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Where's the LISTING Window: Using the New Results Viewer in SAS® 9.3

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ABSTRACT

Are you making the transition from earlier versions of SAS to SAS 9.3? Did you wonder what happened to the LISTING window? Do you like the new cumulative HTML file, but wish you could figure out how to get a different behavior for selected pieces of output?

This paper outlines several techniques for adjusting the behavior of the SAS windowing environment Results Viewer using SAS 9.3. Along the way, you will also see examples of the new Output Delivery System (ODS)-related options that allow you to establish destination and style defaults in your configuration file. By the time this presentation is over, you will understand how to work with the new Results Viewer behavior. Several job aids are provided that outline the alternatives.

INTRODUCTION

SAS 9.3 has two behaviors that are different from previous versions. This might cause existing SAS programmers some adjustment challenges. In addition, the behavior could cause new SAS programmers some confusion if they look at papers or books that talk about creating LISTING output. Remember the old commercial with the tag line, "Where's the beef?" I call the new behavior, "Where's the LISTING window?" or "How Do You Work with the Results Viewer in SAS 9.3?" After a quick explanation of the LISTING window and how it worked in SAS 9.2 an overview of four possible methods of working with the Results Viewer are outlined. Each method starts from a specific preferences setting and walks you through some usage scenarios.

WHAT IS THE LISTING WINDOW

The SAS Output window, also known as the LISTING window, or LISTING destination has been an integral part of working with SAS since the first version was released for the Windows operating system. Even before Windows, in mainframe days, LISTING output (also lovingly called SYSPRINT or SYSOUT output) was, initially, the only way of delivering the printable results from SAS programs. This original "monospace" font LISTING output is very plain and even, some say, old-fashioned looking. In SAS version 7, SAS moved beyond the LISTING look and feel with the introduction of the ODS capability for directing SAS result output to different file types meant to be opened by rendering applications other than SAS (such as a Web browser, a word processing program, or Adobe Acrobat Reader). By default, before SAS 9.3, the LISTING window was always on and collecting output. However, ODS had options to control turning the LISTING destination on or off because LISTING destination output is frequently turned off when other ODS result files are created.

Even though many of us in the SAS community grew up on the LISTING look and feel, many of our newer customers and students turned off the LISTING window immediately using the **Tools → Options → Preferences → Results** choices, and they turned on the automatic creation of HTML results. Other folks, who did not like the LISTING look and feel or did not want LISTING output or want the automatic file creation, used the ODS "sandwich" technique in order to take full control of their output.

The LISTING destination or LISTING window was very good as a learning tool, because output could be generated, viewed, and checked. The LOG and LISTING window could then be emptied or cleared over and over again, without any confusion or mix up about the current output results versus earlier results. Then, when prettier output was required, programmers learned how to use ODS to direct their procedure output to other destinations and file folders.

By comparison, one of the benefits of using SAS® Enterprise Guide is that the output is automatically generated as SASReport XML, which translated very well to HTML form, when viewed inside Enterprise Guide. Also, regular HTML, RTF, and PDF files (as well as ASCII text files) can be generated using point-and-click methods from the Enterprise Guide interface. However, the Enterprise Guide interface uses a project and task paradigm for the collection of results and has its own interface for setting result defaults and its own methods for managing results in a project. A discussion of SAS Enterprise Guide and result collection falls outside the scope of this document.

HOW THINGS WORKED IN SAS 9.2

Let us step back for a minute and talk about the SAS 9.2 (and SAS 9.1.3) behavior for generating output. In these earlier versions of SAS, the LISTING destination was turned on by default, which meant that a cumulative ASCII text file was collected and displayed in the Output window. In this mode of working, when you first submitted code, with the LISTING destination turned on, LISTING results were displayed in the Output window. Also, the Results

Where's the Listing Window?, continued

Navigation pane showed icons, which could be clicked in order to navigate directly to the results in the Output window, as shown in Figure 1. These icons were displayed in the order in which they had been created since the beginning of the session (unless they were deleted or cleared).

In Figure 1, you can see that a PROC PRINT has been submitted, followed by a PROC FREQ, and all the icons in the Results Navigation pane use the LISTING icon of a sheet of paper.

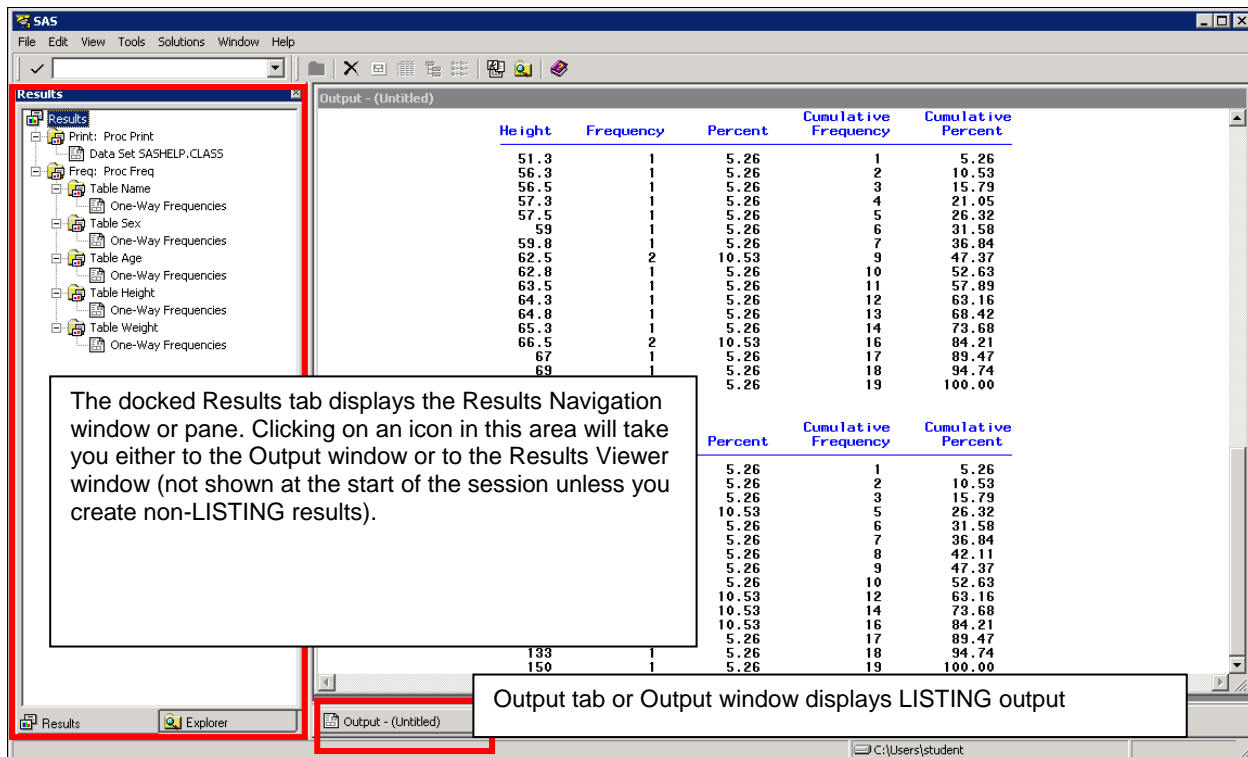


Figure 1. SAS 9.2 Results Viewer and Output Icons

In SAS 9.1.3 or SAS 9.2, you navigated to **Tools** → **Options** → **Preferences** → **Results**, to turn on the creation of automatic HTML results, as shown in Figure 2,.

Where's the Listing Window?, continued

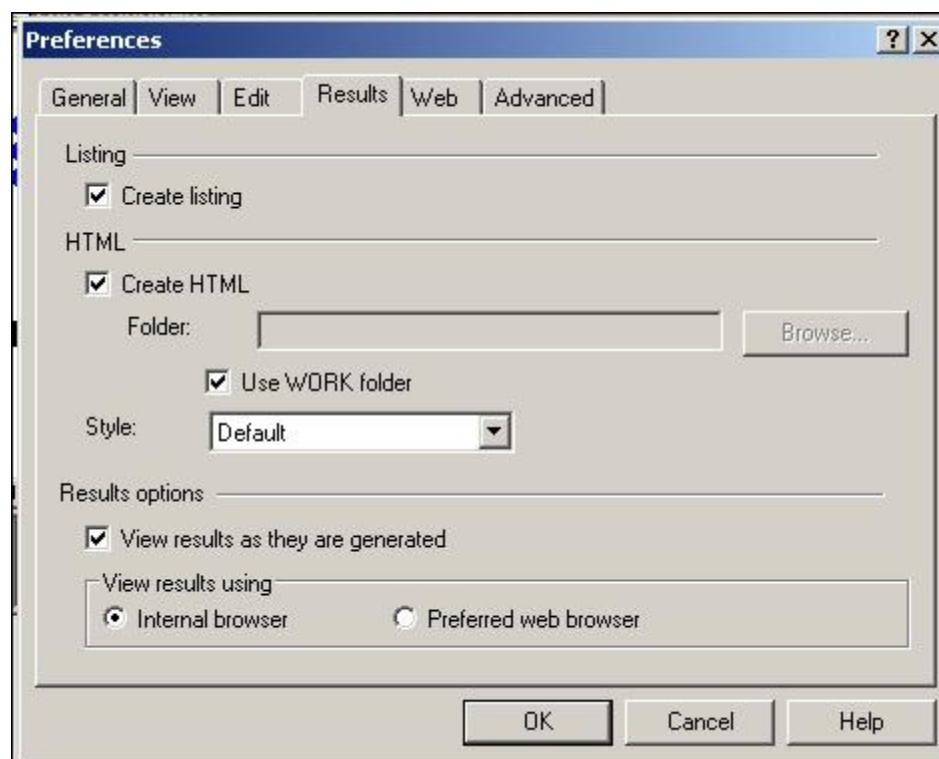


Figure 2. Preferences Dialog Box for Changing Defaults

The ODS HTML destination was turned on, in addition to the LISTING destination (since both boxes are checked). Every procedure then had its own separate HTML file named SASHTML1.HTM, SASHTML2.HTM, SASHTML3.HTM, and so on. If the WORK location choice was turned on, then you would see output in the WORK library, as shown in Figure 3. (A SAS 9.2 installation on a Windows XP machine.)

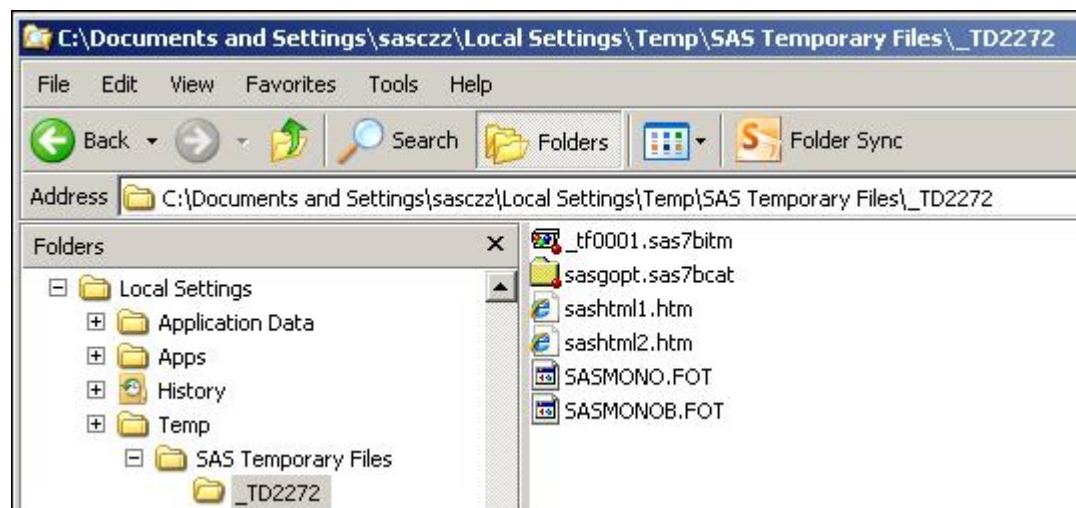


Figure 3. SAS Temporary Work Location

In the SAS Display Manager session (SAS 9.1.3 or SAS 9.2), with the LISTING destination on and the HTML destination on, the LISTING output would be viewed in the Output window (as shown previously), and the HTML output would be viewed in the Results Viewer window, as shown in Figure 4.

Where's the Listing Window?, continued

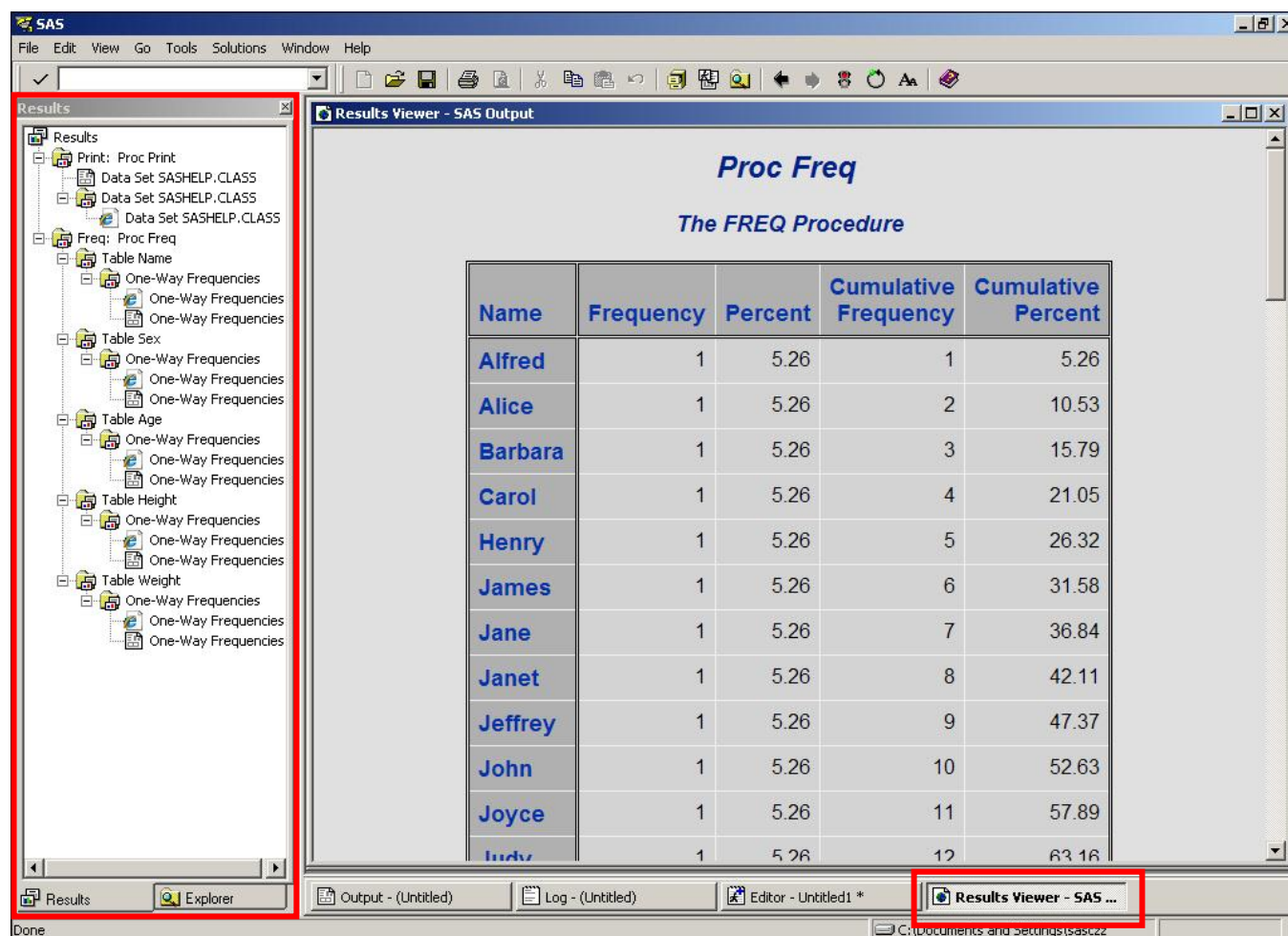


Figure 4. LISTING and HTML Results Displayed in SAS 9.2

A frequently overlooked feature of ODS was that you could turn a destination on with some simple syntax, and the destination would stay open until you explicitly closed it. This simple statement is as follows:

```
ods html;
```

When this statement was submitted it turned on the automatic creation of a numbered HTML file until you closed the open destination with the appropriate ODS CLOSE statement.

It was possible in earlier versions of SAS to use this simple ODS HTML technique, in which the HTML destination could be automatically opened for the collection of results. An automatic filename would be assigned to the output results and the results would be written to the students' current working directory. In earlier versions of SAS, every procedure output went to a numbered file: SASHTML1.HTM, SASHTML2.HTM, and so on. Customers who did not want this automatic file creation, file location, and naming scenario used the ODS "sandwich" technique in order to take control of their output.

This method changed for the better with SAS 9.3.

HOW THINGS WORK IN SAS 9.3

By default, when you first open an interactive SAS session, the previous defaults have changed. Not only is the HTMLBLUE style used by default for HTML output, the LISTING window is initially turned off. In addition, although not the topic of this paper, automatic ODS GRAPHICS creation is turned on. Also, the HTML destination is initially turned on for the cumulative collection of all of your output.

When you first open SAS 9.3, you will see the pop-up window shown in Figure 5.

