

## Get a Quick Start with SAS® ODS Graphics By Teaching Yourself

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### ABSTRACT

SAS® Output Delivery System (ODS) Graphics started appearing in SAS® 9.2. When first starting to use these tools, the traditional SAS/GRAPH® software user might come upon some very significant challenges in learning the new way to do things. This is further complicated by the lack of simple demonstrations of capabilities. Most graphs in training materials and publications are rather complicated graphs that, while useful, are not good teaching examples. This paper contains many examples of very simple ways to get very simple things accomplished. Over 20 different graphs are developed using only a few lines of code each, using data from the SASHELP data sets. The use of the SGPLOT, SGPANEL, and SGSCATTER procedures are shown. In addition, the paper addresses those situations in which the user must alternatively use a combination of the TEMPLATE and SGRENDER procedures to accomplish the task at hand. Most importantly, the use of ODS Graphics Designer as a teaching tool and a generator of sample graphs and code are covered. The emphasis in this paper is the simplicity of the learning process. Users will be able to take the included code and run it immediately on their personal machines to achieve an instant sense of gratification.

### INTRODUCTION

This paper is oriented to users of the original SAS/Graph software (now included in the base product, formerly marketed as a separate product) who are now wanting to move into SAS ODS Graphics (also referred to as SG graphics). The original intention of this paper was to present a number of sample graphs with the “SG” procedures. This has been expanded to include the Proc Template/Proc SGrrender approaches, ODS Graphics Designer, development of styles via Proc Template and an introduction to the routing of output, using a complex example of outputting to multiple frame HTML files. The original paper from which this presentation was abstracted is much wider in scope and published at <http://www.mwsug.org/proceedings/2015/DV/MWSUG-2015-DV-05.pdf>. It was entitled: “Getting Productive Fast in SAS® ODS Graphics – a Simple Look-See Approach. This paper extracts and expands the discussion addressing the ODS Graphics Designer as a self-teaching tool. The electronic poster accompanying this paper is on YouTube (Google search for “SAS Video Playlists by Roger Muller” without the quotes for a dynamic video displaying of the ODS Graphics Designer.

### I. WHERE TO START?

What a question! The beginning user can get frustrated with all of the options available and may very easily go down a path that may not get them where they want as fast as they want. First, there are many different SAS graphics offerings.

The diagram in Figure 1 summarizes SAS graphic offerings (with some liberties taken for brevity).

Several points need to be made before we start:

- The ODS Graphics Designer is clearly the easiest way to teach yourself the code needed to generate many, but not all, ODS graphics FAST. We are not extensively covering the ODS Graphics Designer in this written paper since it is so dynamic in nature. Rather, it will be shown in the electronic poster and accompanying video segments on YouTube as it is highly interactive. It is awful easy for serious SAS programmers to casually overlook this tool. You’ve heard it before: “real programmers write code, they don’t drag-and-drop”. The ODS Graphics Designer is best described as point-and-choose software (GUI – Graphical User Interface) that is highly interactive and can make graphics in SAS Enterprise Guide environment and in PC SAS. It does generate SAS code in addition to producing the graphics.

ODS Graphics Designer is often used by occasional users who do not want to get into extensive programming. The Graphics Designer can be used to generate graphic template code that can be copied and pasted in the SAS environments (PC, EG, batch), and will greatly speed up the development process when learning the new procedures.

ODS Graphics Designer can most definitely be used as the “Training Program for Learning How to Code SAS ODS Graphics”. It will often get you 90% of the way there in 10% of the time. That is not a bad tradeoff. Bottom line: **START HERE!** Look at the YouTube videos. In Google, search for “SAS Video Playlists by Roger Muller” without the quotes.

