hardware fonts (chartypes) that correspond to fonts already available in the target package. When a hardware font is used, rather than containing the move and draw commands to draw each character, the CGM file simply contains the string to be drawn along with the font in which it is to be drawn. To see what hardware fonts are available for a specific CGM driver, you can use PROC GDEVICE to display the CHARTYPE screen for the driver entry, or you can refer to the SAS Technical Support Note for the driver for the package that you are using. For example, if you are using the CGMWPC6A driver to create a CGM file for export to WordPerfect 6.0a for Windows, and want to use the Times Roman font in the graph you are exporting, you can specify F=HWCGM008 in your SAS/GRAPH program, since chartype 8 in the CGMWPC6A driver corresponds to WordPerfect's Times Roman font.

- Reduce the number or density of area fills in your graph. Crosshatch or diagonal fills are usually done with a software fill, which can generate a large number of "move" and "draw"

*Strictly speaking, the HWCGMxxx fonts are not hardware fonts, but correspond to fonts available in the target application. However, since their use in SAS/GRAPH is similar to the use of true hardware fonts, the term "hardware fonts" is used here.

and can increase the size of your CGM file. Solid fills are generally done using a hardware fill, so specifying solid or empty fill patterns usually results in a smaller output file.

Creating Other File Formats in Releases 6.08 and 6.09

Encapsulated PostScript

Many packages can import encapsulated PostScript files, which can be generated by SAS/GRAPH using the PSEPSF driver. (For Interleaf and FrameMaker, a special series of encapsulated PostScript drivers can be created which are tailored for these packages; see Appendix A). Note that the files created by the PSEPSF driver do not contain a TIFF header; this means that graphs created with this driver that are imported into other applications may not display on the screen, but do appear on printed output. The instructions for creating graphics stream files using SAS/GRAPH PostScript drivers are the same as those for creating CGM files, with the following exceptions:

- GSFLLEN=80 should be included in your GOPTIONS on all systems.
- Under MVS, specify TRANTAB=GTABCMS in your GOPTIONS.
- If you are using release 6.07 under UNIX, specify GACCESS=SASGAEDT in your GOPTIONS.
- Under VMS, do not specify GSFCC=NONE on your FILENAME statement.

Hewlett-Packard Graphics Language (HPGL)

Files in another common export format, Hewlett-Packard Graphics Language (HPGL), can be created by using the HPGL device driver. (In releases prior to 6.08, use the HP7475A device driver). The same statements and GOPTIONS used to create CGM files with the CGMxxx series of drivers can be used to create HPGL files using the HPGL or HP7475A drivers. (If you are using the HP7475A driver to create an HPGL file you should also specify GOPTIONS NOPROMPT). Complete instructions on creating HPGL files and importing them into target applications can be found in the SAS Technical Support document for your target application.

In general, exporting a CGM file is preferable to exporting an HPGL file. CGM supports a wider range of hardware fonts than HPGL, hardware fills are more reliable, and color mapping is much more predictable with CGM.

Tag Image File Format (TIFF)

Several SAS/GRAPH drivers are available to create TIFF files. They are:

TIFFBII	Format B--II Format (6.07 and later)
TIFFBMM	Format B--MM Format (6.07 & later)
TIFFB	Black and white with Packbits data compression (6.09 and later)
TIFFP	Class P, 256 colors with Packbits data compression (6.09) and later

To create a TIFF file using SAS/GRAPH software, use the same options and statements listed above for creating CGM files on each operating system, but substitute one of the TIFF drivers for the CGM drivers used in the examples. See the Technical Support notes listed in Appendix A for details on importing TIFF files into specific packages.

Since TIFF files are in bitmap format, you generally have less flexibility in manipulating the images once they have been imported into the target application. The SAS/GRAPH output is normally treated as a single object, and cannot be broken into components such as bars or text.

Windows Bitmap (BMP)

In Release 6.08 of the SAS system you can create a Windows bitmap file by copying the contents of the GRAPH window to the Windows Clipboard. While the GRAPH window is active, select an area of the graph to save by dragging your mouse. Then select **Edit==>Copy to Paste Buffer** to copy the graph to the Windows Clipboard. The contents of the clipboard can then be included in other Windows applications. Note that the clipboard saves graphics only at screen resolution, and in bitmap form. For this reason it is recommended that you export SAS/GRAPH output in CGM format rather than BMP format where possible.