Where's the Listing Window?, continued

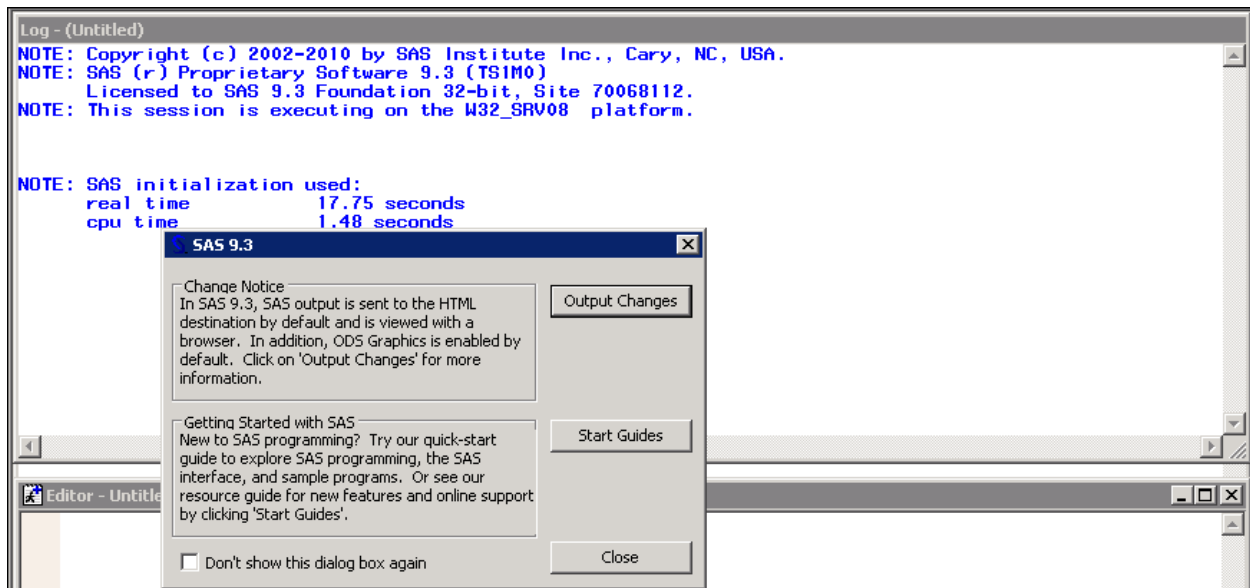


Figure 5. SAS 9.3 Popup Window

Select the **Output Changes** button to read more information about the new SAS 9.3 behavior for ODS results. The method that you can use to view the defaults for your SAS session (or change the defaults, is to navigate to **Tools** → **Options** → **Preferences** and then select the **Results** tab, as shown in Figure 6.

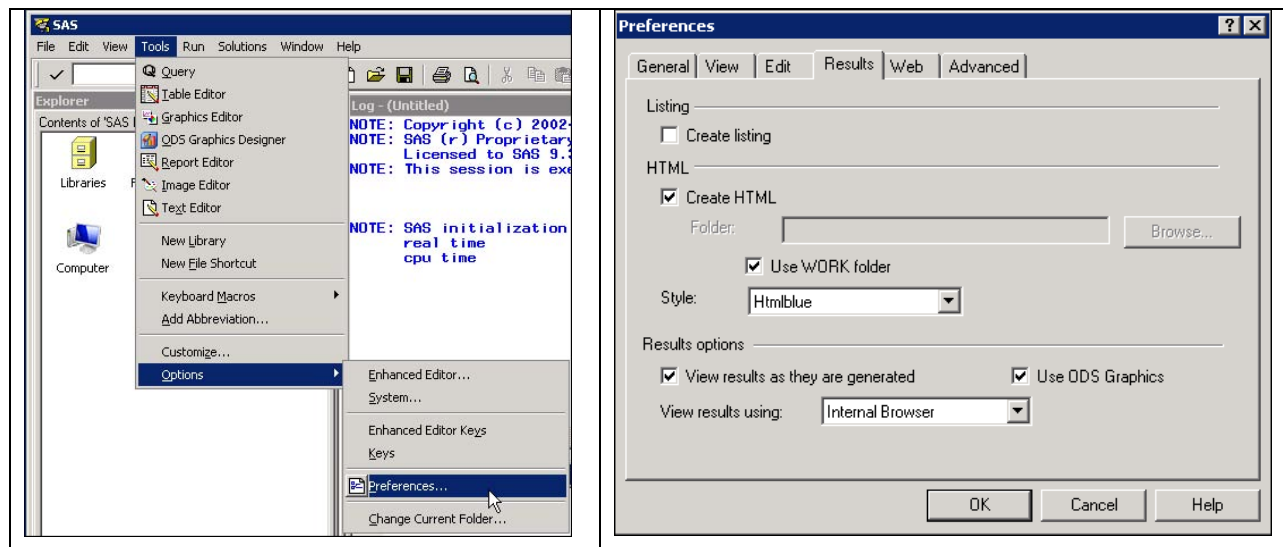


Figure 6. SAS 9.3 Default Results Settings

Unless the default state of your session has been changed by your system administrator, you should see the selections shown in Figure 6. Note that the LISTING choice is turned off by default. Notice also, that the default location of your automatically created HTML file is the WORK location. To determine this physical location, go to the SAS Explorer Window and right-click on the **WORK** library and select **Properties**, to see the Properties Window for the WORK library, as shown in Figure 7.

Where's the Listing Window?, continued

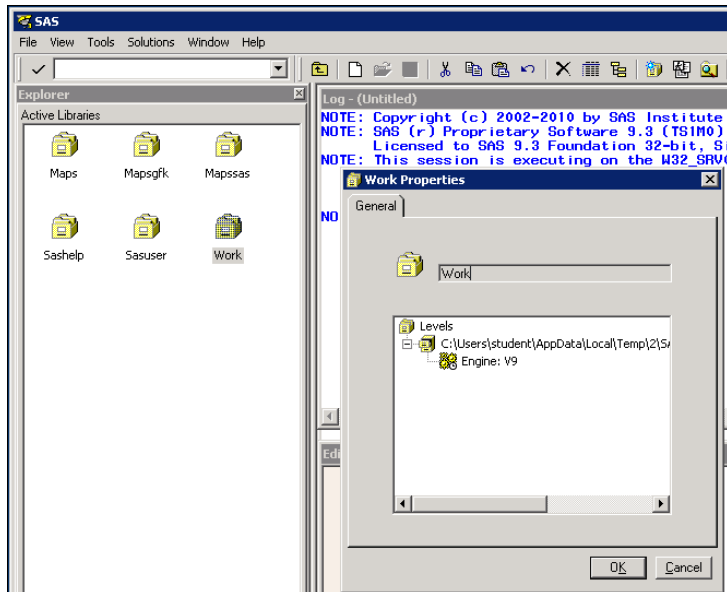


Figure 7. Discover the Location of the Default Work Library

In Figure 8, you will see a decision tree that outlines your four main choice paths for generating output in SAS 9.3. Of course, more combinations are possible. For example, you could choose to selectively turn the automatic collection of procedure output on and off by constantly going back and forth to the **Tools** → **Options** → **Preferences** → **Results** window and changing the automatic output creation check box or changing the folder location. This method would quickly become burdensome and hard to document and would not be considered a “best practice.” Screen captures of each of these choices, with a discussion of the pros and cons of each method will follow on subsequent pages. The first choice discussed will be how to work with the new default behavior of SAS® Display Manager in SAS 9.3.

Where's the Listing Window?, continued

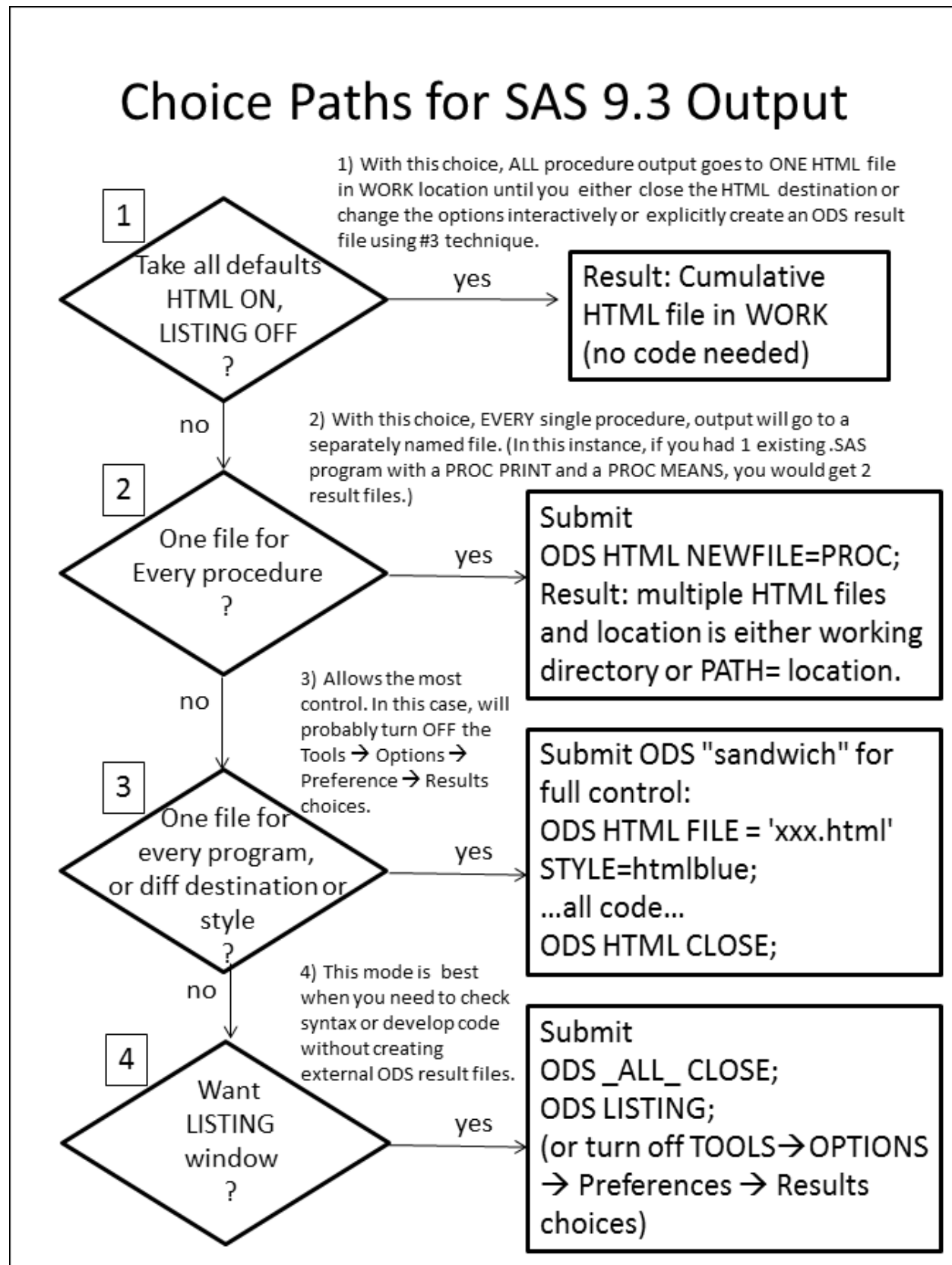


Figure 8. Four Possible Choices

Where's the Listing Window?, continued

CHOICE 1:

Assume that your system administrator has not changed any of the SAS defaults. You type a PROC PRINT directly into the Enhanced Editor and hit the SUBMIT button. The echo of this submission is shown in the SAS log, in Figure 9.

```
4  proc print data=sashelp.class(obs=5);
NOTE: Writing HTML Body file: sashtml.htm
5  Title 'Proc Print';
6  run;
```

Figure 9. First PROC PRINT

You will see in the log (Figure 10) that the generated HTML file is called SASHTML.HTM and you will find it in the WORK folder. (It has a size of 34 KB. If you type a different program, the output size will vary.)

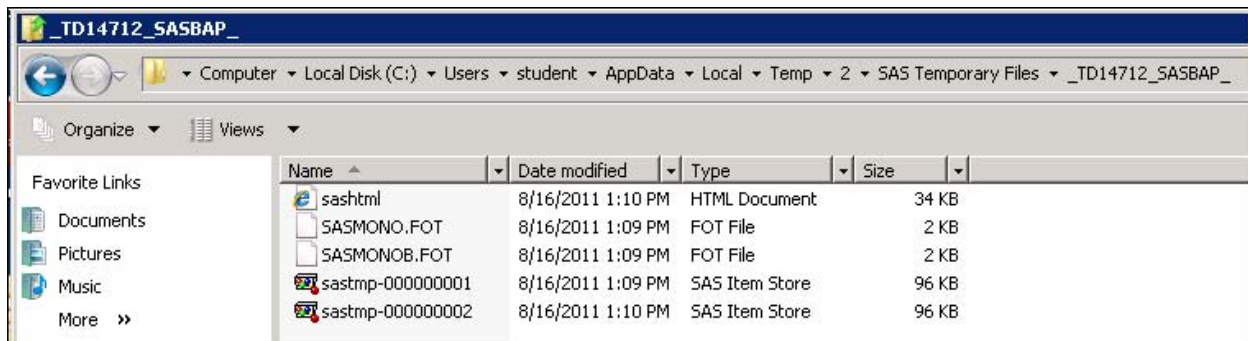


Figure 10. Reviewing Output File Size

Following this submission, what if you next type and submit a PROC FREQ step? The PROC FREQ step, as shown in Figure 11, will generate frequency counts for every variable in SASHELP.CLASS.

```
7  proc freq data=sashelp.class;
8  Title 'Proc Freq';
9  run;
```

Figure 11. PROC FREQ Step in SAS Log

There is no file creation message in the log because the output has been added to the ODS HTML file that was initially opened when SAS started up. Remember that the name of this file was SASHTML.HTM. Also, after the PROC FREQ step, if you compare the new file size to the previous file size, you will see that the SASHTML file has increased in size and the Date modified field has a different time value from the original run, as shown in Figure 12.

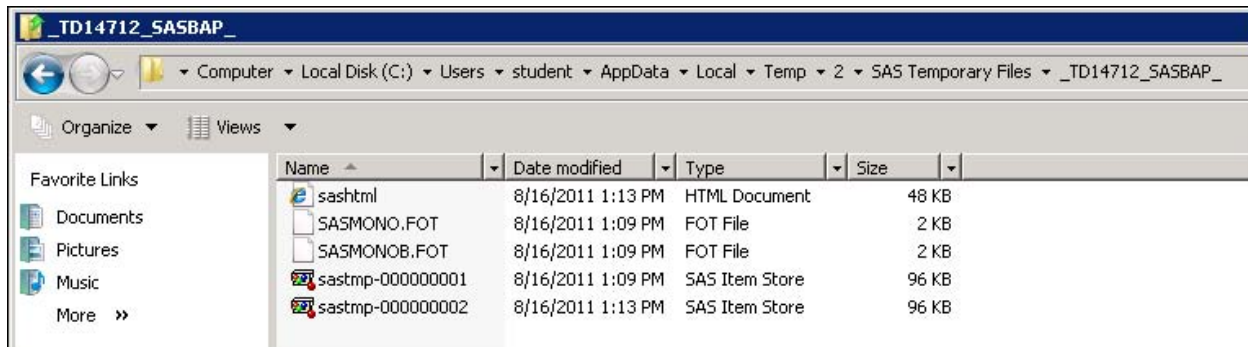


Figure 12. File Size after PROC FREQ

Where's the Listing Window?, continued

If you look in the SAS Results Viewer tab, you will see that the PROC FREQ output follows the PROC PRINT output and that all the icons are browser icons, as shown in Figure 13.

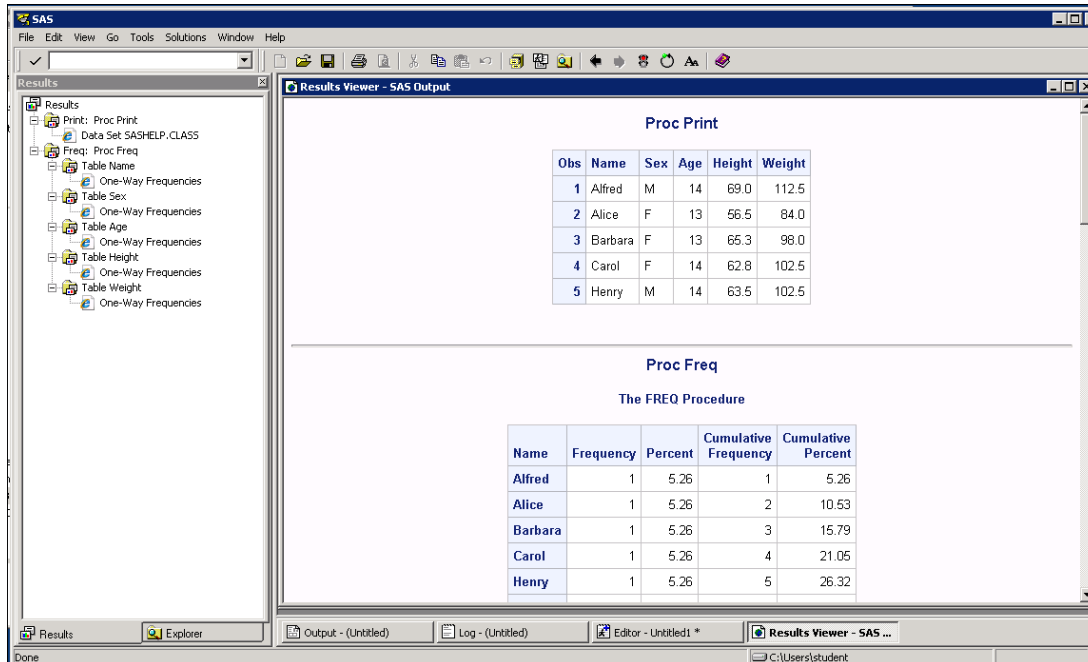
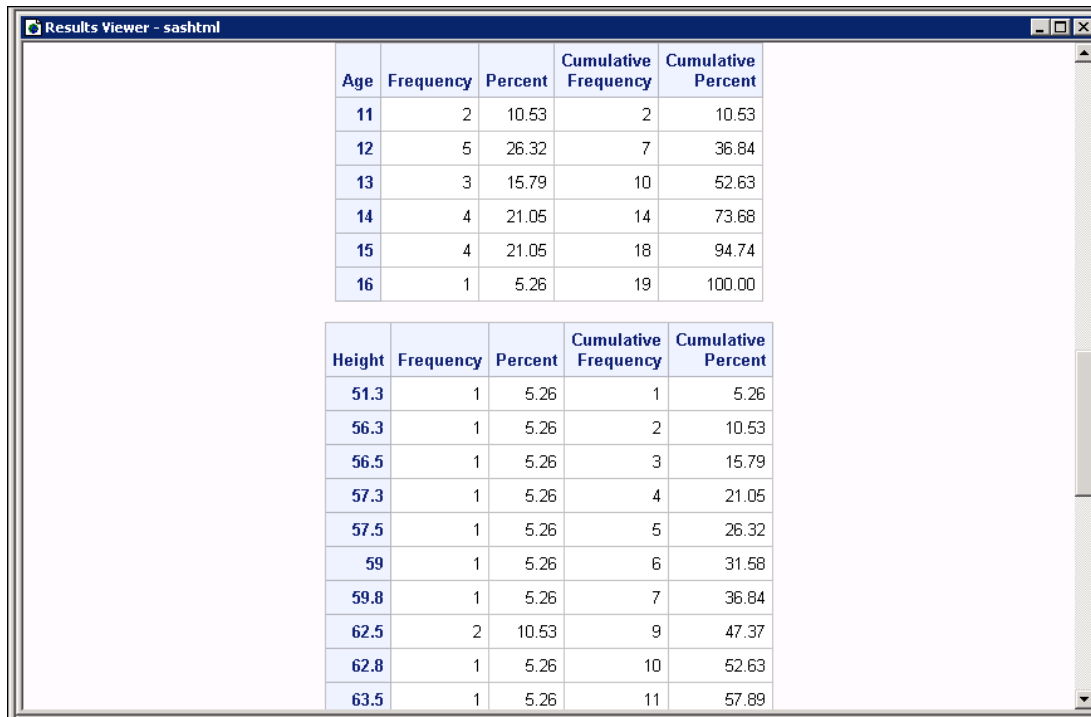


Figure 13. Results Viewer Output Shows HTMLBLUE Style

The new HTMLBLUE style is used, by default, for output creation (based on a choice in the initial **Tools** → **Options** → **Preferences** → **Results** tab). As expected, there are no LISTING icons in the Results Navigation pane. If you click on the Output tab (which displays the LISTING output), at this point, the Output window would be empty.

