

ODS Basics Presentation



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Introduction

As experienced SAS programmers know, procedural output can be routed to:

- A Data Set
- A Flat File
- A Graph
- The Output Window

Programming has made use of Proc Printto and the Data _Null_ Step to achieve output of programming goals.

These options are still viable and will continue to be used.

With ODS, additional programming syntax provides variety and strength for displaying results.

Creating ODS Output

In SAS Version 7, procedural output can be routed to a variety of different destinations.

The current list (along with a few later developments) include:

Listing Window
HTML Documents
Output Data Sets
Graphic Streams
Active X
Java
Rich Text Format (*.Rtf) Files
Printer Locations
Postscript And PCL (For High Fidelity Printers)
SGML And Latex (Tentative)

In addition to sending output to a variety of new destinations, the appearance of the output can be modified with different fonts, colors and formatting.

To understand how SAS achieves these results and to get acquainted with the syntax of ODS, consider the following excerpt from the SAS Institute reference material:

All SAS procedures produce *output objects* that the Output Delivery System delivers to various *ODS destinations*, according to the default specifications for the procedure or to your own specification".

All output objects (for example, a table of parameter estimates) consist of two component parts:

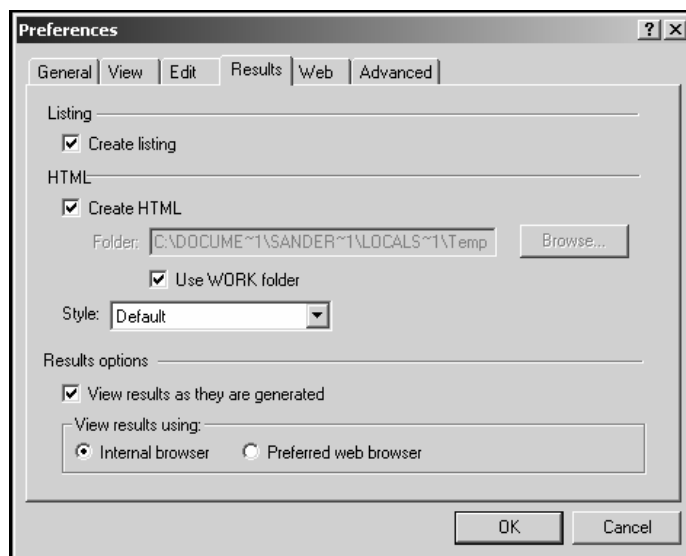
The data component, which consists of the results computed by a SAS procedure.

The template, which contains rules for formatting and displaying the results.

The familiar part of the ODS is that output is channeled to the Listing window (the Output window).

To assure that output is written to the Listing window, select Tools → Options → Preferences from the pull-down menu in the Program Editor.

A Preferences window appears with a Results tab.



The Results tab permits SAS output to be sent to the Listing window, to the Results Viewer (with HTML content), to both the Listing and Results Viewer window, or to none of the above.

The Listing window is open by default.

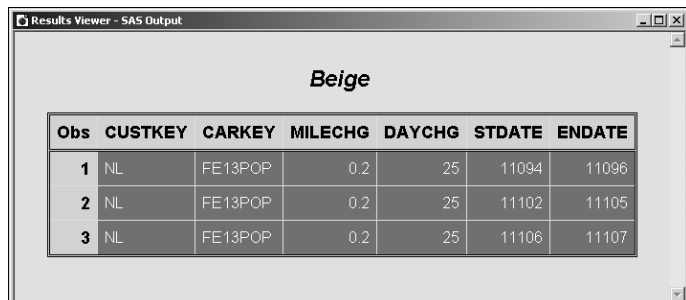
SAS Institute has also created a series of templates with distinct colors, fonts, and HTML options enhancing the appearance of the file in the browser.

The styles include Beige, Brick, Brown, D3D, Default, Minimal, Printer, and Statdoc in Version 8.

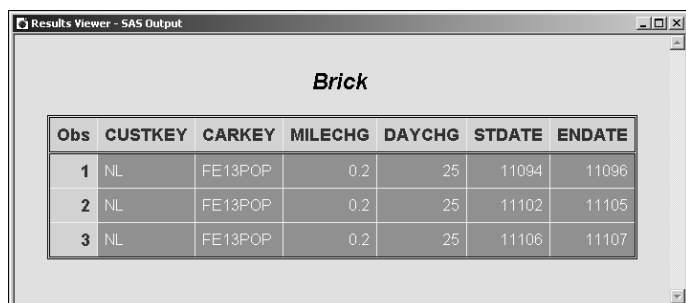
The additional styles of BarrettsBlue, FancyPrinter, NoFontPrinter, Rtf, SansPrinter, and SerifPrinter were added in Version 8e.