Macintosh Application

A special Macintosh application is available from

SAS Institute for creating files that can be exported to applications running on Macintosh computers. The Macintosh application consists of two parts:

- a SAS/GRAPH driver that creates a file that can be transferred to the Macintosh,
- a Macintosh application (named META) that reads the file produced by the SAS/GRAPH driver and converts it to a PICT file.

The PICT file can then be included in other Macintosh applications. To obtain the SAS/GRAPH Macintosh Application, contact SAS Institute Technical Support, and ask for Technical Note TS-210. Note that many Macintosh programs can also import PostScript and CGM files.

New Capabilities in Release 6.10

Several new features have been added in release 6.10 of SAS/GRAPH software that enable you to create a wider variety of export file types, and create them more easily. (The 6.10 release of the SAS System is available for Windows (WIN32), OS/2, and Intel ABI platforms).

File==>Print Pulldown Menu

You can now create a graphics stream file by using the **File==>Print** pulldown menu from the main SAS menu bar. This means that **GOPTIONS** and **FILENAME** statements are no longer required to create a graphics stream file. This feature is particularly useful when used in conjunction with the **TARGETDEVICE=** graphics option. For example, if you want to create a CGM file to export to WordPerfect 5.2 for Windows, before you create your graph, specify:

```
goptions target=cgmpwpa;
```

in your SAS program. When you run the SAS/GRAPH procedure, the graph is displayed on your screen. You can then select **File==>Print** to create the CGM file. This displays a window that lets you indicate that you want the driver output sent to a file and lets you specify the name of the file.

You can also use this method to create PostScript files using the PS or PSEPSF drivers, HPGL files using the HPGL driver, or TIFF files using the TIFFxx drivers.

File==>Export Pulldown Menu

Another way of creating an export file in Release 6.10 is to use the **File==>Export** pulldown menu after a graph has been displayed. When you select **File==>Export**, you can specify the type of file that you want to create. Choices available in Release 6.10 include TIFF, GIF, CGM, BMP, WMF, PBM, PostScript and MET (OS/2 only).

The CGM files created by using **File==>Export** are not tailored for a specific target package. If you want to create a CGM file for a specific target application, you should create a graphics stream file using the appropriate CGMxxx driver, rather than using the **File==>Export** pulldown menu.

IMAGE Catalog Entries

In Release 6.10 you can save SAS/GRAPH output (or imported images) as IMAGE entries in a SAS catalog. IMAGE entries can be edited, included as objects in FRAME entries, or combined with GRSEG entries produced by SAS/GRAPH software. To save SAS/GRAPH output as an IMAGE entry, select **File==>Save as==>Image** from the GRAPH window or the graphics editor.

For additional information on IMAGE catalog entries, refer to *SAS Software, Changes and Enhancements, Release 6.10*.

Importing Graphics Files

In addition to supporting additional export file formats, Release 6.10 of SAS/GRAPH software can import several different file formats, including CGM, TIFF, GIF, BMP, WMF, PCX, TGA, PBM and PostScript. (In previous releases, you could import only CGM files using PROC GIMPORT). To import a graphics file in release 6.10, invoke the SAS/GRAPH graphics editor. This can be done by selecting **Locals==>Edit Graph** while in a GRAPH window, or by selecting **Present==>Create Graphs** from the Globals pulldown menu. From the Graphics Editor, select **File==>Import**, and then select the type of file you want to import. Use the hand tool to indicate where you want the imported image to be placed, and click the mouse to import the image. The image can be resized once it has been imported.

Details on importing and exporting graphics files in Release 6.10 of SAS/GRAPH software can be found in *SAS Software, Changes and Enhancements, Release 6.10*.

APPENDIX A

Summary of CGM Drivers and Related Documentation

The following table lists CGM drivers that are either supplied with SAS/GRAPH software, or can be created by modifying existing drivers. The Document column indicates the Technical Support Note (TS-Doc) that explains how to create (if necessary) and use each driver, and how to import the CGM file into the target package. The Release columns indicate whether a driver is supplied with that version of SAS/GRAPH software ("SUPPLIED") or whether you must create the driver ("build") using instructions in the corresponding Technical Support Note.