Where's the Listing Window?, continued

If you double-click on an output icon in the Result Navigation pane on the left (such as double-clicking on the icon for the One-Way Frequencies table for Age), you will be taken directly to the top of that output in the Results Viewer window, as shown in Figure 14.

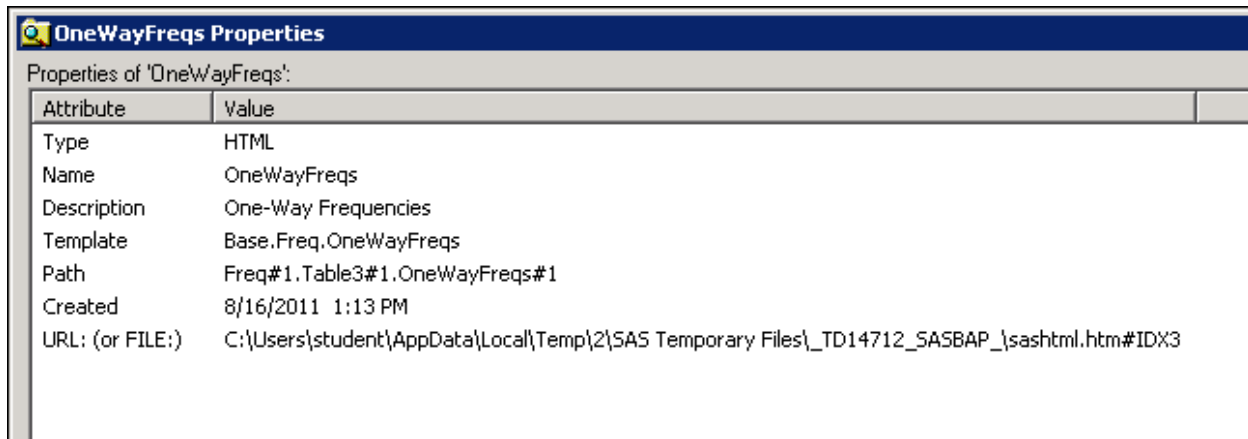


| Age | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|-----|-----------|---------|----------------------|--------------------|
| 11 | 2 | 10.53 | 2 | 10.53 |
| 12 | 5 | 26.32 | 7 | 36.84 |
| 13 | 3 | 15.79 | 10 | 52.63 |
| 14 | 4 | 21.05 | 14 | 73.68 |
| 15 | 4 | 21.05 | 18 | 94.74 |
| 16 | 1 | 5.26 | 19 | 100.00 |

| Height | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|--------|-----------|---------|----------------------|--------------------|
| 51.3 | 1 | 5.26 | 1 | 5.26 |
| 56.3 | 1 | 5.26 | 2 | 10.53 |
| 56.5 | 1 | 5.26 | 3 | 15.79 |
| 57.3 | 1 | 5.26 | 4 | 21.05 |
| 57.5 | 1 | 5.26 | 5 | 26.32 |
| 59 | 1 | 5.26 | 6 | 31.58 |
| 59.8 | 1 | 5.26 | 7 | 36.84 |
| 62.5 | 2 | 10.53 | 9 | 47.37 |
| 62.8 | 1 | 5.26 | 10 | 52.63 |
| 63.5 | 1 | 5.26 | 11 | 57.89 |

Figure 14. Navigation to Frequency Table for AGE Variable

If you highlight the icon for the Age table output in the Result Navigation pane and select **Properties**, you will see the full location of the output, including the HTML anchor name for this AGE result node (Figure 15).



| OneWayFreqs Properties | |
|------------------------------|---|
| Properties of 'OneWayFreqs': | |
| Attribute | Value |
| Type | HTML |
| Name | OneWayFreqs |
| Description | One-Way Frequencies |
| Template | Base.Freq.OneWayFreqs |
| Path | Freq#1.Table3#1.OneWayFreqs#1 |
| Created | 8/16/2011 1:13 PM |
| URL: (or FILE:) | C:\Users\student\AppData\Local\Temp\2\SAS Temporary Files_TD14712_SASBAP_\sashtml.htm#IDX3 |

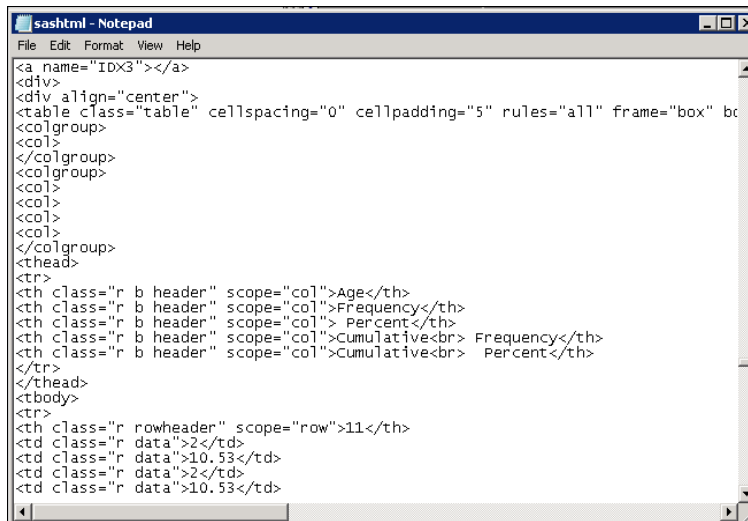
Figure 15. Properties of OneWayFreqs Output Object

This node in the Result Navigation pane is a pointer to a named section in the physical HTML file. This is an important fact to remember when you want to clear icons from the Results Navigation pane. You will be clearing only these "pointers." You will not be deleting or clearing the output from the HTML file itself because once the pointer has been created and the output added to the cumulative HTML file, it is not possible to go back and delete sections from the HTML file.

If you look "inside" the HTML file with Notepad, as shown in Figure 16, you will see the following anchor tag

Where's the Listing Window?, continued

`` preceding the section for AGE.



```

<a name="IDX3"></a>
<div>
<div align="center">
<table class="table" cellspacing="0" cellpadding="5" rules="all" frame="box" border="1">
<colgroup>
<col>
</colgroup>
<colgroup>
<col>
<col>
<col>
</colgroup>
<thead>
<tr>
<th class="r b header" scope="col">Age</th>
<th class="r b header" scope="col">Frequency</th>
<th class="r b header" scope="col">Percent</th>
<th class="r b header" scope="col">Cumulative<br> Frequency</th>
<th class="r b header" scope="col">Cumulative<br> Percent</th>
</tr>
</thead>
<tbody>
<tr>
<th class="r rowheader" scope="row">11</th>
<td class="r data">2</td>
<td class="r data">10.53</td>
<td class="r data">2</td>
<td class="r data">10.53</td>

```

Figure 16. Look Inside the Cumulative HTML File

ODS builds these named anchor tags automatically, based on the code you submitted. What you see in the Results Viewer window is the actual HTML file output. What you see in the Results Navigation pane are the pointers that ODS created when you submitted your code.

What if you want to see the automatic ODS GRAPHICS image creation? Assuming that ODS GRAPHICS is turned on (the default state in SAS 9.3), a PROC REG program, as shown in Figure 17, will produce both tabular and graphical output.

```

10  proc reg data=sashelp.class;
11      model age=height;
12      title 'Proc Reg';
13  run;

14  quit;

NOTE: PROCEDURE REG used (Total process time):
      real time           40.52 seconds
      cpu time            1.20 seconds

```

Figure 17. PROC REG Submission in Log

Notice that the Result Navigation pane, shown in Figure 18, when expanded, now contains icons for all the PROC REG output, and the Results Viewer window is positioned at the bottom of the REG output (Fit Plot for Age).

Where's the Listing Window?, continued

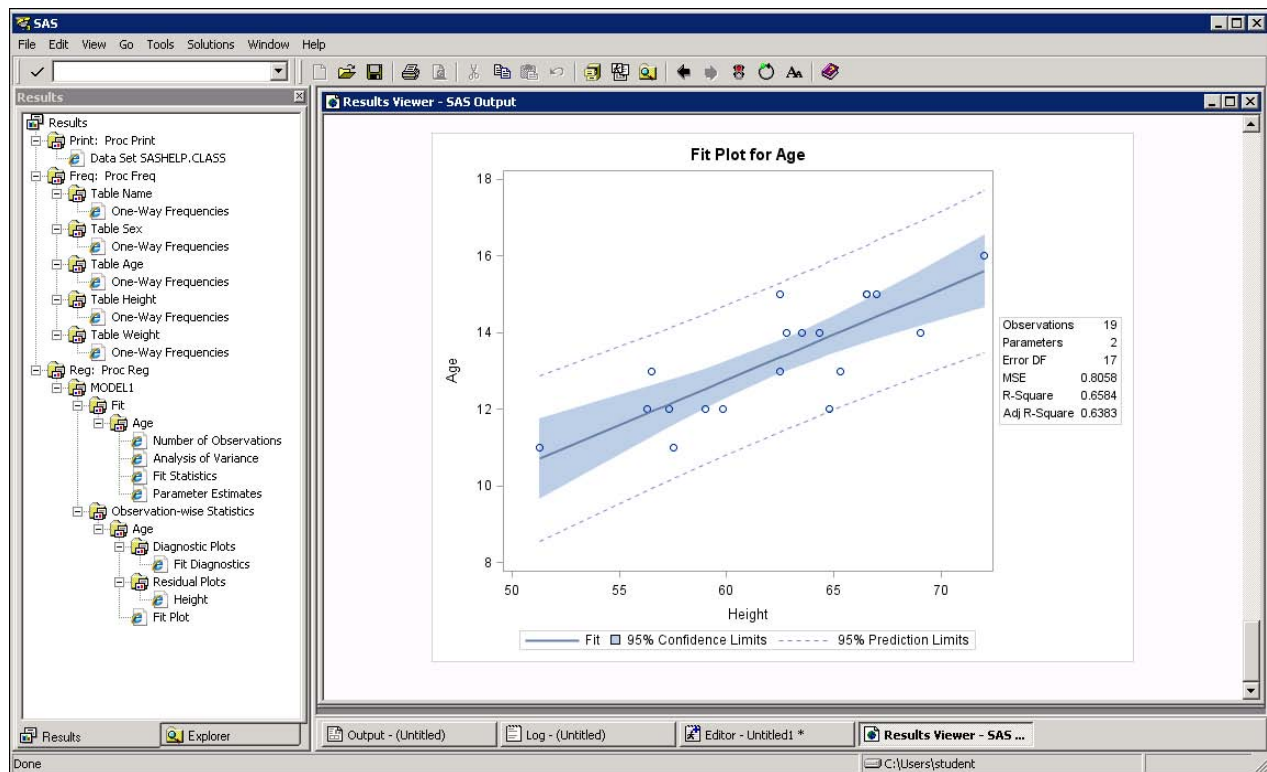


Figure 18. Results Viewer Output Shows PROC REG Output

Because ODS GRAPHICS was turned on by default, the automatic graphs produced by PROC REG are generated and displayed. Examining the WORK folder (Figure 19), shows that the SASHTML file is still accumulating output, and that the PNG files created by ODS GRAPHICS have also been stored in the WORK location.

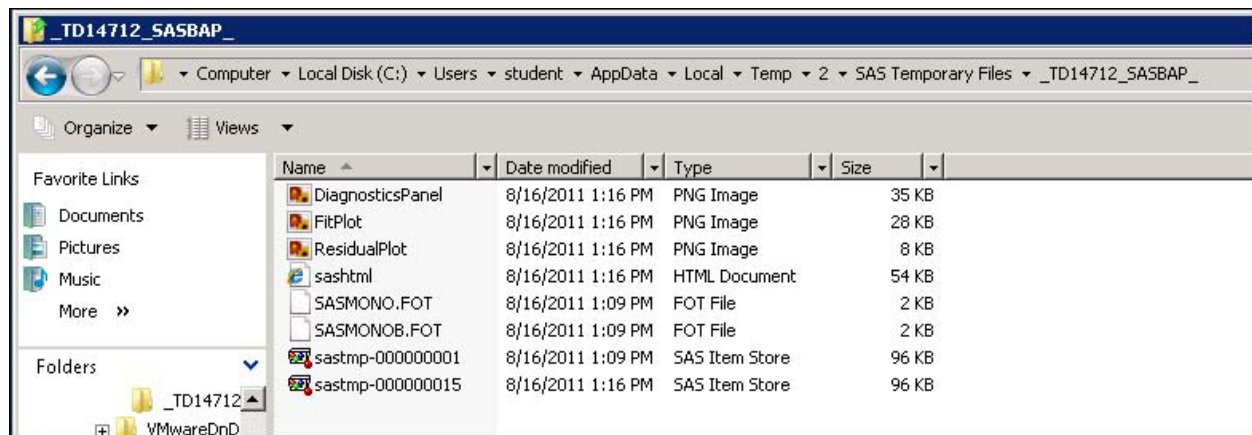


Figure 19. Directory Location with PNG Files from ODS GRAPHICS

The advantage of this approach is that you have a record of everything you have done in the session so far. This is good, especially for beginners, because all your output from an entire session is collected in one place. All the output that you generated has gone to the WORK library, so this means that you are not accumulating output in your permanent folders. In addition, tabular output and graphical output will both use the new HTMLBLUE style by default, so you can test in this mode. When you have output that you want to save permanently, you can use the "full control" method of saving ODS output by using the ODS "sandwich" technique to specify the name and location of your output file. (See Choice 3 for a description of this "full control" technique.)

Where's the Listing Window?, continued

After the PROC REG step, the Result Navigation pane shows the output from the three previously submitted procedure steps. The next scenario switches gears to submit an existing PROC REPORT step that generates PDF output. Figure 20 shows a PROC REPORT program (either typed or opened directly into the Enhanced Editor window).

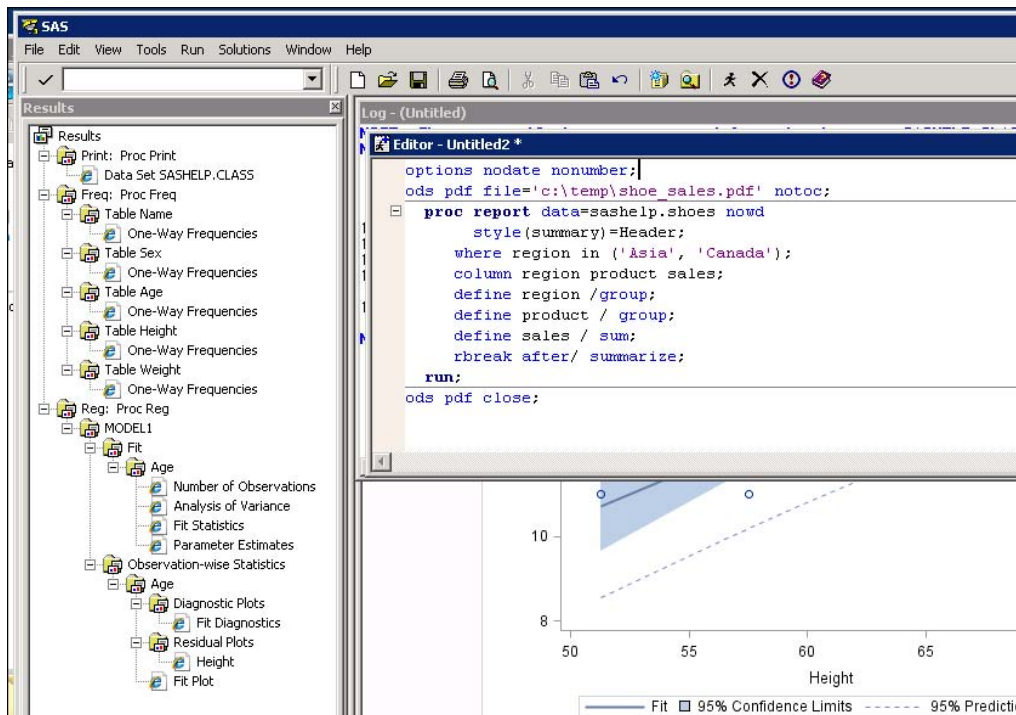


Figure 20. PROC REPORT Program with ODS PDF Statements

After running the code, if you look in the Results Navigation pane (in Figure 21) you can see an icon for a PDF result file (as expected). However, there is also an HTML icon for the output. The PROC REPORT program has sent output to the cumulative HTML file as well. This is because the automatic ODS HTML destination was open, based on the check box in the **Tools** → **Options** → **Preferences** → **Results** tab.