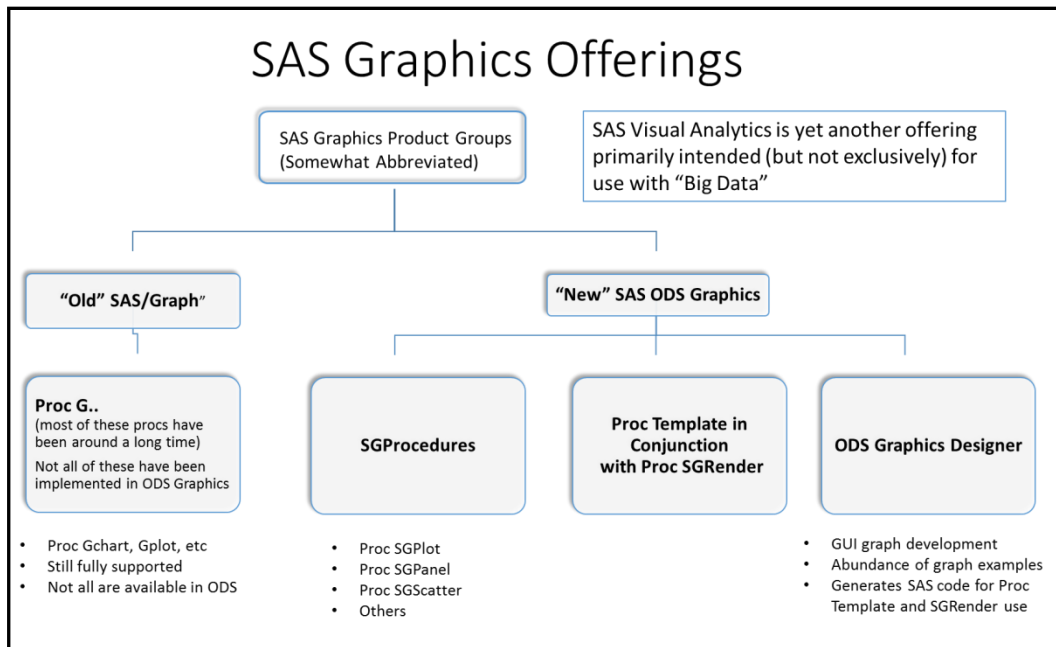


Figure 1. Abbreviated Diagram of SAS Offerings for Graphic Development.

- We are not addressing the assorted SAS ODS graphics that are produced as supplementary output by numerous SAS statistical procedures. These are usually documented with the procedures.
- The “SG” procedures (SGPLOT, SGPANEL, and SGSCATTER) collectively referred to as “the SG procedures” are addressed in this paper.
- Another major point of emphasis is the combined use of Proc Template to create “skeleton template” files for graphic development with Proc SGRender. The stored templates are merged against SAS datasets to develop graphics with Proc SGRender.
- The use of SAS/Graph, the original SAS graphics development tool, is not the subject of this presentation. SAS/Graph is still fully supported and may occasionally be preferred for certain graphics development projects.
- SAS Visual Analytics is yet another SAS offering that will not be covered here. It is primarily marketed for use with “Big Data” and is not really used much by users of the traditional SAS/Graph product. This could change as there are pricing options that would allow for its use in environments that are less than “big data”.

## SOURCES OF INFORMATION ON ODS GRAPHICS

There are many sources of information on the “new” SAS graphics. So many in fact, that it can be overwhelming. The use of internet search engines such as Google will return so many links that it can be

counterproductive to achieving a quick fast start. If you are fortunate enough to have source code from previous programs developed by other competent programmers that you can modify, this will obviously get you off to a good start. There are classes available. The problem with classes is that they may not necessarily be well synchronized with the software availability at your institution and the timing of the projects you are working on. While the SAS programming manuals are available on line, the somewhat condensed version available in html form is not always helpful. The full PDF versions of the manual are on line, but can be unwieldy to use because of their sheer size. I have found that the following manuals purchased as book editions are very useful. They are not necessarily long on examples, but they do contain in-depth information on the numerous programming options (complete information in the Additional Reading section at the end of this paper):

- SAS 9.4 ODS Graphics Procedures Guide 4th edition, 2013. Total pages is 959. There are 361 pages on Proc SGPlot, 291 pages on Proc SGPanel. These procs are heavily used. This has been superseded by the 5th edition.
- SAS 9.4 ODS Graphics Procedures Guide 5th edition, September, 2015. See special section near the end of this paper regarding use of this document including downloading and using a PDF version. Expanded to 1624 pages.
- SAS 9.4 Graph Template Language User's Guide, Third Edition, 2014. Total pages is 633. This book covers many uses of Proc Template for creating templates that are then rendered to SAS ODS graphics with Proc SGRender. This method of operation is preferred by many users as their requirements and skills grow and advance.
- SAS 9.4 Output Delivery System User's Guide, Third Edition, 2013. 1,130 pages. While much broader in scope than just ODS graphics, this manual addresses many issues in handling and understanding ODS (Output Deliver System) usage that programmers will eventually need.