ODS Styles

Compare sample output of each style. Note color variations, as well as font, font face, and type differences.



Obs	CUSTKEY	CARKEY	MILECHG	DAYCHG	STDATE	ENDATE
1	NL	FE13POP	0.2	25	11094	11096
2	NL	FE13POP	0.2	25	11102	11105
3	NL	FE13POP	0.2	25	11106	11107

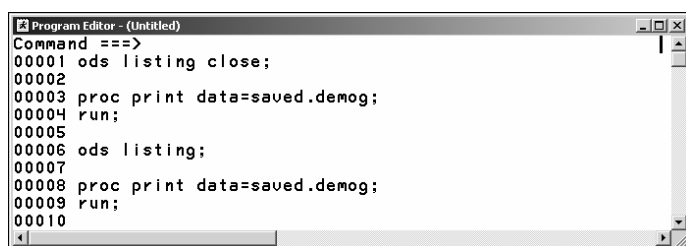


Obs	CUSTKEY	CARKEY	MILECHG	DAYCHG	STDATE	ENDATE
1	NL	FE13POP	0.2	25	11094	11096
2	NL	FE13POP	0.2	25	11102	11105
3	NL	FE13POP	0.2	25	11106	11107

ODS Listing

Let's assume the Results tab in the Preferences window has both the Listing window and HTML output open.

For this exercise, we wish to publish only HTML output. Closing the Listing window will increase efficiency.



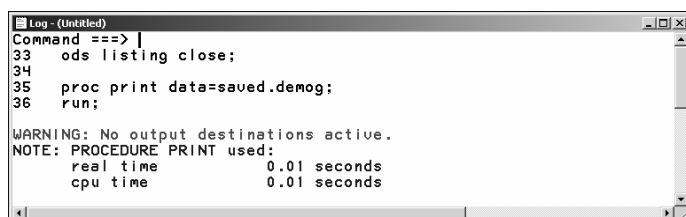
```

Command ==>
00001 ods listing close;
00002
00003 proc print data=saved.demog;
00004 run;
00005
00006 ods listing;
00007
00008 proc print data=saved.demog;
00009 run;
00010

```

Be careful to have at least the Listing window or the Results window open.

If both windows are turned off, the Log will carry a Warning message that no output destinations are active.



```

Log - (Untitled)
Command ==> |
33  ods listing close;
34
35  proc print data=saved.demog;
36  run;

WARNING: No output destinations active.
NOTE: PROCEDURE PRINT used:
      real time           0.01 seconds
      cpu time            0.01 seconds

```

Workshops

Exercise 1

Complete the following:

1. Turn on both the Listing destination and the HTML destination in interactive mode.
2. Select the style 'beige'. Put results into the Work library.
3. Submit a Proc print for the data set 'saved.computer'.
4. Inspect the Results window by drilling down and navigating.
5. Inspect the Results Viewer and the Listing output.
6. Show the HTML source behind the Results Viewer
7. Use the Preferences window to put the HTML output onto the C drive in a folder of your choice (e.g., ods output). Change the style to D3D.
8. Show the HTML document created in 7 in the Windows Explorer window.
9. Inspect the results of 7 in Internet Explorer or Netscape Navigator
10. Temporarily turn off the Listing output and resubmit the Proc print of 'saved.computer'.

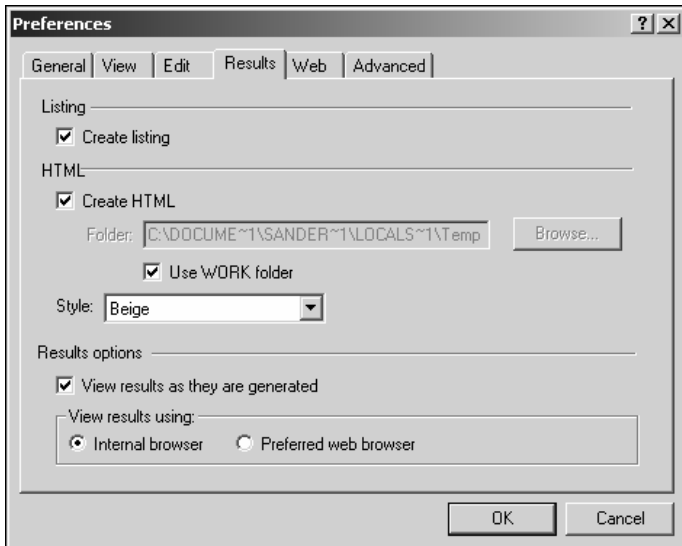
Turn the Listing output back on after the Proc print has finished.