Where's the Listing Window?, continued

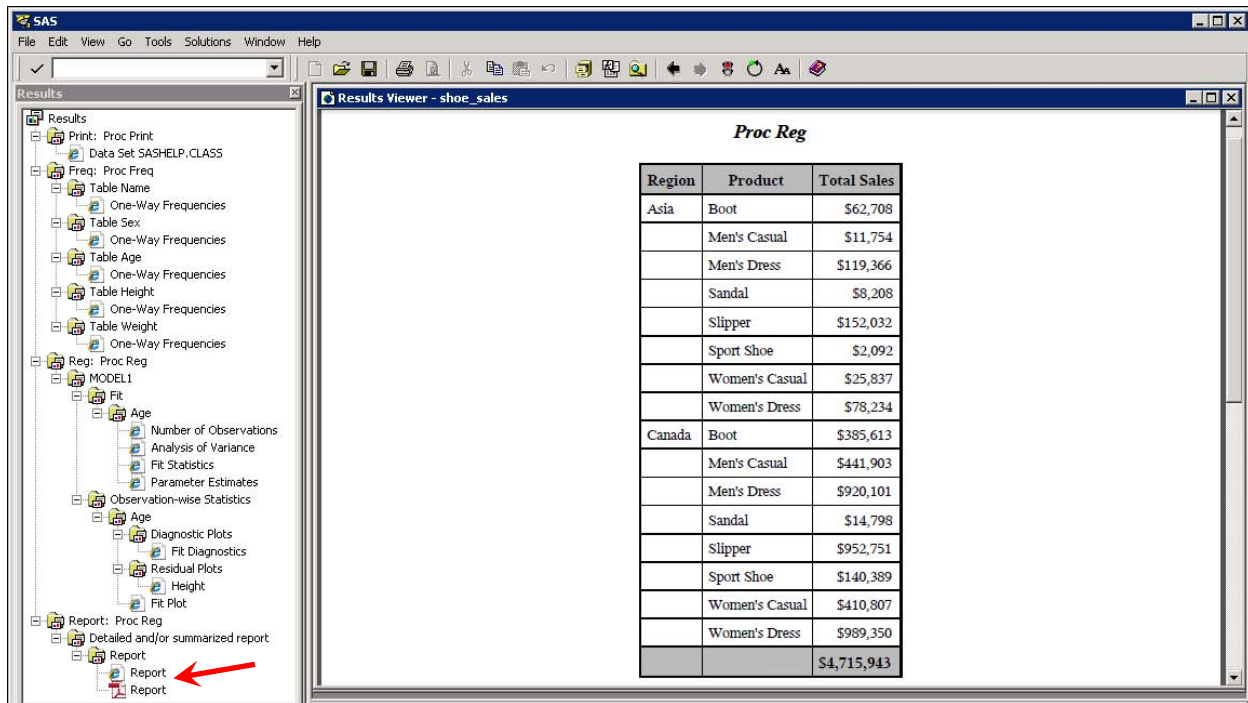


Figure 21. Two Icons (HTML and PDF) in the Results Pane

The Results Viewer window opens the PDF file automatically, but if you click on the HTML icon, you will see that the HTML file has the PROC REPORT output as well (Figure 22).

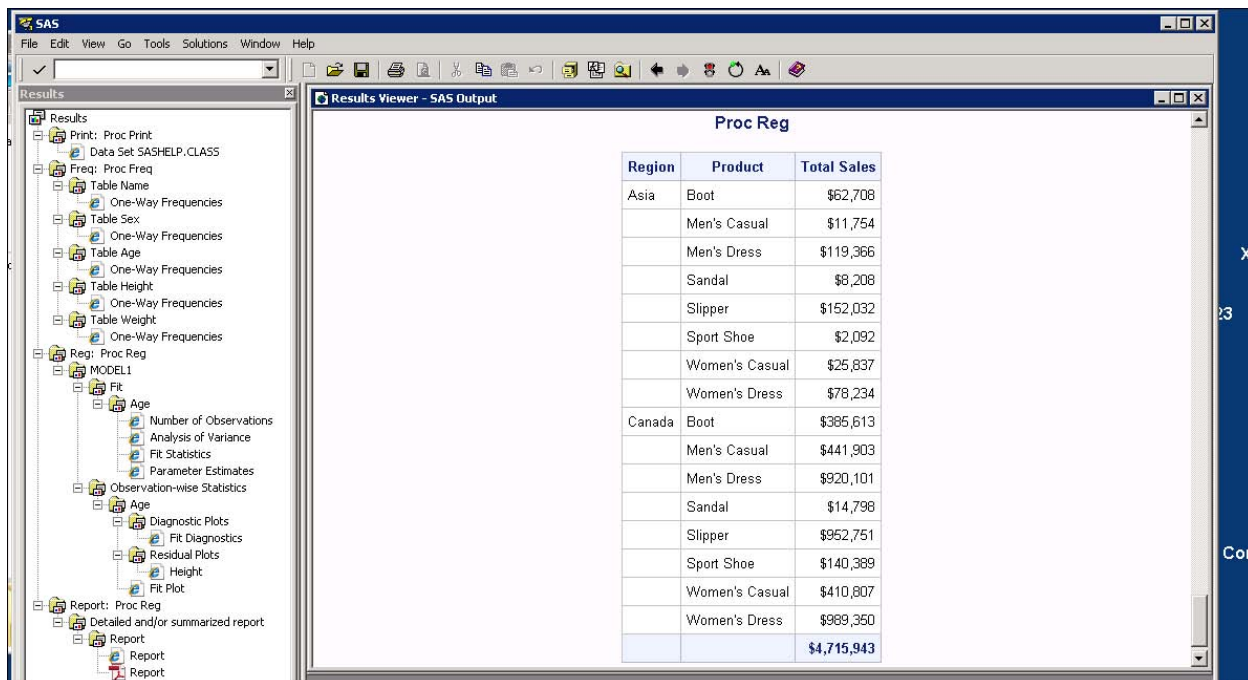


Figure 22. HTML Output for PROC REPORT

There was not a TITLE statement in the PROC REPORT code. Therefore, you want to perform the following actions

Where's the Listing Window?, continued

:

- 1) Change the TITLE in the REPORT code.
- 2) Clear some items out of the Results Navigation pane to make it easier to navigate directly to the PROC REPORT PDF icon after you resubmit the code.

If you right-click an individual icon (such as the PROC PRINT icon), you will not be able to delete just one item.

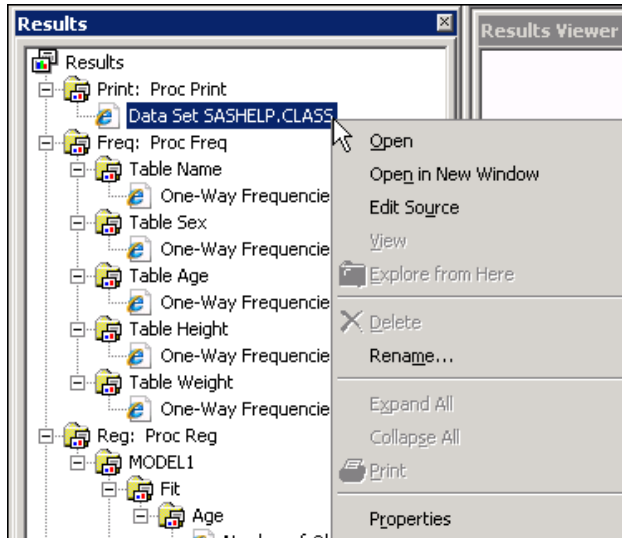


Figure 23. DELETE Option Grayed Out

The Delete option will be grayed out (Figure 23). This is the nature of HTML. As long as SAS is holding the SASHTML.HTM file open, the file itself cannot be deleted, nor can individual sections in the file be deleted. However, you can right-click **Results** at the top of the Results Navigation pane and delete all of the HTML anchors or pointers that are currently showing in the Results Navigation pane, as shown in Figure 24.

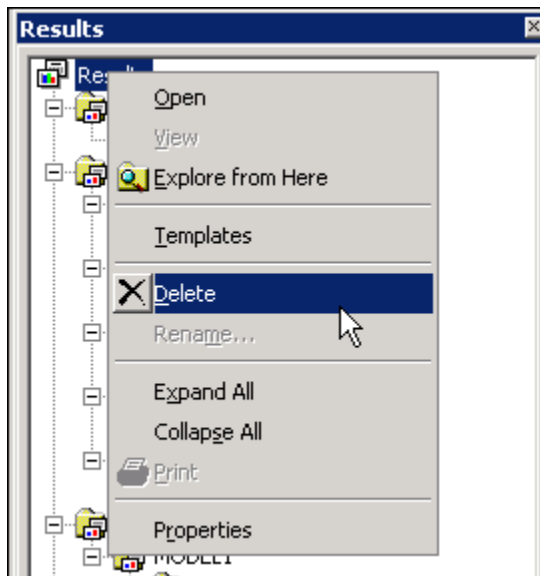


Figure 24. Delete Pointers to Output from Results Pane

It is important to remember that this deletion is only deleting the pointers to the open HTML result file. The file itself still remains in your WORK location, at this point.

Where's the Listing Window?, continued

After deleting the pointers from the navigation pane, the pane is cleared out. However, the SASHTML.HTM file still remains in the WORK folder, as shown in Figure 25.

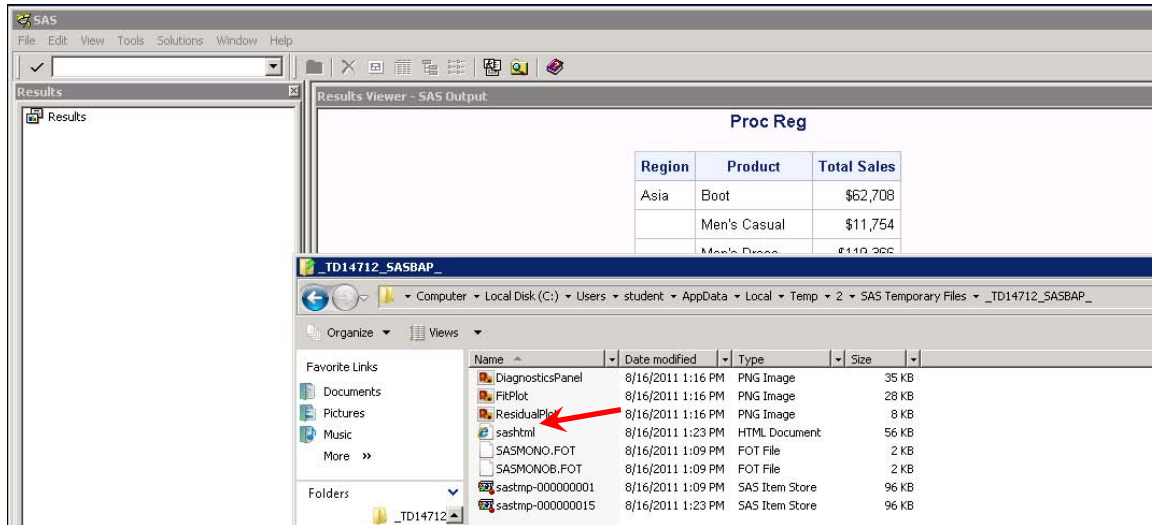


Figure 25. Physical File Still Exists

If you go back to the editor, add a TITLE statement to the PROC REPORT code and resubmit the program. You will then see the new PDF file with the new title in the Results Viewer Window and in the Results Navigation pane. You will also see a PDF icon and an HTML icon (Figure 26).

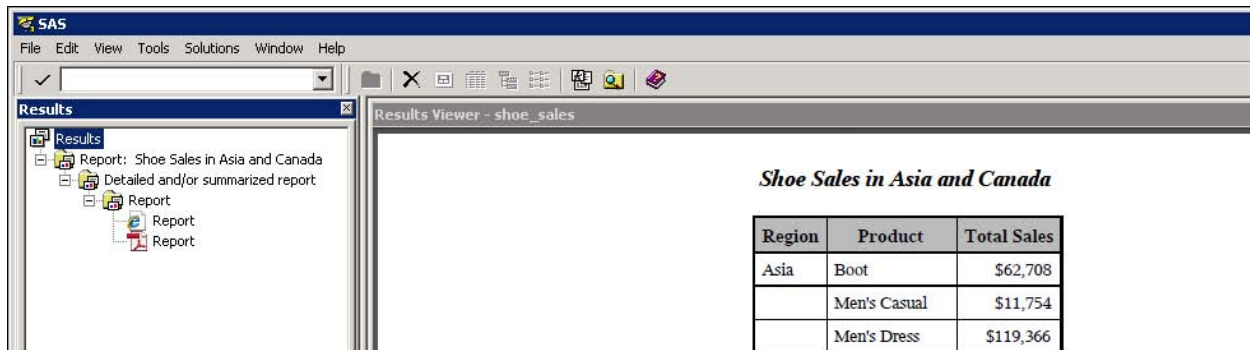


Figure 26. Results Pane and Results Viewer After Changing Title

Where's the Listing Window?, continued

If you click on the HTML icon, you will see that the new HTML output, with the title, as well as all the accumulated output from previous program steps are still visible in the Results Viewer window, as shown in Figure 27.

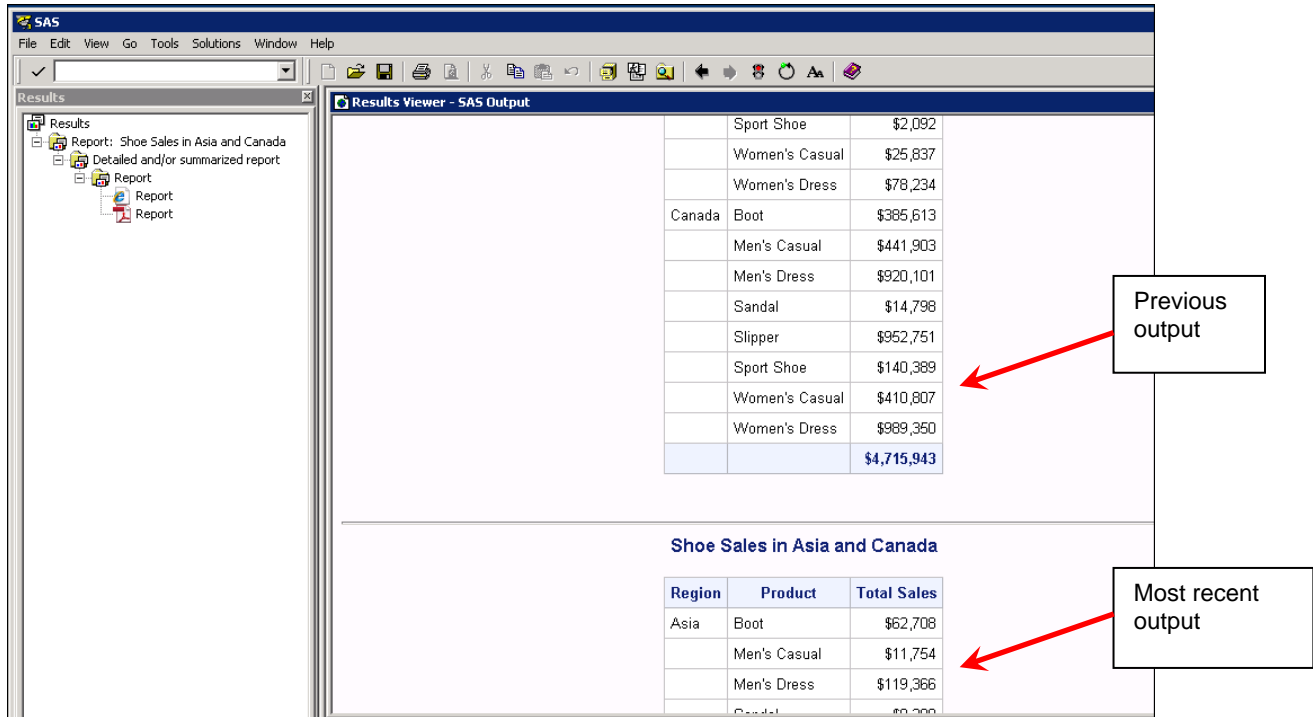


Figure 27. Results Viewer Output Shows HTMLBLUE Style

This shows the cumulative nature of the automatic HTML file generation. Since your WORK location is a session-specific location and only exists for the duration of your session, once you close SAS, all the files in the WORK location would be gone. Only the PDF file, which was created in the C:\temp directory, would remain.

You can use the **Tools** → **Options** → **Preferences** → **Results** tab (shown in Figure 28) to select a different operating system folder location for the cumulative HTML file. However, once you make that choice, it becomes your responsibility to delete the output files from your chosen location.

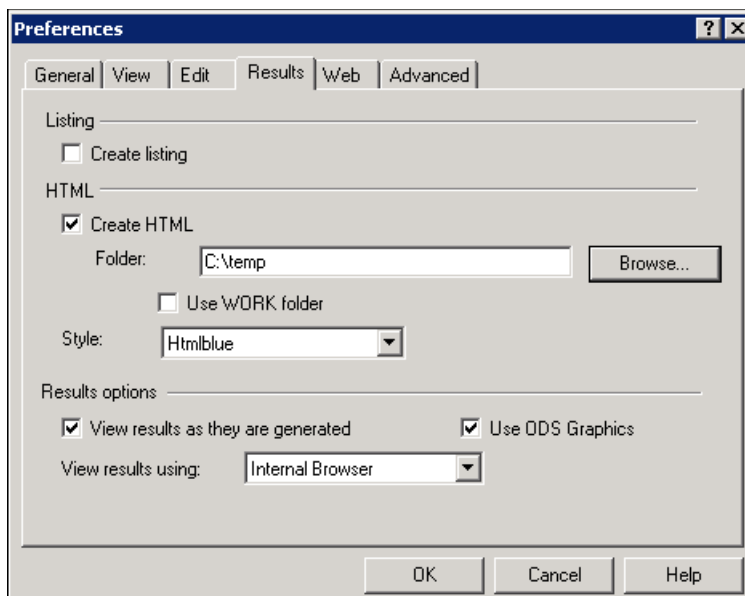


Figure 28. Changing Preferences for Results

Where's the Listing Window?, continued

If you submit existing code that has ODS statements, you can close the automatically generated HTML file. For example, this program (shown in Figure 29) sends output to ODS RTF and ODS PDF destinations.

```

my_program_code *
options nodate nonumber;
ods rtf file='c:\temp\forWord.rtf' startpage=no;
ods pdf file='c:\temp\forReader.pdf' startpage=no notoc;

proc freq data=sashelp.class;
  tables age;
  title 'Proc Freq';
run;

proc means data=sashelp.class;
  class age;
  var height weight;
  title 'Proc Means';
run;

ods _all_ close;
ods listing;
title;

```

Figure 29. Code with ODS _ALL_ CLOSE Statement

Notice the ODS _ALL_ CLOSE statement at the bottom of the code, followed by ODS LISTING. These statements close all the open destinations, including the automatic ODS HTML destination, and reopen the LISTING destination.

