

## Creating a Custom Table of Contents in RTF Documents

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### ABSTRACT

The SAS® Output Delivery System (ODS) allows output to be printed directly to a Rich Text Format (RTF) file. RTF files can be viewed by Microsoft Word and other word-processing packages. A table of contents (TOC) can greatly enhance an RTF file and make it more user-friendly. Headers and footers, as well as custom footnotes, can also greatly enhance an RTF file. This paper will describe a method to imbed “invisible” RTF control words into a file for the purpose of creating a custom TOC. The example presented will also include document headers, footers, and custom footnotes. The example code was run with SAS Version 9.1.2 on Windows XP Professional. The RTF file is viewed with Microsoft® Office Word 2003.

### INTRODUCTION

The purpose of this paper is to describe a technique to include a customized table of contents (TOC) in a Rich Text Format (RTF) file created by SAS. The example presented in this paper creates an RTF file viewed by Microsoft Word. The first programming task is that the TOC must be reproducible (i.e. created by code). The second programming task is that the RTF file must also include Microsoft Word headers and footers, and custom table titles and footnotes.

Beginning with SAS version 8.1, RTF control words can be used within cells. The technique presented here takes advantage of this feature; RTF control words for TOC entries are imbedded into the RTF document. RTF controls words for formatting are also used to make the TOC marks “invisible”.

In the example that follows, an RTF file will be created that contains a custom TOC, Microsoft Word headers and footers, and custom table titles and footnotes. The complete SAS code can be found in **Appendix I**.

### BACKGROUND

#### Table of Contents in Microsoft Word

In Microsoft Word there are three common methods to create a table of contents:

- 1) Create a table of contents from outline levels.
- 2) Create a table of contents from custom styles.
- 3) Create a table of contents from entries you mark yourself.

Method 3 gives you the most flexibility in creating a custom TOC. If you were to create a TOC in Word with method 3, you would use the **Mark Table of Contents** box to insert TOC fields into your document. You choose exactly where the TOC marks go and choose the text that will appear in the TOC. One very important limitation to this method is the inability to mark text that appears in a Word header or footer. Another limitation is that this is a “manual” process and would need to be repeated whenever the RTF file was re-created.

#### Table of Contents with SAS Code

There are also three common methods to create a TOC using SAS code:

- 1) Use the ODS RTF CONTENTS=YES option and the ODS PROCLABEL statement.
- 2) Use the ODS WORDSTYLE option (Experimental in version 9).
- 3) Imbed RTF control words for TOC specifications.

Papers describing methods 1 and 2 can be found on the SAS Support website (<http://support.sas.com/resources/papers/index.html>). Method 3 gives you the most flexibility, and will be the method used in this paper. The technique will be to imbed RTF control words to mark TOC entries, and imbed RTF control words to create the actual TOC. This will be similar to using Word Method 3 *Create a table of contents from entries you mark yourself*. However, since the marks will be created by code, the TOC will be reproduced whenever the RTF file is recreated.

## Viewing Headers and Footers in Microsoft Word

When ODS creates an RTF file, TITLE statements are converted to Word headers and FOOTNOTE statements are converted to Word footers. If you would prefer that SAS titles and SAS footnotes appear as part of the body of the document you can use the BODYTITLE option. The code would be:

```
ods rtf file = "the path name goes here/filename.RTF" bodytitle;
```

In the example presented here, we want Word headers and footers, so will allow ODS to convert the SAS titles and footnotes.

## In-Line Formatting

Beginning in SAS 8.2, ODS supports the ability to insert simple formatting text into a cell. To use in-line formatting, you first define an escape character with the ODS statement: ODS ESCAPECHAR = 'escape-character';. You should choose an escape character that is not used in code for any other reason. The '^' character is usually a safe choice and will be used in this paper.

```
ods escapechar = '^';
```

## Custom Text with ODS RTF TEXT= Statement

The ODS RTF TEXT= statement allows text to be added between procedures. The following code uses in-line formatting to modify the style of the cell. The outputwidth=100% option will create a cell that spans the width of the page, making the cell the same width as the page width. The just=l option will specify left justification for the text. This code will be used to create the custom table titles and footnotes in the RTF file.

```
ods rtf text="^S={outputwidth=100% just=l} Text Goes Here";
```

Since the ODS RTF TEXT= statement creates a cell in the RTF document, it can also be used to imbed RTF control words. This is how the control words for the TOC will be imbedded. RTF control words for formatting will also be imbedded to make the cell "invisible".

```
ods rtf text="^S={outputwidth=100% just=c} RTF Control Words Go Here";
```

## METHODS

### Creating an RTF file in SAS

The ODS code to create a basic RTF file is very simple. The code is:

```
ods rtf file = "the path name goes here/filename.RTF";
/* SAS procedures go here */
run;
quit;
ods rtf close;
```

ODS RTF FILE = opens the destination and file; ODS RTF CLOSE closes the destination and file. The RUN and QUIT commands before the ODS RTF close statement are required. If QUIT is omitted, the output from the last procedure may not be included in the document.