Workshop Solutions

Exercise 1

1. Turn on both the Listing destination and the HTML destination in interactive mode.
2. Select the style 'beige'. Put results into the Work library.

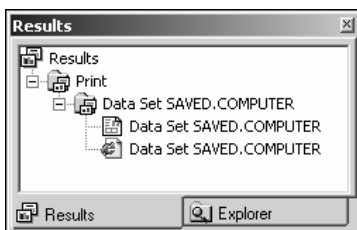
Tools → Options → Preferences



- Submit a Proc print for the data set 'saved.computer'.



Inspect the Results window by drilling down and navigating.

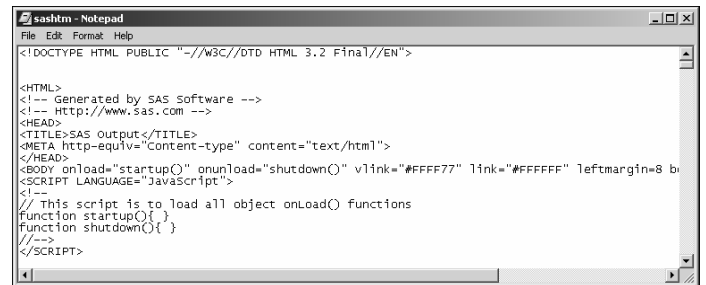


- Inspect the Results Viewer and the Listing output.

Obs	CATNUM	SUPPLIER	TYPE	CPU	DISK	WHOLESAL	RETAIL
1	1	FLOPPY COMPUTERS	DESKTOP	286	20	550	750
2	2	FLOPPY COMPUTERS	DESKTOP	286	40	600	800
3	3	FLOPPY COMPUTERS	DESKTOP	286	100	750	950
4	4	FLOPPY COMPUTERS	DESKTOP	386SX	40	750	950
5	5	FLOPPY COMPUTERS	DESKTOP	386SX	100	950	1150
6	6	FLOPPY	DESKTOP	386SX	40	950	1150

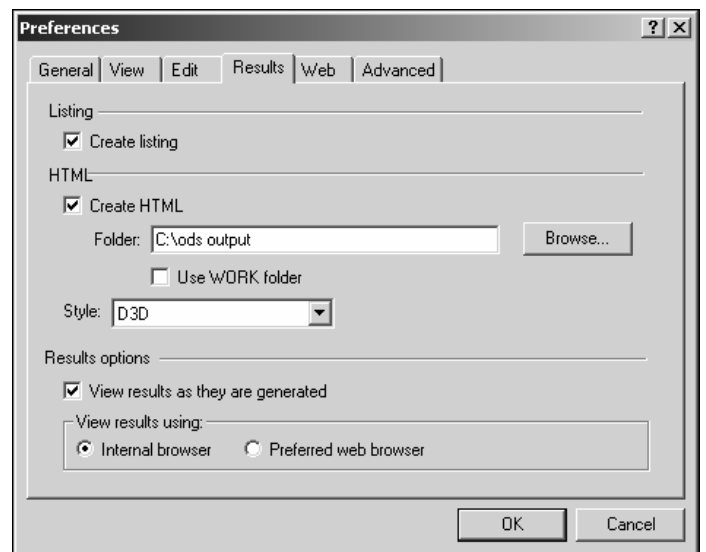
Obs	CATNUM	SUPPLIER	TYPE	CPU	DISK
1	1	FLOPPY COMPUTERS	DESKTOP	286	20
2	2	FLOPPY COMPUTERS	DESKTOP	286	40
3	3	FLOPPY COMPUTERS	DESKTOP	286	100
4	4	FLOPPY COMPUTERS	DESKTOP	386SX	40
5	5	FLOPPY COMPUTERS	DESKTOP	386SX	100
6	6	FLOPPY COMPUTERS	DESKTOP	386SX	40
7	7	FLOPPY COMPUTERS	DESKTOP	386SX	100
8	8	FLOPPY COMPUTERS	DESKTOP	486SX	40
9	9	FLOPPY COMPUTERS	DESKTOP	486SX	100
10	10	FLOPPY COMPUTERS	DESKTOP	486SX	100
11	11	FLOPPY COMPUTERS	PORTABLE	286	40
12	12	FLOPPY COMPUTERS	PORTABLE	386SX	40
13	13	FLOPPY COMPUTERS	PORTABLE	386SX	100