Therefore, if you then submit a simple PROC FREQ program in a new editor window, the Results Navigation pane will show only the LISTING icon, and the Output Window shows the FREQ tabular output (without any style). The reason for this is that the ODS _ALL_ CLOSE statement closed the automatic HTML file (Figure 30).

After ODS _ALL_ CLOSE;

| Products | | | | |
|--------------------|-----------|---------|----------------------|--------------------|
| The FREQ Procedure | | | | |
| Product | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
| Boot | 52 | 13.16 | 52 | 13.16 |
| Men's Casual | 45 | 11.39 | 97 | 24.56 |
| Men's Dress | 50 | 12.66 | 147 | 37.22 |
| Sandal | 49 | 12.41 | 196 | 49.62 |
| Slipper | 52 | 13.16 | 248 | 62.78 |
| Sport Shoe | 51 | 12.91 | 299 | 75.70 |
| Women's Casual | 45 | 11.39 | 344 | 87.09 |
| Women's Dress | 51 | 12.91 | 395 | 100.00 |

Figure 30. Results Viewer Output after ODS _ALL_ CLOSE Statement Shows LISTING Only

To reopen the cumulative ODS HTML destination using code, instead of the Tools Window (in order to resume automatic collection of output, using the default naming conventions), you can add a simple statement to your code:

```

ods html;
proc freq data=sashelp.shoes;

```

Where's the Listing Window?, continued

```
title 'Products';
table product;
run;
```

What you see after you submit your code is that the Results Navigation pane now shows an HTML icon (and a LISTING icon, because the LISTING destination was still open). Instead of being in the WORK library, the default location for the newly created HTML file is C:\Users\student\sashtml1.htm#IDX, as shown in Figure 31. This happens because once the WORK location is closed, ODS does not know that you want to go back to collecting output in the WORK library. Therefore, it defaults to the working directory that is set as a session default when you start-up SAS. In addition, since ODS had already created a file named SASHTML.HTM, the new file name is incremented by 1, named SASHTML1.HTML and stored in the new location.

Many times, new users are confused about the difference between the WORK temporary location and the current working directory. The WORK library location is usually used to access and store SAS data sets that you refer to with an explicit two-level name, such as WORK.MYDATA or with a one-level name, such as MYDATA (which implies the WORK location). Your current working directory, on the other hand, is the default location where ODS output would be written and the default location where program files would be saved (shown in Figures 31 and 35). This location is set by your system administrator in a configuration file that is used every time SAS starts up. You can change this location, in a variety of ways, but most users stick with the default set by their system administrator.

The screenshot shows the SAS interface with the Results Navigation pane on the left, the Results Viewer - SAS Output window in the center, and the OneWayFreqs Properties dialog box open at the bottom. The dialog box shows the URL as C:\Users\student\sashtml1.htm#IDX, which is highlighted by a red arrow and a callout box stating "Not WORK library".

Products
The FREQ Procedure

| Product | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|----------------|-----------|---------|----------------------|--------------------|
| Boot | 52 | 13.16 | 52 | 13.16 |
| Men's Casual | 45 | 11.39 | 97 | 24.56 |
| Men's Dress | 50 | 12.66 | 147 | 37.22 |
| Sandal | 49 | 12.41 | 196 | 49.62 |
| Slipper | 52 | 13.16 | 248 | 62.78 |
| Sport Shoe | 51 | 12.91 | 299 | 75.70 |
| Women's Casual | 45 | 11.39 | 344 | 87.09 |

OneWayFreqs Properties
Properties of 'OneWayFreqs':

| Attribute | Value |
|-----------------|---|
| Type | HTML |
| Name | OneWayFreqs |
| Description | One-Way Frequencies |
| Template | Base.Freq.OneWayFreqs |
| Path | Freq#3.Table1#1.OneWayFreqs#1.OneWayFreqs#2 |
| Created | 8/16/2011 2:55 PM |
| URL: (or FILE:) | C:\Users\student\sashtml1.htm#IDX |

Figure 31. Physical Location of Output after Reopening the HTML Destination

Of course, it is entirely possible to redirect the HTML output of your session back to the WORK library. However, you either have to close and open SAS again, issue an ODS PREFERENCES; command to send output back to the Preferences Window, or use a bit of SAS Macro %SYSFUNC code magic to make it happen:

```
ods _all_ close;
ods html path="%sysfunc(pathname(WORK))";
```

The ODS _ALL_ CLOSE statement will close all the open destinations at this point, both HTML and LISTING. The ODS HTML statement then sets the physical storage location of output explicitly using the PATH= option. Using %SYSFUNC allows you to invoke the PATHNAME function to make sure that the current session's WORK location is

Where's the Listing Window?, continued

used to store your ODS HTML result files. After submitting the above code (as shown in Figure 32), you see that the ODS HTML destination has been reopened with a new automatically created name. The Properties window for the FREQ output icon also shows that the HTML output is again in the WORK library.

The screenshot shows the SAS Results Viewer window. The top pane displays the output of the FREQ procedure, including a table of products and their frequencies. The bottom pane shows the log of the session, which includes the code used to run the FREQ procedure and the resulting output. A callout box points to the URL in the Properties window, indicating that the output is in the WORK library.

Products

The FREQ Procedure

| Product | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---------|-----------|---------|----------------------|--------------------|
| ... | ... | ... | ... | ... |

Log - (Untitled)

```

85 ods _all_ close;
86 ods html path="%sysfunc(pathname(WORK))";
NOTE: Writing HTML Body file: sashtml2.htm
87 proc freq data=sashelp.shoes;
88   title 'Products';
89   table product;
90 run;

NOTE: There were 395 observations read from the data set SASHELP.SHOES.
NOTE: PROCEDURE FREQ used (Total process time):
      real time           0.06 seconds
      cpu time            0.01 seconds
  
```

OneWayFreqs Properties

Properties of 'OneWayFreqs':

| Attribute | Value |
|-----------------|---|
| Type | HTML |
| Name | OneWayFreqs |
| Description | One-Way Frequencies |
| Template | Base.Freq.OneWayFreqs |
| Path | Freq#5.Table1#1.OneWayFreqs#1 |
| Created | 8/16/2011 3:16 PM |
| URL: (or FILE:) | C:\Users\student\AppData\Local\Temp\2\SAS Temporary Files_TD14712_SASBAP_\sashtml2.htm#IDX |

Back to WORK library!

Figure 32. Physical Location of Output After Using %SYSFUNC

This set of usage scenarios has stepped you through just one possible session, starting with the default state of the Results tab, based on your Preferences settings. As you can see, there is a lot of flexibility in how you use SAS to submit code and gather your output.

CHOICE 1 PROS AND CONS

The advantages of the automatic cumulative HTML file are numerous: you have an automatic record of everything you do within one session. All the output, graphics, and tabular is collected in one location. As long as you do not close your SAS session, the HTML file continues to collect your output. And, if your code or procedures uses ODS GRAPHICS, then the tabular and graphic output will all use the new HTMLBLUE style. Minimal to no code is needed to generate good looking output.

There are a few disadvantages to this technique, as well. Since the HTML file is cumulative, you cannot print just one piece of output or one set of procedure results without closing the HTML file and reopening it in a different location. Since you have only pointers in the Results Navigation pane, you can delete the pointers, but you cannot (easily) "empty out" the cumulative HTML file. If you submit existing code that uses ODS _ALL_ CLOSE; or otherwise closes the open HTML destination, then you terminate the automatic creation of the HTML file in the WORK library location. If you use minimal code (without a FILE= option), to reopen the HTML destination, the output goes to your current working directory folder.

Of course, there are more ways to control the ODS HTML file that you create. What if you like the automatic file creation with the minimal code approach, and, you like the output in the WORK library, and you like the automatic naming convention, but do not like the cumulative nature of the HTML file. What then? Read on to Choice 2.

CHOICE 2:

While the automatic cumulative file has advantages, you might want to create a separate HTML file for every procedure you run. This would make it possible for you to print or e-mail a single result to someone for review. Using the NEWFILE= option, it is possible to create a new or fresh HTML file for every procedure step that you submit. For example, PROC SORT does not generate report output, so PROC SORT would not create a new HTML file; however, a PROC PRINT step followed by a PROC FREQ step followed by a PROC REG step can generate 3

Where's the Listing Window?, continued

automatic HTML files with minimal code.

First, log off from your previous SAS session to close all the open destinations and delete the created WORK library files. Then, start SAS again in a new session and verify that the **Tools** → **Options** → **Preferences** → **Results** tab choices are set, as shown in Figure 33.

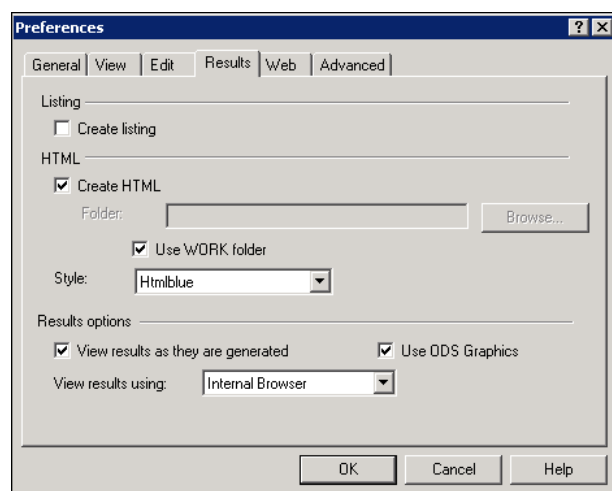


Figure 33. Verify Results Preferences

Next, before you submit any other code, submit the following code in an Enhanced Editor window. Using NEWFILE=PROC will impact the open ODS HTML destination:

```
ods html newfile=proc;
```

The NEWFILE=PROC option instructs ODS to create a new results file for every procedure step in your code. If you open an existing program, such as **first_job.sas** shown in Figure 34, you will note that the program contains three separate procedure steps and that there are no other ODS statements in the program code.

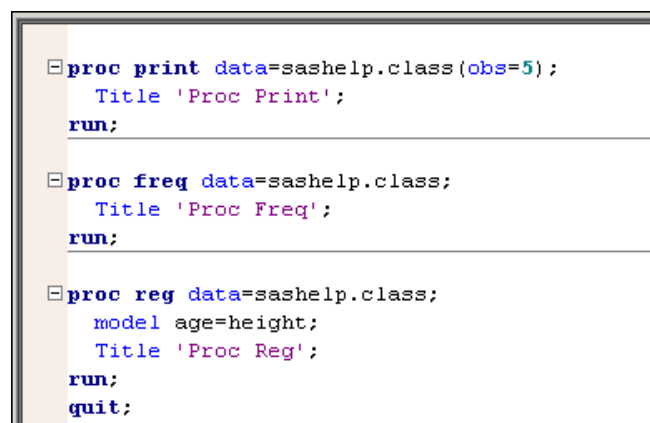


Figure 34. Program FIRST_JOB.SAS Opened in the Enhanced Editor

After this code is submitted, these are the SAS log messages:

Where's the Listing Window?, continued

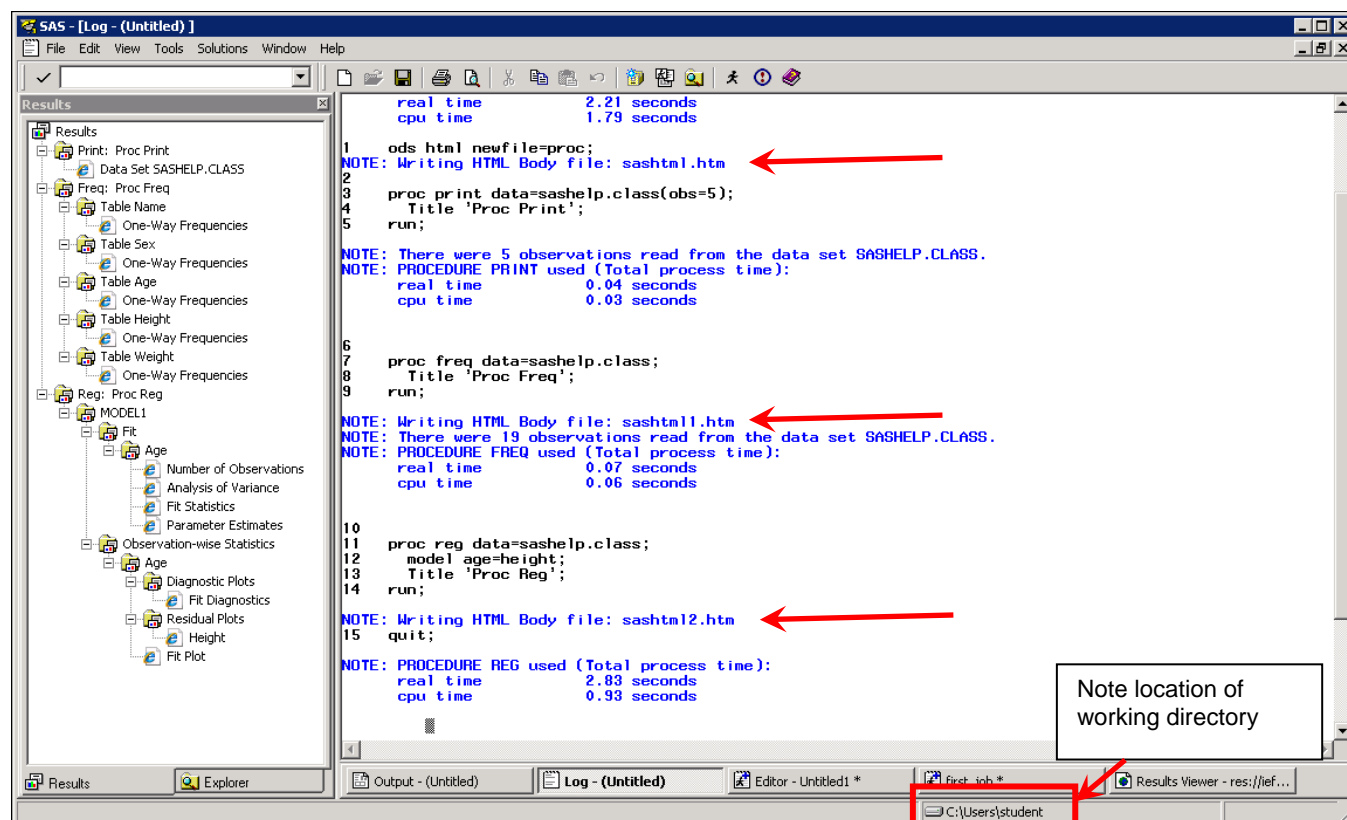


Figure 35. SAS Log Window After Code Submission

Issuing the first ODS HTML statement caused SAS to open the SASHTML.HTM file in the new session. Then, the PROC PRINT output went to that open file. This destination file was then closed when the PROC FREQ was encountered. The PROC FREQ output went to the file SASHTML1.HTM and then the PROC REG output went to the file SASHTML2.HTM file. However, if you look in the WORK location for this session, the three result files are not in the SAS WORK library. Where did the result files go? If you look in the current working directory for the session (C:\Users\student, as shown in the status bar in Figure 35), you will find the three output files (also shown in Figure 36).

The output files were stored in this location because the ODS HTML statement with the NEWFILE= option changed the directory folder location of the result files to a location other than that of the WORK library. Figure 36 compares the contents of the WORK library location for this session with the contents of the current working directory folder.

Where's the Listing Window?, continued

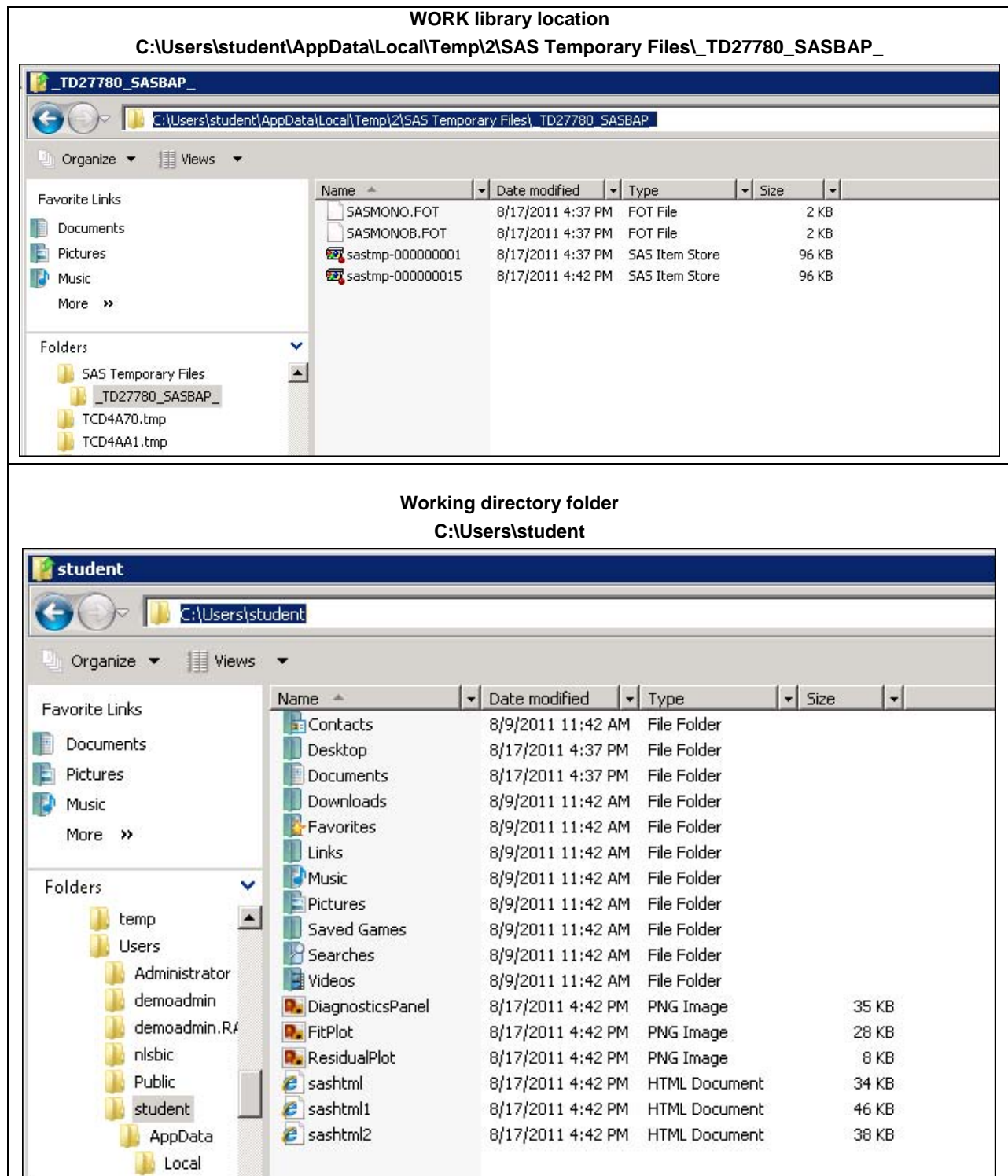


Figure 36. Compare WORK Location with Current Working Directory Location

Therefore, while this minimal code technique, with NEWFILE=PROC, does allow you to generate a new result file for every procedure step, you need to decide whether you want the result files to be in your current working directory folder (such as C:\Users\student) or in your WORK library location (such as

Where's the Listing Window?, continued

C:\Users\student\AppData\Local\Temp\2\SAS Temporary Files_TD27780_SASBAP_).