### **SOME QUESTIONS TO ANSWER BEFORE YOU START**

- What version of SAS do you have? If you are creating a graphics system for widespread use, what version will eventual users of the system have access to? SAS ODS graphics start with version 9.2. If you are earlier than that, you must use the original SAS/Graph software. There has been a continual stream of enhancements ODS graphics as SAS releases have moved to the current releases of 9.4. If you do not have the latest releases, you may be missing significant ODS graphics capabilities.
- What is my operating environment? Likewise, what is the environment of the eventual users?
  - PC, with or without Enterprise Guide?
  - Unix (or some other remote batch facility)?
- What is the desired output and where does it get placed?
  - To a graphics file?
  - Just to a screen?
  - Inside a document such as an html page, a Microsoft Word RTF file, or an Adobe Acrobat PDF?
- Do you like to use Graphical User Interfaces or do you want to hardcode programs with an editor?
- Is this a "one-time deal" for creating graphics for a one person project? Or is this a system to be used by others over an extended period?

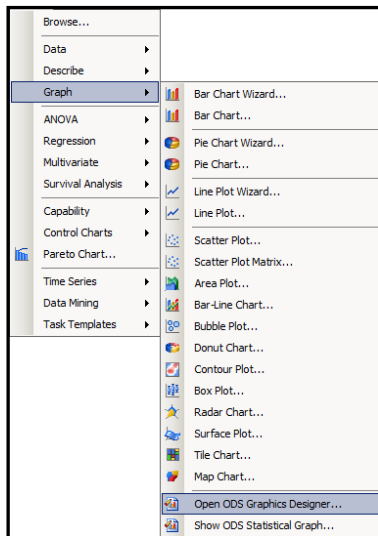
This paper does not address all of these issues. It is intended to get a single SAS programmer rapidly developing graphics using the ODS Graphics Designer.

## II. THE ODS GRAPHICS DESIGNER AS A CODE TRAINER AND “PROTOTYPER”

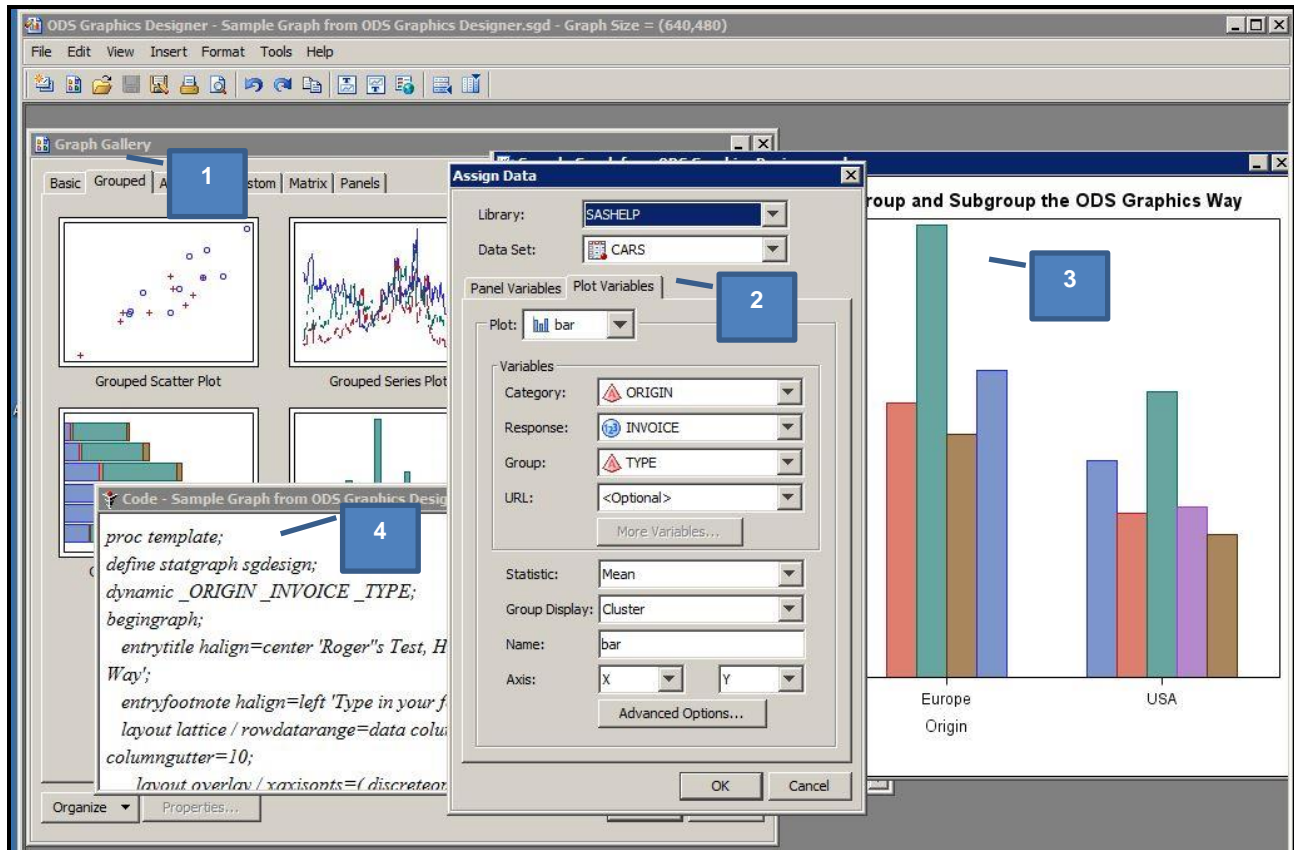
Do yourself a big favor and forget any preconceived notions about the use of GUI tools with their drag-and-drop features. Use ODS Graphics Designer as your initial code prototype tool and your personal trainer. There is no better set of examples of potential SAS ODS Graphs that can be generated here. While it does take the approach of developing underlying code using Proc Template with Proc SGRRender, it will also benefit users of SGPlot, SGPanel and SGScatter as there are lots of similarities in the code developed.