Show the HTML source behind the Results Viewer

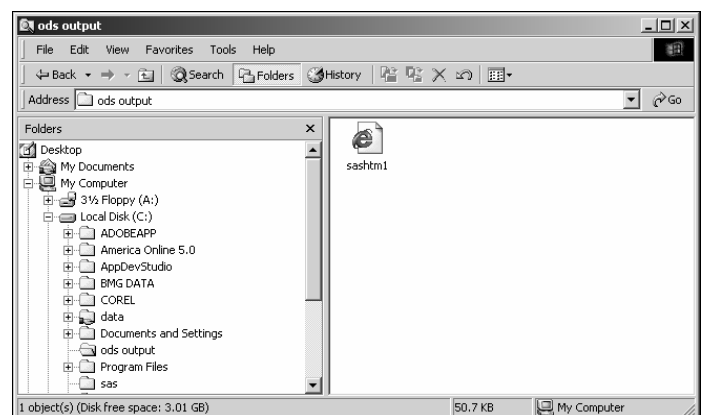


- Use the Preferences window to put the HTML output onto the C drive in a folder of your choice (e.g., ods output).

Change the style to D3D.



- Show the HTML document created in 7 in the Windows Explorer window.



- Inspect the results of 7 in Internet Explorer or Netscape Navigator

Obs	CATNUM	SUPPLIER	TYPE	CPU	DISK	WHOLESALE	RETAIL
1	1	FLOPPY COMPUTERS	DESKTOP	286	20	550	750
2	2	FLOPPY COMPUTERS	DESKTOP	286	40	600	800
3	3	FLOPPY COMPUTERS	DESKTOP	286	100	750	950
4	4	FLOPPY COMPUTERS	DESKTOP	386SX	40	750	950
5	5	FLOPPY COMPUTERS	DESKTOP	386SX	100	950	1150
6	6	FLOPPY COMPUTERS	DESKTOP	386DX	40	950	1150

Temporarily turn off the Listing output and resubmit the Proc print of 'saved.computer'.

Turn the Listing output back on after the Proc print has finished.

```

Command ==>
00001 ods listing close;
00002
00003 proc print data=saved.computer;
00004 run;
00005
00006 ods listing;
00007

```

Consider the HTML output for Proc Contents.

```

Command ==>
00001 proc sort data=saved.demog out=work.demog;
00002   by gender status;
00003 run;
00004
00005 proc sql;
00006   create index money on work.demog (salary, children);
00007 quit;
00008
00009 ods listing close;
00010 proc contents data=work.demog;
00011 run;
00012 ods listing;
00013

```

The Results window shows that Proc Contents has multiple separate parts.

Each part of the output is a separate HTML table.

Other Proc output is actually composed of multiple tables.

	4	HEIGHT	Num	8	8
1	NAME	Char	25	48	
9	SALARY	Num	8	40	
6	STATUS	Char	8	81	
5	WEIGHT	Num	8	16	

#	Index	# of Unique Values	Variables
1	money	47	SALARY CHILDREN

Sortedby:	GENDER STATUS
Validated:	YES
Character Set:	ANSI

Components of ODS Output

In many cases, separate HTML tables combine to create one Proc output. Why is this important?

First, consider the Results window which allows the user to navigate directly to a specific HTML table by clicking on its name.

Results	
Contents	
WORK.DEMOG	
Attributes	
Engine/Host Information	
Variables	
Indexes	
Sortedby	

Although each of the tables is contained in a single HTML file, navigation is made possible to any table through hyperlinks in the HTML file.

The HTML hyperlinks providing this navigation option are shown below.

By asking to inspect the source code, the hyperlinks are made visible. Hyperlinks can be identified by the syntax `<A NAME="IDX3">`, or where the number is any number. In the example below, IDX3 and IDX4 are both shown.

```

</TABLE>
</FONT></CENTER>
<A NAME="IDX3">&nbsp;&nbsp;&nbsp;</A>
<CENTER>
<FONT face="Arial, Helvetica, Helv" size="3" color="#002288">
<TABLE cellspacing=1 cellpadding=7 rules=GROUPS frame=BOX border=1 bgcolor="#F0F0F0" border=
<thead>
<TR>
<TD COLSPAN=4 ALIGN=CENTER VALIGN=BOTTOM bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, H
</TR>
<TR>
<TD ALIGN=RIGHT VALIGN=BOTTOM bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="
<TD ALIGN=LEFT VALIGN=BOTTOM bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="4
<TD ALIGN=RIGHT VALIGN=BOTTOM bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="
<TD ALIGN=LEFT VALIGN=BOTTOM bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="4
</TR>
</thead>
<tbody>
<TR>
<TD ALIGN=RIGHT bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="4" color="#003
<TD ALIGN=LEFT bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="4" color="#0000
<TD ALIGN=RIGHT bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="3" color="#0000
<TD ALIGN=LEFT bgcolor="#B0B0B0"><FONT face="Arial, Helvetica, Helv" size="3" color="#0000
</TR>
</tbody>
</TABLE>
</FONT></CENTER>
<A NAME="IDX4">&nbsp;&nbsp;&nbsp;</A>

```

These hyperlinks are part of the document and are automatically created when the HTML destination is open.