## Setup for Example RTF File

The following code will create a basic RTF file with one table of information (created by PROC PRINT). The macro variables `textformat_left` and `textformat_center` will define the formats to use in the TITLE and FOOTNOTE statements. ODS will convert the SAS TITLE and FOOTNOTE statements to Microsoft Word headers and footers. The escape character is defined for in-line formatting used in later code. The `startpage=no` option of the ODS RTF FILE= statement is used to prevent SAS from printing each procedure on a new page (the default). In the final RTF file, two pages contain two tables each (created by PROC FREQ and PROC MEANS). We will control when page breaks are made with the `startpage=` options; options include `yes|no|now`. The `notoc_data` option is used to prevent SAS from adding default TOC commands to the document; we want only the TOC entries we create to appear in the final TOC.

```

title;
footnote;

options orientation=landscape nodate center pageno=1;

%let textformat_left   = font=Arial height = 12 pt justify = l;
%let textformat_center = font=Arial height = 12 pt justify = c;

ods escapechar = '^';

title1 &textformat_left. 'Sample Report Header 1';
title2 &textformat_left. 'Sample Report Header 2';

footnote1 &textformat_left. 'Sample Report Footer 1';
footnote2 &textformat_left. 'Sample Report Footer 2';

ods rtf file = "U:\SGF08\Output\SGF08.rtf" startpage=no notoc_data;
/* Create the table */
proc print data=sashelp.class noobs;
run;

quit;
ods rtf close;

```

## Adding the Table of Contents Code

The ODS RTF TEXT= option is used to create the cell in which the RTF control words for creating the actual table of contents are imbedded. The control word `\TOC` indicates that a table of contents should be created. The control word `\f` indicates that text marked with the `\tc` control word will be included as an entry in the TOC. The control word `\h` indicates that the entry should be created as a hyperlink.

```

ods rtf text =
  "^S={outputwidth=100% just=1}{\field{\*\fldinst {\TOC \f \h}}"};

```

The ODS RTF TEXT= option is also used to create the cell in which the RTF control words for marking the TOC entries are imbedded. The control word `\tc` indicates that the entry is marked for inclusion into the TOC. The formatting control word `\f3` indicates the font. The formatting control words `\fs0` and `\cf8` indicate that the font size is 0 and the font color is white. With a font size of 0 and a font color of white (assuming the report will be printed on white paper) the imbedded text becomes "invisible".

```

ods rtf text =
  "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 1 - Class List}";

```

The following is updated code to create the RTF file with one table and one TOC entry:

```

ods rtf file = "U:\SGF08\Output\SGF08.rtf" startpage=no notoc_data;

title3 &textformat_center. bold 'Table of Contents';
ods rtf startpage=now;

```

```

ods rtf text =
  "^S={outputwidth=100% just=1}{\field{\*\fldinst {\TOC \f \h}}}" ;

/* ***** */
/* Page 2 of RTF File */
/* ***** */

/* Start a new page */
title3;
ods rtf startpage=now;

/* Imbed the TOC mark */
ods rtf text =
  "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 1 - Class List}";

/* Create the table */
proc print data=sashelp.class noobs;
run;

quit;
ods rtf close;

```

## Rendering the Table of Contents in Microsoft Word

When the RTF file has been created by SAS and opened in Word, you will not immediately see the TOC. To render the TOC press <Ctrl><A> to select all and then press F9 to create the TOC. **Figure 1** displays the TOC created with the above code. Since the TOC entries were specified as hyperlinks, you can press CTRL + click to follow the link to the appropriate location in the document.