**Getting ODS Graphics Designer Started.** This depends a little bit on your environment. It should be installed as the ODS graphics software has been included with the Base SAS installation since version 9.3.

In SAS Enterprise Guide 7.1, ODS Graphics Designer is somewhat hidden. From the Enterprise Guide menu bar select “Tasks” and proceed to select “Graph”. Then select “Open ODS Graphics Designer” as shown in the figure to the left and it will open into the “Graph Gallery” window. Find a sample that more-or-less matches what you want to do.



**An Important Note:** When pulling down the menu “Tasks” – “Graphics” in SAS Enterprise Guide, many other graphics options are available besides “Open ODS Graphics Designer”. These are for generating graphs and SAS code with the older SAS/Graph product. This is not SAS ODS graphics. These procedures are fully supported by SAS Institute.”. Do not hesitate to use them (the older procedures). These assorted icons are designed to be dragged into the Process Flow diagrams of SAS Enterprise Guide. **For assistance in doing this see the papers or video by Muller, 2013.**



In the figure above, 4 major sub windows are overlapped. In the Graph Gallery of samples (1), a “Cluster Grouped Vertical Bar” was selected. The “filled-in” data panel is partially shown (2) and the graph as currently specified is shown at the right (3). Most importantly, from the Menu at the top of the screen “View” – “Code” was selected and the SAS code to do this graph via Proc Template and Proc SGRender is shown in the code window (4).

**Author’s personal opinion:** I am repeating a position stated earlier. This tool is the best training tool out there to learn what SAS code it takes to accomplish programming in SAS “SG” graphics. This is particularly true in regards to understanding the Proc Template with Proc SGRender approach. There have not been a lot of examples published illustrating capabilities of “SG” graphics and the underlying code. This is “do-it-yourself” training and “do-it-yourself” example building via the “look-see” approach. **Start Here!**

### III. THE “SG” PROCEDURES VS THE COMBINATION OF PROC TEMPLATE AND PROC SGRENDER VS ODS GRAPHICS DESIGNER

As you work through assorted ODS Graphics publications, you will find three procedures which are address most frequently for creating graphics:

1. Proc SGPlot will have the most examples as it the proc most often used.
2. Proc SGPanel can do most of the graphics that are done in SGPlot, but also provides an interesting “panelby” option to place graphics into a lattice grid.
3. Proc SG Scatter is used to develop scatter plots of data points.
4. Numerous references have been made earlier to the combined used of Proc Template and Proc SGRender. It has been suggested to start with the ODS Graphics Designer and use that code to learn ODS graphics techniques and programming. A lot of the coding that was developed there

is similar to Proc SGPlot, SGPanel and SGScatter.

Are there overlaps in the functionality of these proc's and approaches? Yes.

Start with ODS Graphics Designer to train yourself.