We can customize their syntax to take advantage of them for navigation purposes.

ODS Trace

There is a second reason for examining HTML output as separate tables: the programmer may wish to show only selected portions of output without showing other parts.

ODS programming allows the specification of which tables to suppress or present.

Suppressing unwanted parts of the output increases efficiency.

To find out more about the components of the Proc output, use the ODS trace statement.

```
Program Editor - (Untitled)
Command ==>
00001 ods trace on;
00002 proc contents data=work.demog;
00003 run;
00004 ods trace off;
00005
```

This syntax requests information into the Log, which is essential for using ODS options.

The Log will now show information about each table.

```
Log - (Untitled)
Command ==>
1315 ods trace on;
1316 proc contents data=work.demog;
1317 run;

NOTE: Writing HTML Body file: sashtm8.htm

Output Added:
-----
Name:      Attributes
Label:     Attributes
Template:  Base.Contents.Attributes
Path:      Contents.DataSet.Attributes
-----

Output Added:
-----
Name:      EngineHost
Label:     Engine/Host Information
Template:  Base.Contents.EngineHost
Path:      Contents.DataSet.EngineHost
-----

Output Added:
-----
Name:      VariablesAlpha
Label:     Variables
Template:  Base.Contents.Variables
Path:      Contents.DataSet.VariablesAlpha
-----

Output Added:
-----
Name:      Indexes
Label:     Indexes
Template:  Base.Contents.Indexes
Path:      Contents.DataSet.Indexes
-----

Output Added:
-----
Name:      Sortedby
Label:     Sortedby
Template:  Base.Contents.Sortedby
-----
```

By default, the trace record contains the following information:

Item	Description
Name	Name of the output object
Label	Brief description of the output object
Data Name	Name of data component used to create the output; provided only when it differs from the name of the output object
Template	Template name used to create output
Path	Path of the output object

ODS Select and ODS Exclude

Suppose we were interested solely in the information about the variables and the indexes.

The syntax should request information be displayed on the selected tables only (or, the syntax should specifically exclude the other tables).

```
Program Editor - (Untitled)
Command ==>
00001 title "Full Output of Proc Contents";
00002 proc contents data=work.demog;
00003 run;
00004
00005 title "Partial Output of Proc Contents";
00006 ods select contents.dataset.variablesalpha
00007          contents.dataset.indexes;
00008 proc contents data=work.demog;
00009 run;
00010
00011 title;
00012
```

The output of the second Proc Contents is shown below. The output shows only the variables and the indexes.

```
Log - (Untitled)
Command ==>
1341 title "Full Output of Proc Contents";
1342 proc contents data=work.demog;
1343 run;

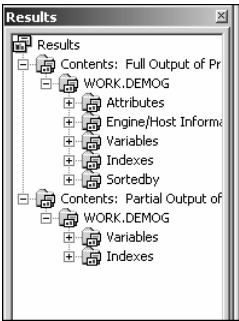
NOTE: Writing HTML Body file: sashtm13.htm
NOTE: PROCEDURE CONTENTS used:
      real time      0.22 seconds
      cpu time       0.06 seconds

1344
1345 title "Partial Output of Proc Contents";
1346 ods select contents.dataset.variablesalpha
1347          contents.dataset.indexes;
1348 proc contents data=work.demog;
1349 run;

NOTE: Writing HTML Body file: sashtm14.htm
NOTE: PROCEDURE CONTENTS used:
      real time      0.17 seconds
      cpu time       0.04 seconds

1350
1351 title;
```

The Results window shows the full output and the partial output.



The same output is created using the Exclude action.

```
Program Editor - (Untitled)
Command ==>
00001 ods exclude contents.dataset.attributes
00002                contents.dataset.enginehost
00003                contents.dataset.sortedby;
00004 proc contents data=work.demog;
00005 run;
00006
```

Both the Select action and the Exclude action can be used to subset the output.

Since output often consists of multiple tables, the programmer can specify which portions of a Proc will be displayed.