You can continue to send output to the current working directory (and clean this folder occasionally). Another options is to navigate to **Tools → Options → Change Current Folder** and change your current working directory folder (or have your SAS administrator change the working directory location in your SAS configuration file). If you change your folder, you do not need to make any further code changes.

You can also change the ODS HTML PATH to go to another folder location (and clean this folder occasionally):

```
ods html path="c:\temp\output" newfile=proc;
```

A further options is to change the ODS HTML PATH to use the WORK library, using the %SYSFUNC technique illustrated earlier:

```
ods html path="%sysfunc(pathname(WORK))" newfile=proc;
```

The difference between the above code techniques is that while both techniques will generate a new HTML file for every procedure step, the first invocation will send output to the **C:\temp\output** folder location (not to the working directory) and output will stay in this folder until the output is manually deleted or you write over output created in a previous session. The second invocation example will direct ODS HTML to create a new result file for every procedure step and the location of your output results will be in the WORK library location for that session.

Currently, there is no point-and-click method by which you can select both the WORK location for your automatically created ODS HTML file and also specify the NEWFILE=PROC option. Therefore, if you want to create automatic HTML files for every procedure and have the result files go to your WORK library, you have to use the code technique illustrated in the following program:

```
ods html path="%sysfunc(pathname(WORK))" newfile=proc;

proc print data=sashelp.class(obs=5);
  Title 'Proc Print';
run;

Proc freq data=sashelp.class;
  Title 'Proc Freq';
run;

proc reg data=sashelp.class;
  model age=height;
  Title 'Proc Reg';
run;
quit;
```

Where's the Listing Window?, continued

After running this code, you would see the icons in the SAS Results Navigation pane shown in Figure 37.

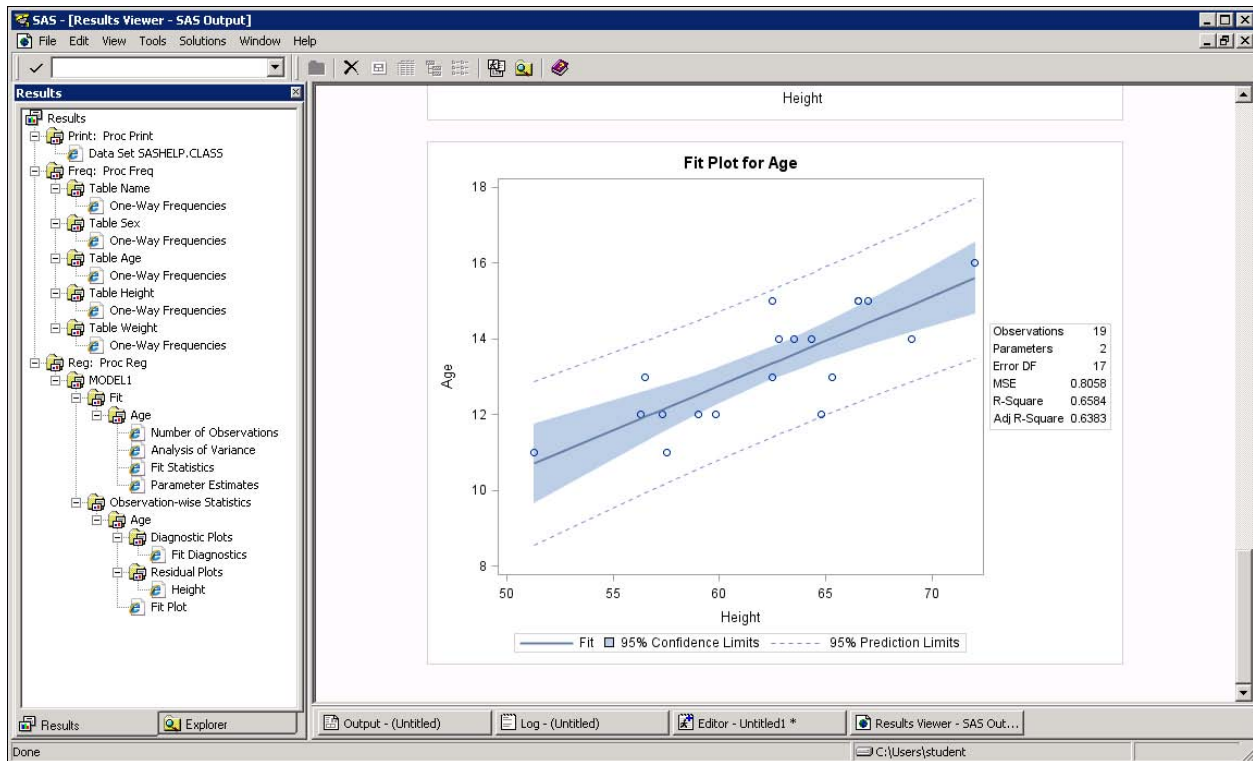
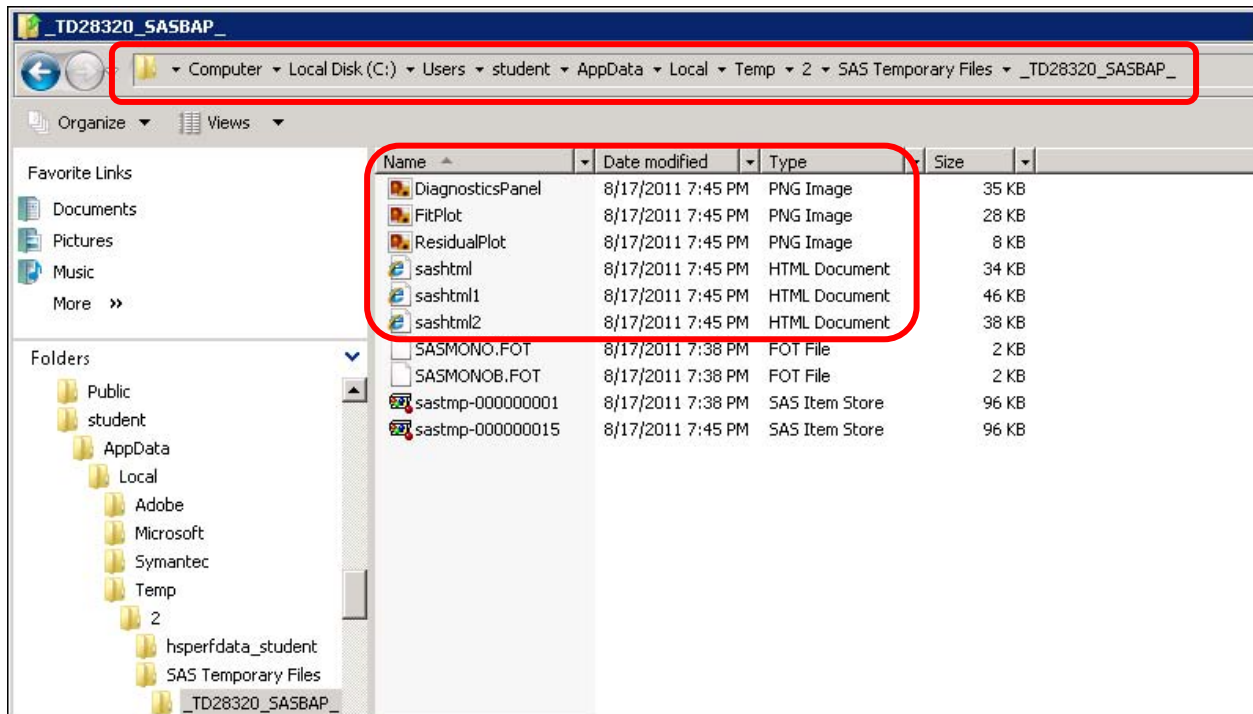


Figure 37. Results after Code Submission

If you navigate to the physical location of the WORK library, you will see the three procedure result files (and images) in the WORK folder, as shown in Figure 38.



Where's the Listing Window?, continued

Figure 38. Output Stored in WORK Temporary Location

CHOICE 2 PROS AND CONS

If you did not like the cumulative file that is automatically generated with SAS 9.3 (Choice 1), then Choice 2 provides you some of the same automatic result file generation benefits, but also affords you more control over when and how each procedure's output file is created. One of the advantages of having separate HTML files for every procedure is that you can isolate one procedure's results from previous runs of the same procedure. Since you get only one output at a time in your HTML file, there will be no confusion when you open or print the file because no previous results will be in the HTML file. If you want to print or e-mail just one procedure result file, then you easily find your single output, since the LOG shows you the name of the output file that is created for each procedure.

This approach also has disadvantages. If you choose to send the output to your current working directory folder, then you will be responsible for cleaning out the directory from previous submissions. While other values are available for the NEWFILE= option, NEWFILE=PROC is the level of granularity that most closely approximates how output was created by the **Tools** → **Options** → **Preferences** → **Results** check box method in SAS 9.1.3 and SAS 9.2. If you do use the NEWFILE=PROC approach, then you must use minimal code to turn on the option. If you want to send your result files to the WORK library location, then you must also use the PATH= option. Another disadvantage of this approach is that if you have one .SAS program that consists of three procedure steps (such as the first_job.sas program), then using this Choice 2 approach (minimal code, NEWFILE=PROC) provides no way to automatically get all three procedure outputs into one ODS HTML file. Also, if you wanted to direct output from one set of procedures to one physical directory location for archive purposes, and different output to a different physical directory for a separate report, then you have to continually issue ODS PATH statements to switch your ODS HTML destination path.

At this point, you might be thinking that having full control over your output filenames and file locations might be a useful approach. If so, read on to Choice 3.

Where's the Listing Window?, continued

CHOICE 3:

Since the beginning of the Output Delivery System, you have been able to take full control over the location of your ODS output, the filenames, and the file locations. In fact, piecing together what we have already seen, this "sandwich" technique should be fairly intuitive.

Starting with a new SAS session, there are two ways to take full control. One option is to use the point-and-click approach. You can do this by clearing the Create HTML check box on the Results tab of the Preferences window, as shown in Figure 39.

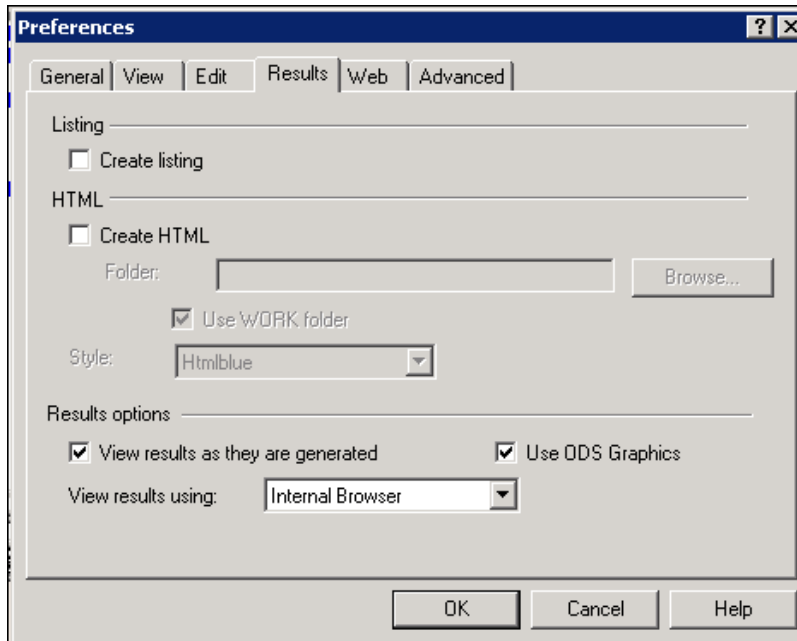


Figure 39. Results Preferences Initial Settings

The other option is to use the code approach. You can do this by submitting the following code in an AUTOEXEC file or as code submitted from the Enhanced Editor window.

```
ods _all_ close;
```

Submitting this code at the beginning of your session has the same impact as using the point-and-click approach to reset your Preferences choices. Remember that this statement also closes the LISTING destination. At this point, you need to decide which destination to open. Otherwise, you will receive the message "No output destinations active" in the SAS log when you submitted code.

Where's the Listing Window?, continued

Now that all the destinations are closed, to direct all three procedures in first_job.sas to one HTML file (or one RTF file or one PDF file), you need only to add an explicit ODS "sandwich" to the FIRST_JOB.SAS code, as shown in Figure 40.

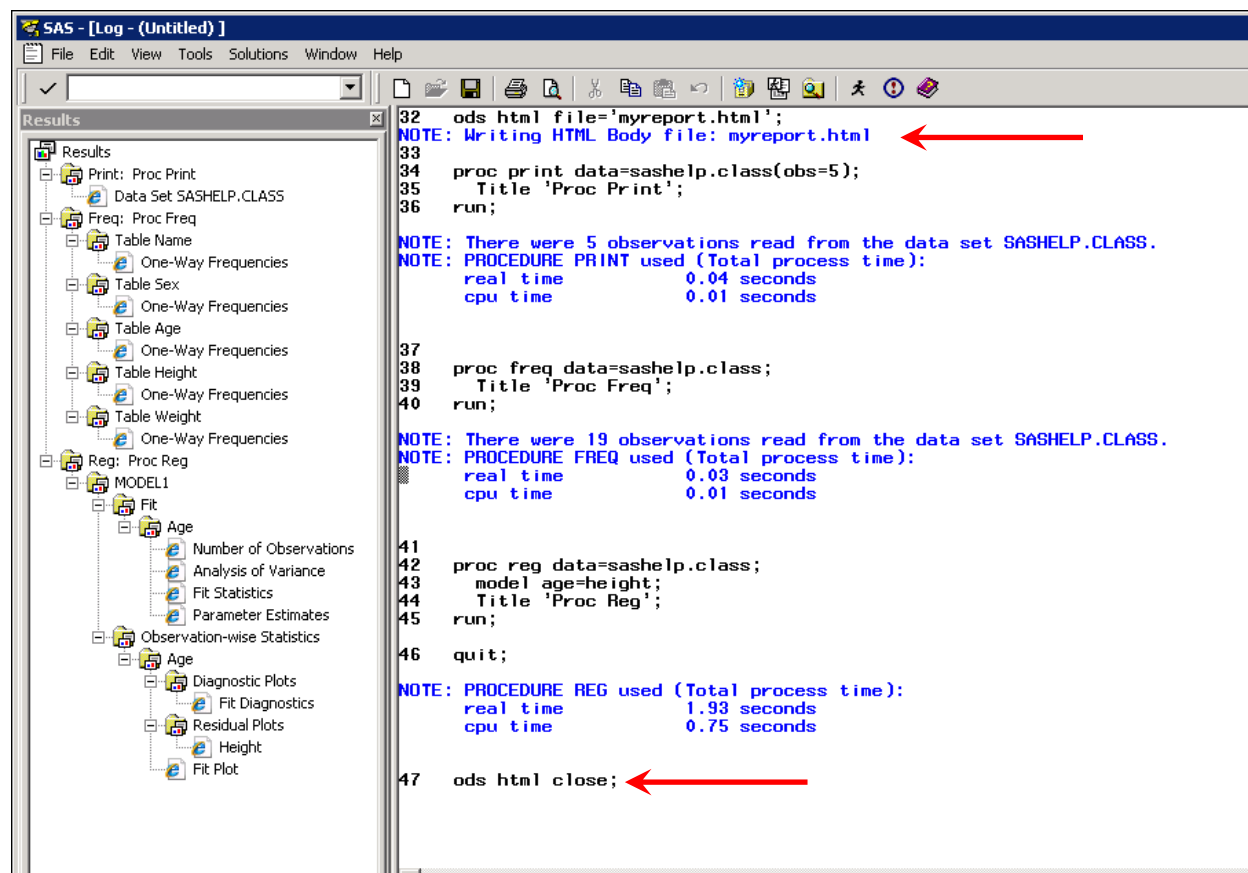


Figure 40. FIRST_JOB.SAS with Explicit ODS Statements

Without any folder location information in your code, all the output (tables and images) will be written to the current working directory. In this session, it is the same as seen previously: C:\Users\student. However, this location can be easily changed, as shown in the modified code:

```

ods html path='c:\temp\output' file='myreport.html';
ods rtf file='c:\temp\output\myreport.rtf';
ods pdf file='c:\temp\output\myreport.pdf';

... same three procedure steps as previously shown ...
ods _all_ close;

```

To save the output to the c:\temp\output folder location, use PATH= and FILE= with ODS HTML and use FILE= with a fully qualified path and filename for ODS RTF and ODS PDF. The reason you need PATH= for the ODS HTML output is that the use of PATH= ensures that, if your program code is generating images and tabular output, then the images will be in the same directory as the HTML file. As soon as you stop using the default working directory location and the automatic result collection, using PATH= will keep HTML files and images together. RTF and PDF results have the graphic images embedded inside the result file, which is why you do not have to worry about PATH= for these two destinations.