IF you wish to do standalone coding, start with Proc SGPlot and move on from there to Proc SGPanel, and SGScatter.

If the 3 "SG" procs don't get the job done, then where do you go? Back to Proc Template. Nearly all of the functionality of the "SG" procs and MORE is available. The Graphics Template Language (GTL) is more robust. Proc Template creates "skeleton" files that are used as a pattern or template. When these are merged with the data and specific inputs in Proc SGrender, the final graph is produced.

#### IV. BEFORE GETTING STARTED, A DISCUSSION ON THE ODS STATEMENTS THAT "WRAP THE GRAPHICS CODE"

There is a wrapper around the graphics code that is developed. This wrapper usually contains a statement on some specific graphics options and then some code concerning the routing of output. There may more.

Typical order (very primitive and simplified):

```
ODS graphics on;
ODS HTML ...etc.    ;
Lots of graphics code (Proc SG..whatever);
ODS HTML close;
```

The following are a few comments on these statements and the wrapper. See Muller 2015 for more complete details.

<code>ODS Graphics On /Reset;</code>	Turns on ODS graphics (or Off if desired). Reset will set other options to default
<code>ODS Graphics On /imagemap</code>	Enables display of data tips in HTML graphics. These are not displayed in other output destinations such as PDF, RTF, etc. Data tips are mouse overs that display underlying data values and more (see intense HTML example.
<code>ODS Graphics Height=3in width=3in;</code>	Set graphics size.
<code>ODS Graphics imagefmt=jpeg ; /* png bmp etc (15 are available)*/</code>	Set format for image to be produced. If that format is not compatible with the current active output destination, this will be ignored and the default for destination will be used
<code>ODS Graphics /* any or all of 25 plus settings -*/</code>	Control a wide variety of graphics options too numerous to list here. See <a href="#">ODS Graphics Statement (abbreviated)</a> , <a href="#">ODS Graphics Statement (more complete documentation)</a>

## IX. THE STYLES AND ATTRIBUTES ASSOCIATED WITH GRAPHICS – THE SO-CALLED “ATTERS”.

Author's note: Discussing this is huge complexity to address all aspects. This discussion is a simple overview and introduction to get you started. See Muller 2015, <http://www.mwsug.org/proceedings/2015/DV/MWSUG-2015-DV-05.pdf>.

What about all of the enhancements to graphics – the labels, scales, colors, legends, symbols, fills, typefaces and sizes etc. that must nearly always be used to customize graphics?

Some of these can be addressed by what is called “Styles”. These are catalogued libraries of content styles that will cover many of these needs. After specifying a style, the programmer can go in and assign all kinds of attributes to different graphics items to modify (override) current style-assigned values and thus alter their appearance. There are so many of these that SAS programmers frequently refer to them collectively as “ATTERS” as a shortcut for the word “attributes”. There are so many styles and attributes that this is beyond the scope of this paper. For a thorough introductory discussion, see Muller 2015, <http://www.mwsug.org/proceedings/2015/DV/MWSUG-2015-DV-05.pdf>.

### A STYLE EDITOR AVAILABLE IN ODS GRAPHICS DESIGNER

But wait, there is also your own personal trainer out there to show you examples of the behind the scenes coding of many of the “attrs”. It's your own personal trainer “ ODS Graphics Designer”. Once you have started ODS Graphics Designer, start the Style Editor by selecting “Tools” – “Style Editor” from the menu bar. A window showing how to set or change some of the settings comes up. By looking at the code that is generated, you get a feel how individual elements are changed. To cover all of the elements and attributes is beyond the scope of the document. Here is an example of generated code out of the ODS Graphics Designer where Style Editor was used:

```
proc template;
define statgraph sgdesign;
dynamic _SEX _HEIGHT;
begingraph / backgroundcolor=CXE8E6E8 dataskin=matte;
  entrytitle halign=center 'This is Roger''s Title' /
textattrs=(color=CX0000FF family='Brush Script MT' size=24 );
  entryfootnote halign=center 'This is Roger''s Footnote';
  layout lattice / rowdatarange=data columndatarange=data rowgutter=10
columngutter=10;
  layout overlay / xaxisopts=( discreteopts=(
tickvaluefitpolicy=splitrotate));
  barchart category=_SEX response=_HEIGHT / name='bar' stat=mean
barwidth=0.85 groupdisplay=Cluster clusterwidth=1.0 grouporder=data;
  endlayout;
  endlayout;
endgraph;
end;
run;

proc sgrender data=SASHELP.CLASS template=sgdesign;
dynamic _SEX="SEX" _HEIGHT="HEIGHT";
run;.
```