**Figure 1: Table of Contents with One Entry**

Sample Report Header 1	1
Sample Report Header 2	
<b>Table of Contents</b>	
Table 1 - Class List.....	2

## Adding Custom Titles and Footnotes to Tables

By adding additional ODS RTF TEXT= statements, custom titles and footnotes can be added to describe a table. Adding the following code to the previous example will create a title and a footnote for Table 1.

```

/* ***** */
/* Page 2 of RTF File */
/* ***** */
/* Start a new page */
title3;
ods rtf startpage=now;

/* Print the table title */
ods rtf text=
  "^S={outputwidth=100% just=1} {\f3\fs24 Table 1 - Class List*}";

/* Imbed the TOC mark */

```

```
ods rtf text=
  "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 1 - Class List}";

/* Create the table */
proc print data=sashelp.class noobs;
run;

/* Print the custom footnotes */
ods rtf text=
  "^S={outputwidth=100% just=1} {\f3\fs24 *This is custom footnote for Table 1}";
```

## Marking Additional Entries for TOC

The following code marks the table of contents entries for tables 2 and 3, both of which will be on the page 3 of the RTF document. The code also adds custom titles and footnotes to these tables. **Figure 2** displays page 3 of the RTF document. **Figure 3** displays the rendered table of contents in Microsoft Word after running the complete code found in **Appendix I**.

```
/* ***** */
/* Page 3 of RTF File */
/* ***** */
/* Start a new page */
ods rtf startpage=now;

/* Print the table title */
ods rtf text=
  "^S={outputwidth=100% just=1} {\line\line\f3\fs24 Table 2 - Gender}";

/* Imbed the TOC mark */
ods rtf text=
  "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 2 - Gender}";

/* Create the table */
proc freq data = sashelp.class;
  table sex;
run;

/* Print the custom footnotes */
ods rtf text=
  "^S={outputwidth=100% just=1}{\f3\fs24 *This is custom footnote for Table 2}";

/* ***** */
/* Second Table on Page 3 */

/* Print the table title */
ods rtf text= "^S={outputwidth=100% just=1}
  {\line\line\line\line\line\line\f3\fs24 Table 3 - Mean Age}";

/* Imbed the TOC mark */
ods rtf text= "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 3 - Mean Age}";

/* Create the table */
proc means data = sashelp.class;
  var age;
run;

/* Print the custom footnotes */
ods rtf text=
  "^S={outputwidth=100% just=1}{\f3\fs24 †This is custom footnote for Table 3}";
```

Figure 2: Page 3 of RTF Document

3															
Sample Report Header 1 Sample Report Header 2															
Table 2 - Gender*															
<i>The FREQ Procedure</i>															
<table border="1"> <thead> <tr> <th>Sex</th> <th>Frequency</th> <th>Percent</th> <th>Cumulative Frequency</th> <th>Cumulative Percent</th> </tr> </thead> <tbody> <tr> <td>F</td> <td>9</td> <td>47.37</td> <td>9</td> <td>47.37</td> </tr> <tr> <td>M</td> <td>10</td> <td>52.63</td> <td>19</td> <td>100.00</td> </tr> </tbody> </table>	Sex	Frequency	Percent	Cumulative Frequency	Cumulative Percent	F	9	47.37	9	47.37	M	10	52.63	19	100.00
Sex	Frequency	Percent	Cumulative Frequency	Cumulative Percent											
F	9	47.37	9	47.37											
M	10	52.63	19	100.00											
*This is custom footnote for Table 2															
Table 3 - Mean Age†															
<i>The MEANS Procedure</i>															
<table border="1"> <thead> <tr> <th colspan="5">Analysis Variable : Age</th> </tr> <tr> <th>N</th> <th>Mean</th> <th>Std Dev</th> <th>Minimum</th> <th>Maximum</th> </tr> </thead> <tbody> <tr> <td>19</td> <td>13.3157895</td> <td>1.4926722</td> <td>11.0000000</td> <td>16.0000000</td> </tr> </tbody> </table>	Analysis Variable : Age					N	Mean	Std Dev	Minimum	Maximum	19	13.3157895	1.4926722	11.0000000	16.0000000
Analysis Variable : Age															
N	Mean	Std Dev	Minimum	Maximum											
19	13.3157895	1.4926722	11.0000000	16.0000000											
†This is custom footnote for Table 3															
Sample Report Footer 1 Sample Report Footer 2															

Figure 3: Table of Contents for all Entries

1	
Sample Report Header 1 Sample Report Header 2	
<b>Table of Contents</b>	
Table 1 - Class List.....	2
Table 2 - Gender.....	3
Table 3 - Mean Age.....	3
Table 4 - Mean Weight.....	4
Table 5 - Mean Height.....	4