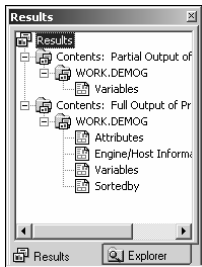
The Select action and Exclude action are in effect for the Proc which immediately follows them.

```

Program Editor - (Untitled)
Command ==>
00001 title "Partial Output of Proc Contents";
00002 ods exclude contents.dataset.attributes
00003         contents.dataset.enginehost
00004         contents.dataset.sortedby;
00005 proc contents data=work.demog;
00006 run;
00007
00008 title "Full Output of Proc Contents";
00009 proc contents data=work.demog;
00010 run;
00011

```

The Results window shows the differences in output.



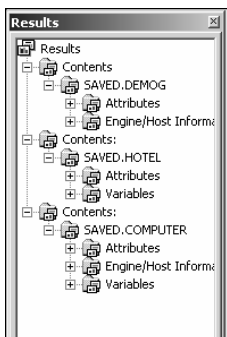
In order to extend the functionality of the Select action or the Exclude action to the next procedural output, use the Persist syntax.

```

Program Editor - (Untitled)
Command ==>
00001 /* predict the output for each Proc Contents */
00002
00003 ods listing;
00004 ods listing show;
00005 ods exclude variablesalpha;
00006 proc contents data=saved.demog;
00007 run;
00008 ods listing show;
00009 ods exclude enginehost;
00010 proc contents data=saved.hotel;
00011 run;
00012 ods listing show;
00013 ods exclude none;
00014 proc contents data=saved.computer;
00015 run;
00016 ods listing show;
00017 ods listing close;
00018

```

The Results window will display the following.



```

Log - (Untitled)
1094 ods listing;
1095 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL select list is:
1. variablesalpha(PERSIST)
1096 ods exclude variablesalpha;
1097 proc contents data=saved.demog;
1098 run;
NOTE: Writing HTML Body file: sashtml4.htm
NOTE: PROCEDURE CONTENTS used:
      real time    0.17 seconds
      cpu time     0.03 seconds

1099 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL select list is: ALL
1100 ods exclude enginehost;
1101 proc contents data=saved.hotel;
1102 run;
NOTE: Writing HTML Body file: sashtml5.htm
NOTE: PROCEDURE CONTENTS used:
      real time    0.18 seconds
      cpu time     0.03 seconds

1103 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL select list is: ALL
1104 ods exclude none;
1105 proc contents data=saved.computer;
1106 run;
NOTE: Writing HTML Body file: sashtml6.htm
NOTE: PROCEDURE CONTENTS used:
      real time    0.21 seconds
      cpu time     0.03 seconds

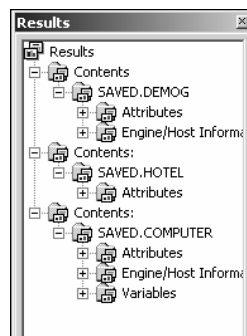
1107 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL exclude list is: NONE
1108 ods listing close;
1109

```

```

Program Editor - (Untitled)
Command ==>
00019 /* explain the output for each Proc Contents*/
00020 ods listing;
00021 ods listing show;
00022 ods exclude variablesalpha (persist);
00023 proc contents data=saved.demog;
00024 run;
00025 ods listing show;
00026 ods exclude enginehost (persist);
00027 proc contents data=saved.hotel;
00028 run;
00029 ods listing show;
00030 ods exclude none;
00031 proc contents data=saved.computer;
00032 run;
00033 ods listing show;
00034 ods listing close;
00035

```



```

119 ods listing;
120 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL exclude list is: NONE
121 ods exclude variablesalpha (persist);
122 proc contents data=saved.demog;
123 run;
NOTE: Writing HTML Body file: sashtml7.htm
NOTE: PROCEDURE CONTENTS used:
      real time    0.14 seconds
      cpu time     0.03 seconds

124 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL exclude list is:
1. variablesalpha(PERSIST)
125 ods exclude enginehost (persist);
126 proc contents data=saved.hotel;
127 run;
NOTE: Writing HTML Body file: sashtml8.htm
NOTE: PROCEDURE CONTENTS used:
      real time    0.22 seconds
      cpu time     0.03 seconds

128 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL exclude list is:
1. enginehost(PERSIST)
129 ods exclude none;
130 proc contents data=saved.computer;
131 run;
NOTE: Writing HTML Body file: sashtml9.htm
NOTE: PROCEDURE CONTENTS used:
      real time    0.18 seconds
      cpu time     0.03 seconds

132 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL exclude list is: NONE
133 ods listing close;