## XII. A SPECIAL NOTE ON THE 5TH EDITION OF THE SAS ODS GRAPHICS PROCEDURES GUIDE

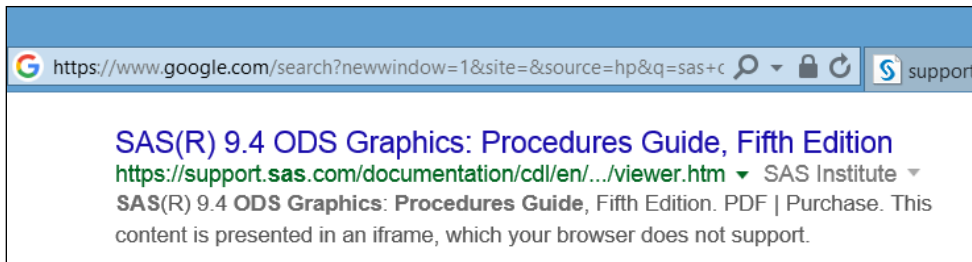
At the time of publication of this paper, the 5<sup>th</sup> edition of this book was released. Content was increased by a whopping 60%. When search engines such as Google are crawled on this book, only the on-line html versions are returned in the search engine. I find the contents of this HTML approach to often be cryptic at best and very abridged.

**The better methodology is to (1) buy the printed version of the book, and (2) download the free PDF version of the book to your local machine and used Adobe Acrobat Reader.** The PDF version of the book is encrypted and search crawlers are not allowed access to the metadata. Without this, there are no results returned to Google and other engines!

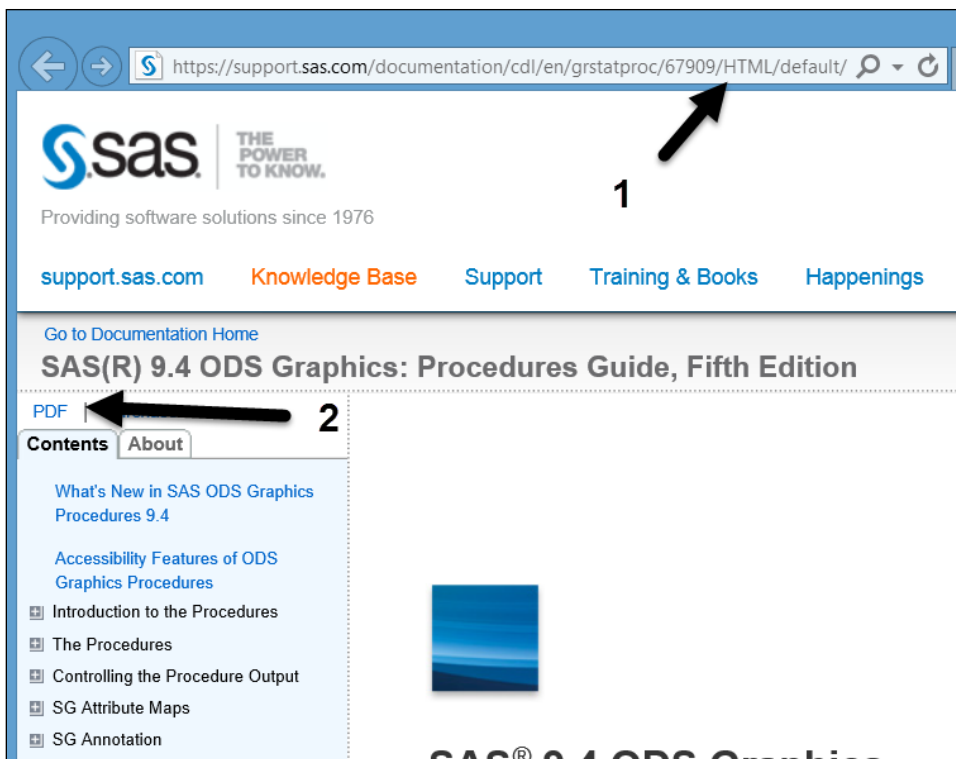
Steps to find, download, save, search and comment with Acrobat Reader are shown in the following figures. Note: Extensive as this book is, it contains only minimal reference to the use of ODS Graphics Designer and the use of Proc Template with Proc SGRender as techniques for graphics development with SAS. These are in other separate books.