Package	Suggested Driver	Document	Release 6.04	Release 6.07 Unix	Release 6.08	Release 6.09 Unix
Aldus Pagemaker 4.0 for Windows	CGMAPMA	TS-252F	build	build	build	SUPPLIED
Aldus Persuasion for Windows	CGMAPSA	TS-252D	build	build	build	SUPPLIED
BPS 35MM Express	CGM35	TS-252	build	build	build	SUPPLIED
Borland Quattro Pro 5.0 Windows	CGMBQWC	TS-252J	build	build	build	build
Borland Quattro Pro DOS	CGMBQA	TS-252	build	build	SUPPLIED	SUPPLIED
Frame Technology Frame Maker	CGMFRCA CGMFRGA CGMFRMA PSCFRAME PSGFRAME PSMFRAME	TS-252H				SUPPLIED SUPPLIED SUPPLIED build build build
Harvard Graphics 2.12 for DOS	CGHHG	TS-252	SUPPLIED	SUPPLIED	SUPPLIED	SUPPLIED
Harvard Graphics 3.0 for DOS	CGMHG3A	TS-252A	build	build	SUPPLIED	SUPPLIED
Harvard Graphics for Windows	CGMHGWA	TS-252C	build	build	SUPPLIED	SUPPLIED
ImageBuilder	CGMIMG	TS-252	SUPPLIED	SUPPLIED	SUPPLIED	SUPPLIED
Interleaf 5	CGMCILF CGMGILF CGMMILF PSIEALFC PSILEAFG PSILEAFM	TS-252I	build	build	build build build build build build	build build build build build build
Lotus Ami Pro 3.0 for Windows	CGMAM3C CGMAM3G CGMAM3M	TS-252M	build	build	build	build
Lotus Ami Pro 2.0 for Windows	CGMAMIA	TS-252	build	build	build	build
Lotus Freelance for DOS	CGMFLALJ CGMFLAPL CGMFLAPT	TS-252	build	build	SUPPLIED SUPPLIED SUPPLIED	SUPPLIED SUPPLIED SUPPLIED
Lotus Freelance for Windows 2.0	CGMFL2C CGMFL2G CGMFL2M	TS-252K	build	build	build	build
Lotus Freelance for Windows 1.0	CGMFLWA	TS-252	build	build	SUPPLIED	SUPPLIED
Lotus 1-2-3 4.0 for Windows	CGMI23C	TS-252N	build	build	build	build
Lotus 1-2-3 1.0	CGMI23	TS-252	build	build	build	build

Microsoft Excel 5.0 for Windows	CGMME3C CGMME3G CGMME5M	TS-252Q	build	build	build	build
Microsoft Word 6.0 for Windows	CGMMW6C CGMMW6G CGMMW6M	TS-252L	build	build	build	build
Microsoft Word 2.0 for Windows	CGMMWWC	TS-252B	build	build	build	SUPPLIED
Microsoft Power Point	CGMMPPA	TS-252E	build	build	build	build
Polaroid CI3000	CI3000	TS-252	build	build	SUPPLIED	SUPPLIED
Word Perfect 5.1 for DOS	CGMWPCA CGMWPCAP CGMWPGA CGMWPGAP CGMWPCA CGMWPCAP CGMWPGA CGMWPGAP	TS-252G	build build build build build build build build	build build build build build build build build	build build build build build build build build	SUPPLIED SUPPLIED SUPPLIED SUPPLIED SUPPLIED SUPPLIED SUPPLIED SUPPLIED
Word Perfect 6.0a for Windows	CGMWP6CA CGMWP6GA CGMWP6MA	TS-252P	build	build	build	build
Word Perfect 6.0 for Windows	CGMWP6C CGMWP6G CGMWP6M	TS-252O * Beta release of driver	build	build	build	build
Word Perfect 5.2 for Windows	CGMWPWA	TS-252	build	build	SUPPLIED	SUPPLIED
Word Perfect Presents for DOS	CGMWPCA CGMWPGA CGMWPCA CGMWPGA	TS-252G	build	build	build	SUPPLIED SUPPLIED SUPPLIED SUPPLIED
Zenographics Pixie	CGMPIX	TS-252	SUPPLIED	SUPPLIED	SUPPLIED	SUPPLIED

*Awaiting maintenance release of Word Perfect before creating a production driver.

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