```

To review, examine the following variations on ODS Select and ODS Exclude syntax.

```
Ods select <table_template_name>;
Ods select all;
Ods select
Ods select <table_template_name> (persist);

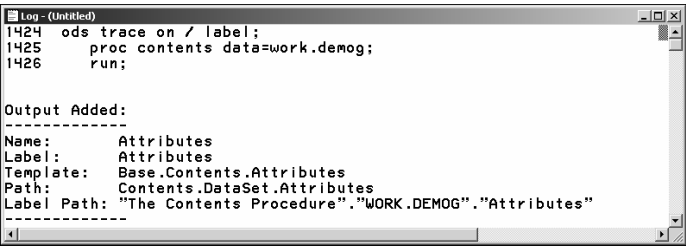
Ods exclude <table_template_name>;
Ods exclude none;
Ods exclude;
Ods exclude <table_template_name> (persist);
```

The default values depend on the ODS destination:

- **ODS LISTING:** select all
- **ODS HTML:** select all
- **ODS OUTPUT:** exclude all
- **Overall:** select all

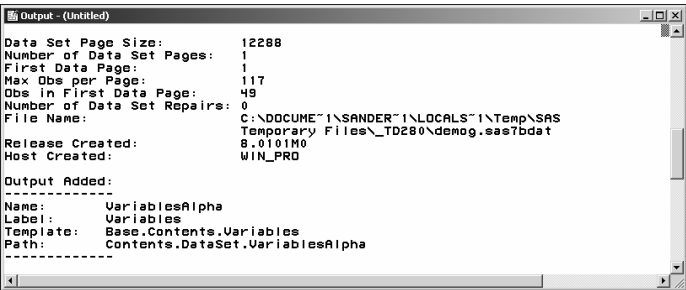
Using Labels and Listing Options on ODS Trace Statements

The ODS trace statement uses the Label and Listing options, as displayed.



The Label option displays additional information in the Log window.

The Listing option includes the trace details in the Listing window.



The Listing option and the Label option may be used together.

Alternative Table References

The ODS trace statement showed the following features of each output table:

Name
Label

Template
Path
Label Path

The syntax shown earlier, for the Select action and the Exclude action, referenced the full path.

We can use syntax for the Select action and Exclude action to reference any of the following parts of a table's features:

- Full path
- Partially qualified path
- Label (surrounded by quotation marks)
- Label path
- Partial label path
- Mixture of labels and paths
- Any above specification with # plus number

A partially qualified path is always truncated by removing portions from the left side up to each dot.

For example, the full path:

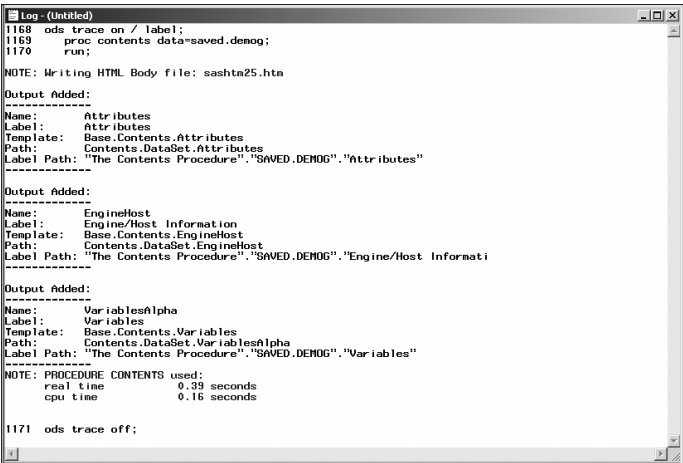
contents.datasets.indexes

Could be given partial path designations of:

datasets.indexes
indexes

A partially qualified label path observes the same truncation rule: removing portions from the left side up to each dot.

To show how output can be referenced, the following syntax each references the same output table.



EngineHost	Name
------------	------

"Engine/Host Information"	Label
Contents.DataSet.EngineHost	Path
DataSet.EngineHost	Partial Path
EngineHost	Partial Path
"The Contents Procedure". "Saved.Demog"."Engine/Host Information"	Label Path
"Saved.Demog"."Engine/Host Information"	Partial Label Path
"Engine/Host Information"	Partial Label Path

A combination of labels and paths can be used.

Any path specification followed by a # and a number will reference that name and the numbered output.
The references above are not case sensitive.

Of the information in the Trace output, only the Template information is not used in the Select and Exclude syntax.

ODS Listing Syntax

Although the Listing window is open by default, it can be opened, managed, and closed as needed.