**To work with this manual in PDF form:**

1. Search for the guide in Google, only the HTML version is crawled.

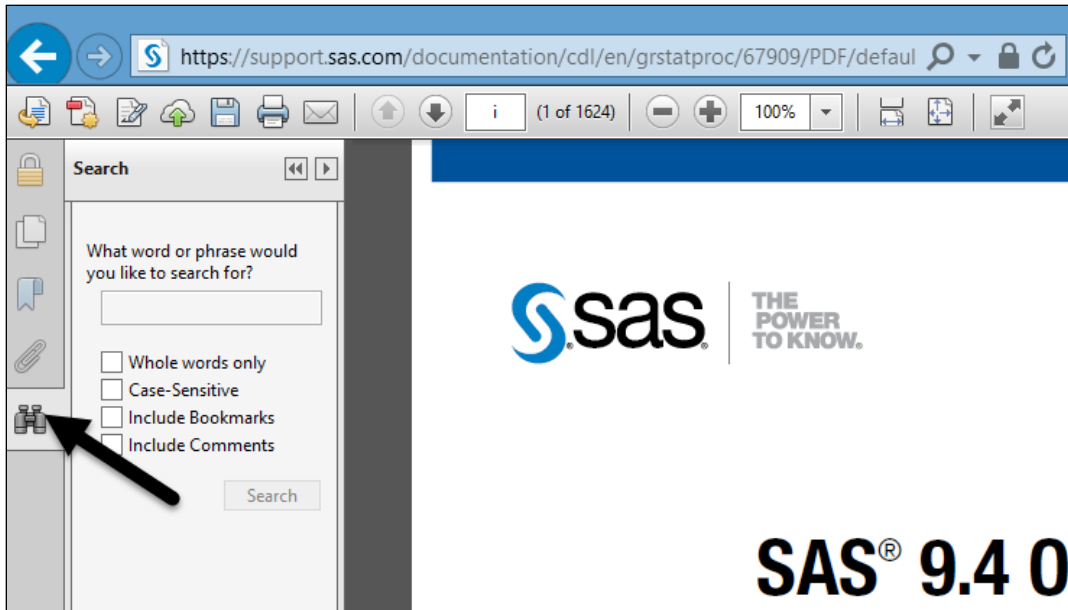


2. Open the returned HTML reference (Arrow 1) and look at the top left corner for the "PDF" link (Arrow 2).



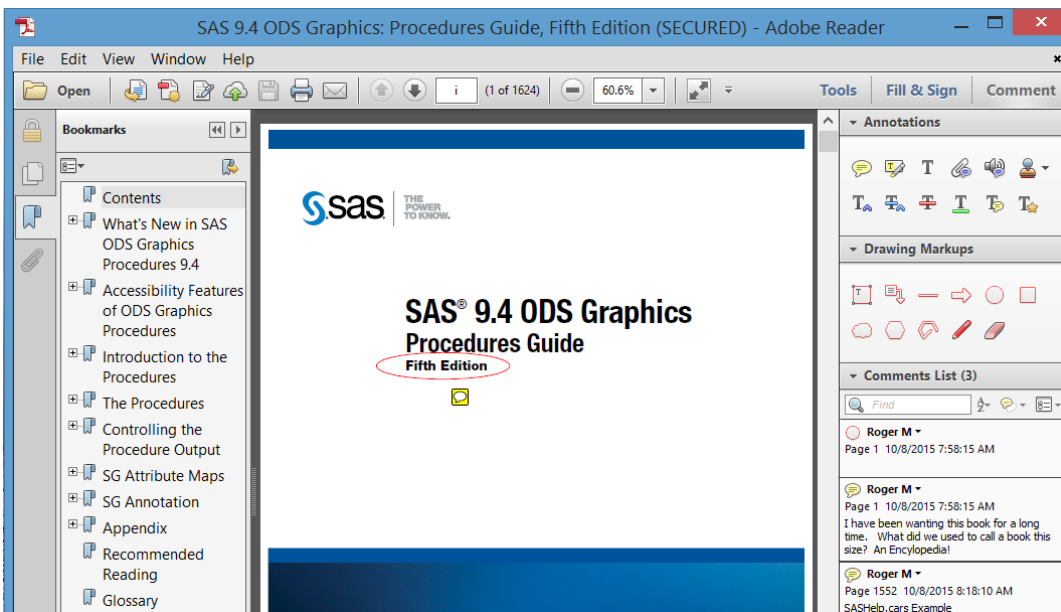
3. Open the PDF link. Depending on your browser and how it has been configured by you or your enterprise technicians, some sort of reader will open displaying the document. You may even have some sort of search capability within the document as indicated in this configuration which appears to be a modification of the Adobe Acrobat Reader.