CHOICE 3 PROS AND CONS

If you are the type of person who wants to take full control of the name and the location of ODS result files, then the advantages of Choice 3 are obvious. If you turn off the **Tools** → **Options** → **Preferences** → **Results** choice to

Where's the Listing Window?, continued

create an automatic HTML file, then you will need to explicitly turn your destinations on and off using the code shown. The ODS "sandwich" technique is very straightforward, and since the output persists after your SAS session is over, you can find the most recent outputs using the name you coded, in the location you specified. Rather than getting a cumulative HTML result file or an HTML file for every procedure step, you can choose how many procedure outputs go into one ODS result file. If you work on multiple programs for different report purposes, the "full control" method allows you to document inside the program itself (using PATH= and/or FILE=) where the report output will be stored for each program's results. Another advantage of the full control technique is that if you need to use other ODS options, for one set of output, but not a different set of output, the full control method allows you to add the options you want without impacting the cumulative HTML file or subsequent code submissions.

The disadvantages of this technique are that you do have to use code and you are responsible for cleaning up the location(s) where you store your ODS result files.

What if you are developing production programs or macro programs that will be submitted in batch mode or that will be turned into stored processes? Or you are doing data maintenance, where the important processing is done in a DATA step program and you only want to use PROC FREQ or PROC PRINT or other procedures to validate the data? In this case, you might not care about the cosmetics of the output. Therefore, you might not want to use any of the three choices above. You might want to use just the LISTING destination or Output window to view your procedure results to aid in your development or data validation. If this describes how you want to work with SAS, then Choice 4 might suit you best.

CHOICE 4:

If you want to use the LISTING destination, primarily, you can still couple this method with the Choice 3 method. This means that you will have full control over ODS result file creation. Also, when you are in testing or development mode, you can direct results automatically to the LISTING destination in order to quickly check results without creating external operating system files.

To set this up, check the Create listing check box on the Results tab of the Preferences window.. Note that the Create HTML check box is unchecked (Figure 41).

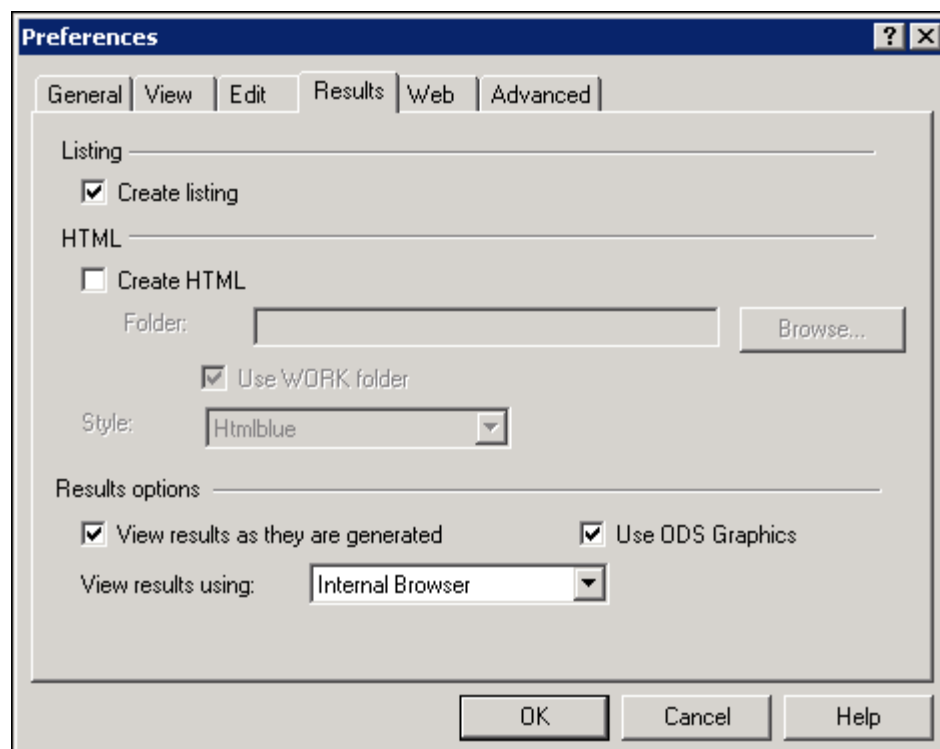


Figure 41. Results Preference Settings for Choice 4

You can decide whether you want the ODS GRAPHICS check box checked, based on whether you will be generating graphics or not. If you leave this check box checked, with the LISTING check box also checked, any tabular results

Where's the Listing Window?, continued

will go to the LISTING or Output window and any graphic results will go to an external image file (usually PNG). The LISTING output will not use the HTMLBLUE style, but the ODS GRAPHICS image will use the HTMLBLUE style. If you want your images and tabular output to use the same ODS style, then use one of the other techniques previously discussed.

The Results tab method will change your choices until reset. You can also issue code to change these choices. The code method would be:

Turn: HTML OFF, LISTING ON, ODS GRAPHICS ON

```
ods _all_ close;
ods listing;
ods graphics on;
```

Turn: HTML OFF, LISTING ON, ODS GRAPHICS OFF

```
ods _all_ close;
ods listing;
ods graphics off;
```

In this situation, if you submit the program first_job.sas, the results from the first scenario would be as shown in Figure 42.

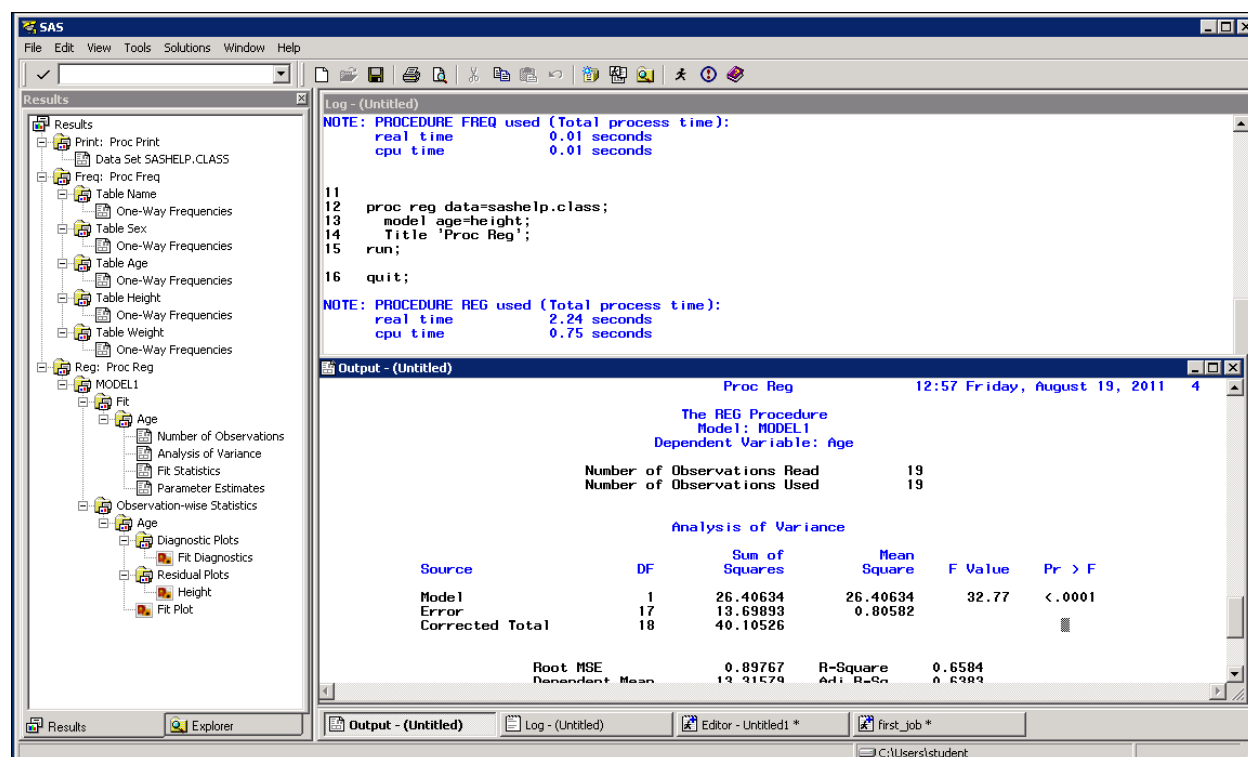


Figure 42. After Code Submission with HTML OFF, LISTING ON, and ODS GRAPHICS ON

If you look at the properties, shown in Figure 43, for the Fit Plot image, you will see that an external file named FitPlot.png has been created:

Where's the Listing Window?, continued

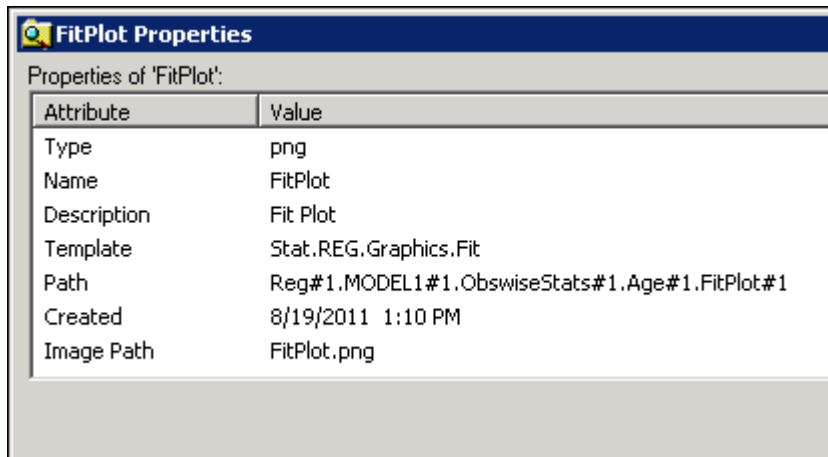


Figure 43. Physical Location of the PNG File

The file was written to the default working directory, in this case, C:\Users\student (Figure 44). The contents of C:\Users\student was manually cleaned out after prior SAS sessions. Therefore, in this new session, the only result files currently in the location are the three images created by PROC REG.

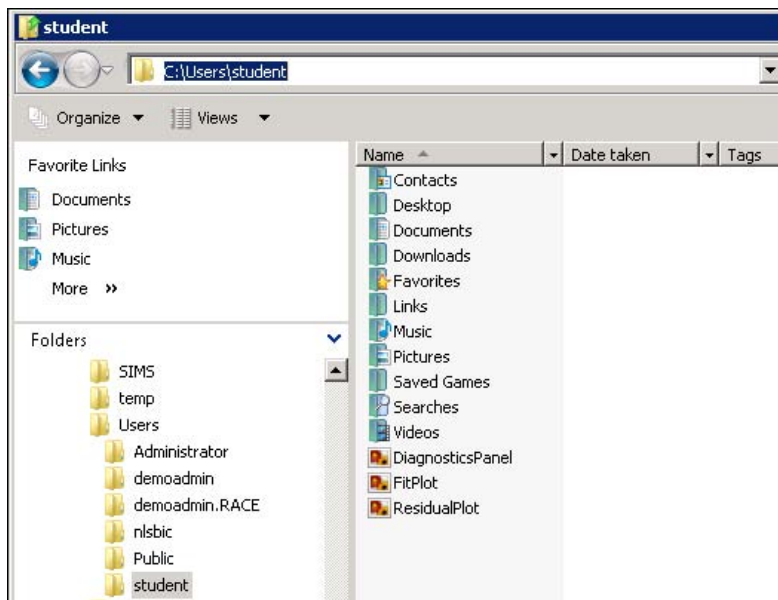


Figure 44. Directory Location of the PNG File

All the tabular output, from PROC PRINT, PROC FREQ, and PROC REG appear in the LISTING window.

Now, say that you like the way the output looks, you are happy with what you see in the LISTING window, and you want to create a PDF file of your output to e-mail to a colleague.

To do this, you only have to modify your code to add the ODS "sandwich" for ODS PDF in order to create a PDF file. You must slightly modify the code in first_job.sas to use the Choice 3 ("full control") code, as shown in the SAS log in Figure 45.

In this screen capture of the Results Navigation pane and Log windows, you can see that the Results Navigation pane only shows the PDF icon for this output, and the Log window shows the location of the output results file. Since the default ODS GRAPHICS check box was checked, the PROC REG graphic images are embedded in the PDF file. Therefore, the icons for the plots produced by PROC REG are represented by PDF icons.

Where's the Listing Window?, continued

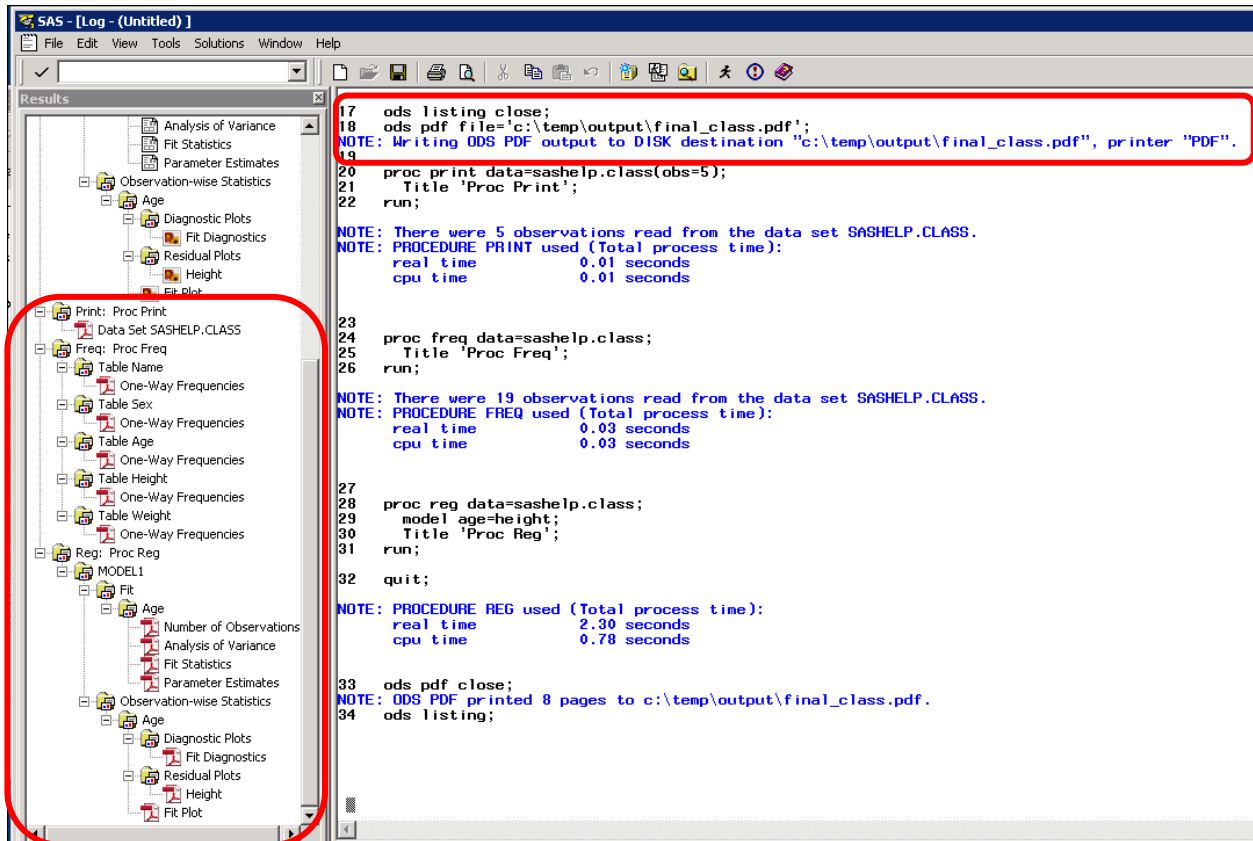


Figure 45. PDF Results after Code Submission

Partial PDF results are shown in Figure 46.