- ODS LISTING
- ODS LISTING EXCLUDE
- ODS LISTING SELECT
- ODS LISTING SHOW
- ODS LISTING CLOSE

```

Program Editor - (Untitled)
Command ==>
00001 ods listing exclude variablesalpha;
00002 proc contents data=saved.demog;
00003 run;
00004
00005 ods listing select attributes;
00006 proc contents data=saved.computer;
00007 run;
00008

```

The ODS Listing statement with 'show' can be helpful in determining what is subsetted.

```

Program Editor - (Untitled)
Command ==>
00001 ods listing show;
00002 ods listing exclude variablesalpha;
00003 ods listing show;
00004 proc contents data=saved.demog;
00005 run;
00006
00007 ods listing show;
00008 proc contents data=saved.computer;
00009 run;
00010 ods listing close;
00011

```

```

Log - (Untitled)
1469 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL select list is: ALL
1470 ods listing exclude variablesalpha;
1471 ods listing show;
Current LISTING exclude list is:
1. variablesalpha
1472 proc contents data=saved.demog;
1473 run;

NOTE: Writing HTML Body file: sashtm4.htm
NOTE: PROCEDURE CONTENTS used:
      real time      0.56 seconds
      cpu time       0.04 seconds

1474
1475 ods listing show;
Current LISTING select list is set to default value (ALL).
Current OVERALL select list is: ALL
1476 proc contents data=saved.computer;
1477 run;

NOTE: Writing HTML Body file: sashtm5.htm
NOTE: PROCEDURE CONTENTS used:
      real time      0.20 seconds
      cpu time       0.03 seconds

1478 ods listing close;

```

Workshop

Exercise 1

Anticipate the results of each output.

```

Program Editor - (Untitled)
Command ==>
00036 /* explain the output for each Proc Contents */
00037
00038 ods listing;
00039 ods listing show;
00040 ods select variablesalpha (persist);
00041 proc contents data=saved.demog;
00042 run;
00043 ods listing show;
00044 ods select enginehost (persist);
00045 proc contents data=saved.hotel;
00046 run;
00047 ods listing show;
00048 ods select all;
00049 proc contents data=saved.computer;
00050 run;
00051 ods listing show;
00052 ods listing close;
00053 ods listing;
00054 ods listing show;
00055 ods select variablesalpha (persist) attributes;
00056 proc contents data=saved.demog;
00057 run;
00058 proc contents data=saved.hotel;
00059 run;

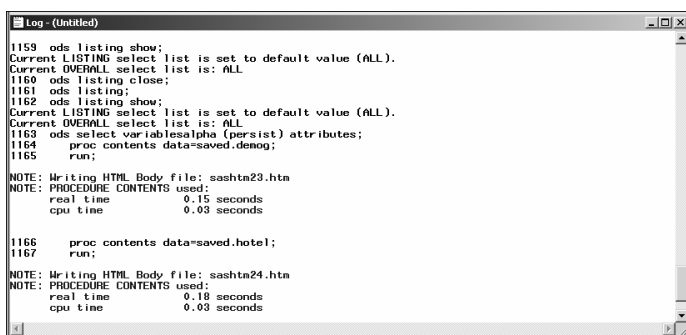
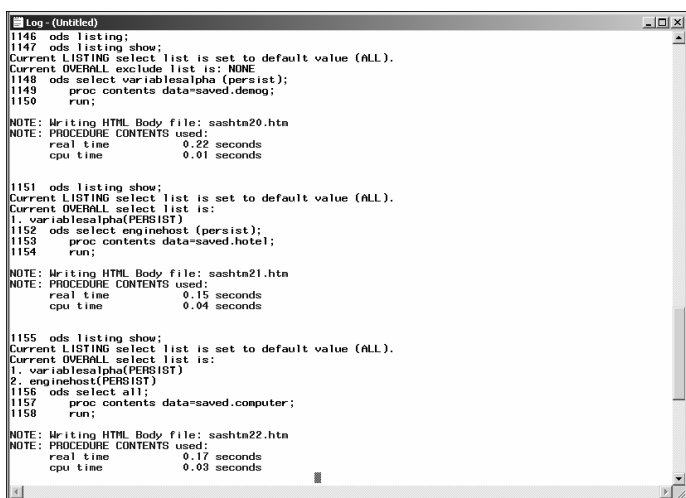
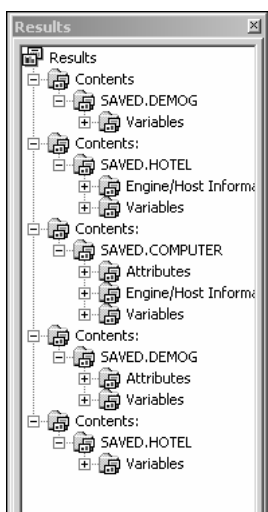
```

Exercise 2

Determine the Trace information for the Procedures you use. Inspect the information in particular for Proc Univariate, Proc Freq, and Proc Print.

Workshop Solutions

Exercise 1



Exercise 2

Submit the following program. Review the Log.