These readers and their configurations which may have their place in certain documents and configurations, can be extremely limited and downright irritating. Download the “real” Adobe Acrobat Reader.

4. Save the PDF document to your local hard drive. Remember that you do not have write access to the document when viewing the web version. Yes, SAS allows you to save the PDF to your hard drive and write notes and more in it.
5. Open with the “Real” Adobe Acrobat Reader. Note the bookmarks, the comments that you can insert, the hiltling tools, etc. For some reason, “find” does not have an icon, but rather is opened from the Menu with “Edit – Find” or with Ctrl-F. An advanced search is available with “Shift + Ctrl + F”. Your comments, highlights and more are written to the file residing on your hard drive. You can modify the reader to have a find icon.



For more information on using Adobe Acrobat Reader, the use of Adobe search techniques within the document and the insertion of comments, see Muller and Horstman, 2010.  
<http://www.mwsug.org/proceedings/2010/resources/MWSUG-2010-120.pdf>

## CONCLUSION

Getting off to a good start using SAS ODS Graphics is challenging. The use of the ODS Graphics Designer with its GUI interface will write creative SAS code that will help meet initial needs and will steer you in the right direction. Attribute definitions for things like fonts, fills, colors etc. is tedious when starting. Using Styles as the primary determinant of visual attributes simplifies this process.

## ACKNOWLEDGEMENTS

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## ADDITIONAL READING

The following are links to books that contain ODS Graphics examples:

- [http://www.sas.com/store/books/categories/examples/statistical-graphics-procedures-by-example-effective-graphs-using-sas-/prodBK\\_63855\\_en.html](http://www.sas.com/store/books/categories/examples/statistical-graphics-procedures-by-example-effective-graphs-using-sas-/prodBK_63855_en.html)
- [http://www.sas.com/store/books/categories/getting-started/statistical-graphics-in-sas-an-introduction-to-the-graph-template-language-and-the-statistical-graphics-procedures/prodBK\\_63120\\_en.html](http://www.sas.com/store/books/categories/getting-started/statistical-graphics-in-sas-an-introduction-to-the-graph-template-language-and-the-statistical-graphics-procedures/prodBK_63120_en.html)
- [http://www.sas.com/store/books/categories/getting-started/getting-started-with-the-graph-template-language-in-sas-examples-tips-and-techniques-for-creating-custom-graphs/prodBK\\_66550\\_en.html](http://www.sas.com/store/books/categories/getting-started/getting-started-with-the-graph-template-language-in-sas-examples-tips-and-techniques-for-creating-custom-graphs/prodBK_66550_en.html)

Another good resource for examples include:

- <http://support.sas.com/sassamples/graphgallery/index.html>
- <http://support.sas.com/rnd/datavisualization/index.htm>
- <http://blogs.sas.com/content/graphicallyspeaking/>

### Attributes and style:

- <http://support.sas.com/documentation/cdl/en/grstatproc/67909/HTML/default/viewer.htm#n02bywwj20leln15x30wucq9pn8.htm>

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- SAS Institute, 2014. SAS 9.4 Graph Template Language User’s Guide, Third Edition, 633 pages. Published by SAS Institute, Cary NC
- SAS Institute, 2013 SAS 9.4 ODS Graphics Procedure Guide, 4th edition 958 pages. Published by SAS Institute, Cary NC
- SAS Institute, 2015 SAS 9.4 ODS Graphics Procedure Guide, 5th edition 1624 pages. Published by SAS Institute, Cary NC
- SAS Institute, 2013. SAS 9.4 Output Delivery System User’s Guide, Third Edition. 1129 pages. Published by SAS Institute, Cary NC
- SAS Institute Inc. 2015. SAS® 9.4 ODS Graphics Designer: User's Guide, Third Edition. Cary, NC: SAS Institute Inc.
- SAS Institute Inc. 2015. SAS® 9.4 ODS Graphics Editor: User's Guide, Fourth Edition. Cary, NC: SAS Institute Inc

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