Where's the Listing Window?, continued

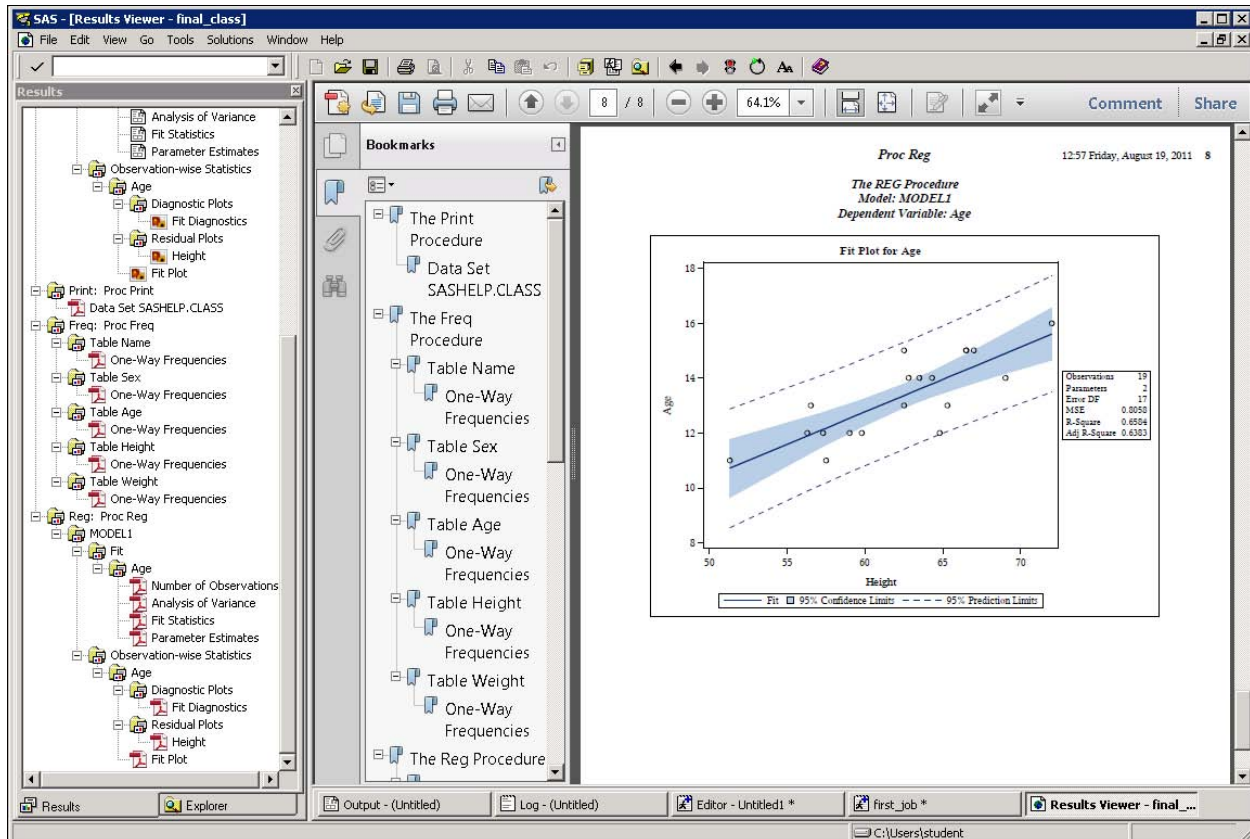


Figure 46. PDF Output Shows an Embedded Image for PROC REG

If you want to run PROC REG with different options or a different MODEL statement and review the LISTING results, before you generate ODS GRAPHICS images, then you might want to start your SAS session with the ODS GRAPHICS choice turned off. In this scenario, you might choose to clear the ODS GRAPHICS check box in the Results tab, or you might choose to submit the following code at the beginning of your session:

```
ods _all_ close;
ods listing;
ods graphics off;
```

If you submit those three lines of code, followed by submitting the same first_job.sas program, you would see in the Output window that no graphic images were created for the PROC REG procedure. Instead, the tabular results are shown, as in Figure 47.

Where's the Listing Window?, continued

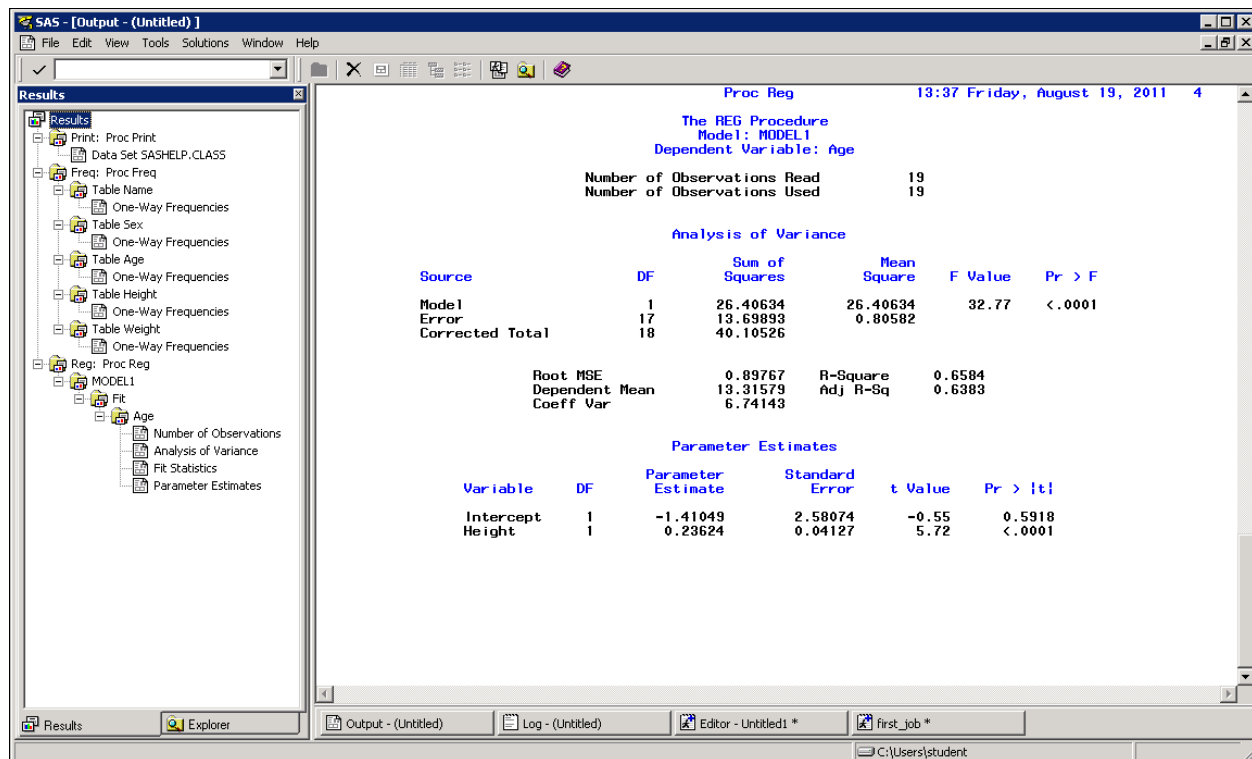


Figure 47. LISTING Output with No ODS GRAPHICS Output

If you wanted to take full control and generate ODS GRAPHICS images from PROC REG, then submitting a simple ODS GRAPHICS ON; statement would begin the creation of graphic images. To take full control over the creation of output, as seen in the previous example, you would only have to modify the previous code to explicitly turn on the creation of graphics:

| Code | Notes |
|--|--|
| <pre>ods listing close; ods graphics on; ods pdf file='c:\temp\output\Class_Reader.pdf'; ** same code as shown previously; ods pdf close; ods listing; ods graphics off;</pre> | <p>Close the open LISTING destination.</p> <p>Turn ODS GRAPHICS creation ON.</p> <p>Create a PDF file with the name you choose, in the location you choose.</p> <p>Close the open PDF destination.</p> <p>Reopen the LISTING destination.</p> <p>Turn ODS GRAPHICS creation OFF.</p> |

Now, in the Results Navigation pane and in the Results Viewer display of the PDF file, as shown in Figure 48, the full control method has created exactly the output desired, with the ODS GRAPHICS output embedded in the PDF file.

Where's the Listing Window?, continued

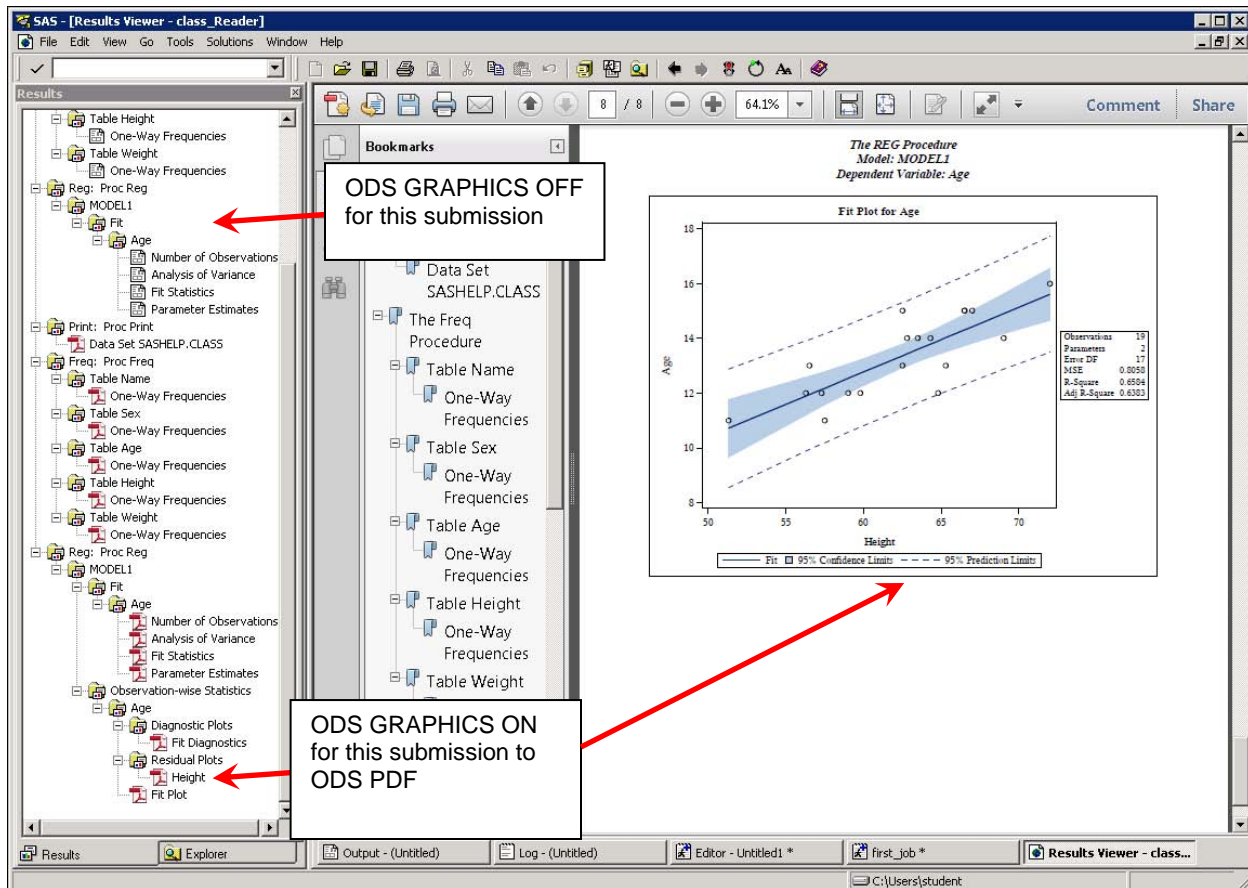


Figure 48. PDF Output After Turning ODS GRAPHICS On

If you look in the C:\temp\output folder with Windows Explorer, you see that both the first and second PDF files are in this folder location. If the second submission had used the same name as the first submission (such as might have happened if you ran the first bit of code on Monday and then came back on Tuesday to run the second bit of code), then the original results file would have overwritten a file with the same name. However, in this case, the files were created with two different names, so we see two separate PDF icons, each created at a different time on the same day:

Where's the Listing Window?, continued

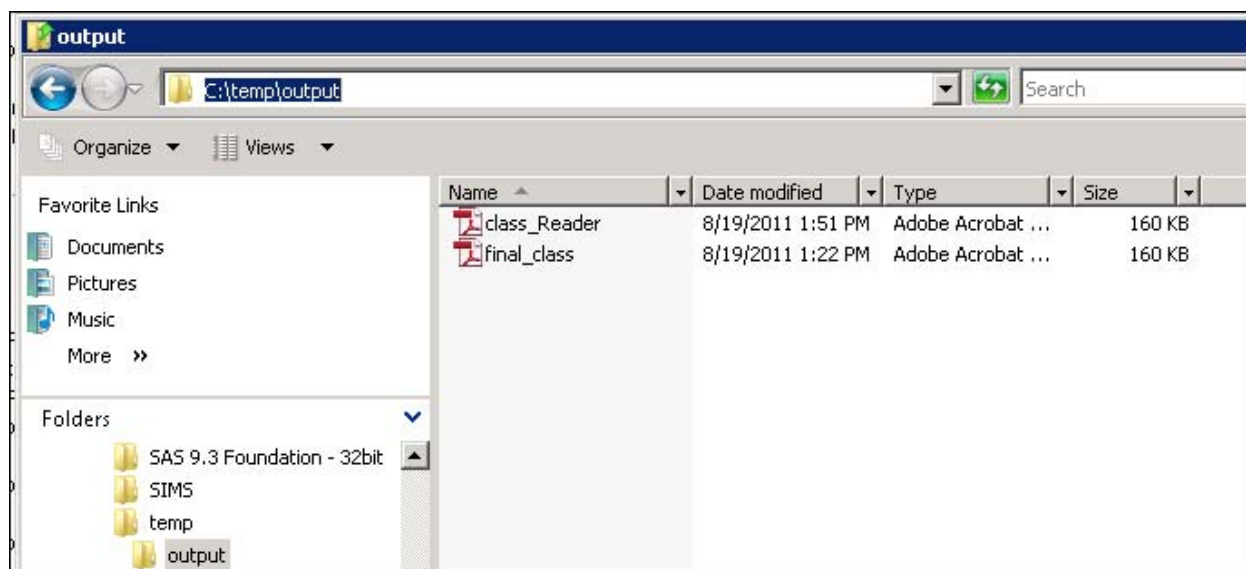


Figure 49. Physical Location of the PDF File with Embedded Images

CHOICE 4 PROS AND CONS

The advantage of this method of working is that it most closely mimics the original behavior of SAS Display Manager in interactive mode. By default, the LISTING destination was turned on, all the other destinations were turned off, and ODS GRAPHICS could be turned on or off based on the needs of your code. This method, when coupled with the "full control" method for ODS destination results, allows you to decide absolutely everything about your result file creation.

The disadvantage of this method is that you have to understand how ODS works in order to decide what statements to use. Another disadvantage is that you need to know the correct code technique to get the results you want.

However, it is not a bad thing to be absolutely explicit in all your code, especially if you are developing code for a production system or production usage. When you have full control, it does not matter if the LISTING destination is on and ODS GRAPHICS is off. Once you put the appropriate statements in your program code, then every time you run a specific program, if you have the statements that you want in your program, you or anyone who uses your code will get the same output. There will be no need to tell them "Oh, first, check the status of your **Tools** → **Options** → **Preferences** → **Results** tab -- " in order to make sure that their settings are exactly the same as your settings.

CONCLUSION

Everybody works with SAS in a different way. The thing about working with SAS is that if you ask four SAS programmers how to do something, they will probably come up with eight ways to accomplish what you want. The developers have even made it easy for your SAS Administrator to set some start-up options to ensure that everyone who uses SAS has the same set of defaults. These new start-up system options are: ODSDEST=, ODSGRAPHICS=, and ODSSTYLE=. For more information on these options, see the "System Options for ODS" section of the [SAS® 9.3 Output Delivery System: User's Guide](#).

You can use any combination of the techniques discussed above. Start out with the Results tab turned on to automatic collection as you work, turn off the automatic collection, generate some reports using the full control method, and turn automatic collection back on. You just have to remember how the results file folder location changes as you use the automatic or minimal code methods. For full control, you have the other methods discussed. Somewhere among these choices, I am sure you will find the one that best suits you and how you work. At the end of this paper, is an additional job aid that summarizes your choices.

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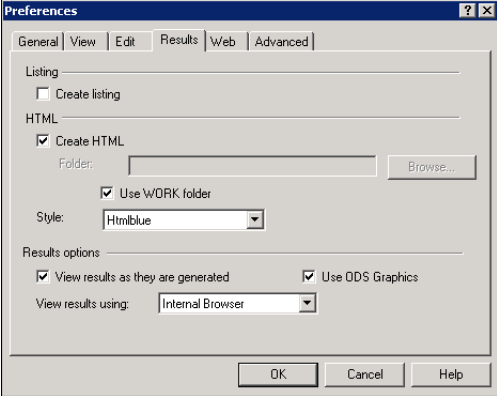
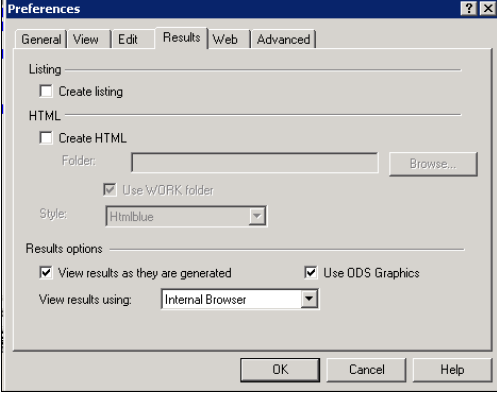
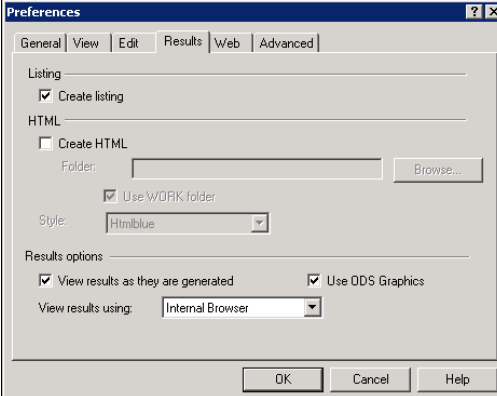
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Where's the Listing Window?, continued

APPENDIX: JOB AID

| Choice | Tools → Options → Preferences → Results | Code Needed | Results Location |
|---|---|--|---|
| 1 LISTING OFF HTML ON WORK folder CUMULATIVE HTML file |  | None (However, if the HTML destination is closed during the session, the code may be needed to turn HTML back ON.) ods html; | WORK library location, which will be deleted when the SAS session ends. This automatically named file is called SASHTML.HTM, and the file is CUMULATIVE and will contain ALL results. |
| 2 LISTING OFF HTML ON WORK folder NEWFILE for each PROC step | Same initial state as Choice 1 | Minimal code ods html newfile=proc; ods html path="<path>" newfile=proc; | Initially, the WORK library location. Once you use the NEWFILE=PROC option, result files will be written to your current working directory. Use PATH= to control the folder location. |
| 3 LISTING OFF HTML OFF ODS Code determines result filename and location |  | Full code. Result files go to the location you choose (HTML invocation shown, other destinations possible.) ods html path="<path>" file="<filename.ext>" style=<style> <other options>; *** Code for 1 procedure or multiple procedures; ods html close; | |
| 4 LISTING ON HTML OFF ODS Code determines result filename and location, if ODS output is needed. |  | Minimal code to use LISTING destination. Full code to use other ODS destinations. You need to know if ODS GRAPHICS ON/OFF in order to control whether graphic images should be created. | LISTING output is written to the SAS location for the Output window. Graphic images from ODS GRAPHICS are written to the current working directory, unless a PATH= option is used to redirect images elsewhere. |