## CONCLUSIONS

The technique described in this paper can be used to create an RTF file that contains a custom TOC when viewed in Microsoft Word. The technique involves imbedding "invisible" RTF control words to mark TOC entries and create the actual TOC. Since the TOC is created with RTF code, it is reproducible whenever the RTF file is recreated. With one exception, you have total control over the text of the TOC entries and the placement of the

TOC marks. The exception is the inability place a TOC mark in the Header or Footer of a Microsoft Word document. In addition, this paper also describes how to include the results of more than one SAS procedure per page, and use the ODS RTF TEXT= statement to add custom titles and footnotes to the results of each procedure.

## REFERENCES

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## CONTACT INFORMATION

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## APPENDIX I: Complete Code for Example RTF File

```

/* APPENDIX I: Complete Code for Example RTF File */

title;
footnote;

options orientation=landscape nodate nocenter pageno=1;

%let textformat_left = font=Arial height = 12 pt justify = l;
%let textformat_center = font=Arial height = 12 pt justify = c;

ods escapechar = '^';

title1 &textformat_left. 'Sample Report Header 1';
title2 &textformat_left. 'Sample Report Header 2';

footnote1 &textformat_left. 'Sample Report Footer 1';
footnote2 &textformat_left. 'Sample Report Footer 2';

ods rtf file = "U:\SGF08\Output\SGF08.rtf" startpage=no notoc_data;

/* ***** */
/* Page 1 of RTF File */
/* ***** */

/* ***** */
/* Create Table of Contents */
/* NOTE: Once RTF document is open in WORD, */
/* press <ctrl>A to select all and F9 to create TOC */
title3 &textformat_center. bold 'Table of Contents';
ods rtf startpage=now;
ods rtf text= "^S={outputwidth=100% just=1}{\field{\*\fldinst {\TOC \f \h} } }";

/* ***** */
/* Page 2 of RTF File */
/* ***** */

/* Start a new page */
title3;
ods rtf startpage=now;

/* Print the table title */
ods rtf text= "^S={outputwidth=100% just=1} {\f3\fs24 Table 1 - Class List*}";

/* Imbed the TOC mark */
ods rtf text= "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 1 - Class List}";

/* Create the table */
proc print data=sashelp.class noobs;
run;

/* Print the custom footnotes */
ods rtf text=
  "^S={outputwidth=100% just=1} {\f3\fs24 *This is custom footnote for Table 1}";

/* ***** */
/* Page 3 of RTF File */
/* ***** */

```

```

/* Start a new page */
ods rtf startpage=now;

/* Print the table title */
ods rtf text=
  "^S={outputwidth=100% just=1} {\line\line\f3\fs24 Table 2 - Gender*}";

/* Imbed the TOC mark */
ods rtf text= "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 2 - Gender}";

/* Create the table */
proc freq data = sashelp.class;
  table sex;
run;

/* Print the custom footnotes */
ods rtf text=
  "^S={outputwidth=100% just=1} {\f3\fs24 *This is custom footnote for Table 2}";

/* ***** */
/* Second Table on Page 3 */

/* Print the table title */
ods rtf text= "^S={outputwidth=100% just=1}
  {\line\line\line\line\line\line\f3\fs24 Table 3 - Mean Age†}";

/* Imbed the TOC mark */
ods rtf text= "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 3 - Mean Age}";

/* Create the table */
proc means data = sashelp.class;
  var age;
run;

/* Print the custom footnotes */
ods rtf text=
  "^S={outputwidth=100% just=1} {\f3\fs24 †This is custom footnote for Table 3}";

/* ***** */
/* Page 4 of RTF File */
/* Start a new page */
ods rtf startpage=now;

/* Print the table title */
ods rtf text= "^S={outputwidth=100% just=1} {\f3\fs24 Table 4 - Mean Weight*}" ;

/* Imbed the TOC mark */
ods rtf text=
  "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 4 - Mean Weight}";

/* Create the table */
proc means data = sashelp.class;
  var weight;
run;

/* Print the custom footnotes */
ods rtf text=
  "^S={outputwidth=100% just=1} {\f3\fs24 *This is custom footnote for Table 4}";

```

```
/* ***** */
/* Second Table on Page 4 */

/* Print the table title */
ods rtf text=
"^S={outputwidth=100% just=1}{\line\line\line\line\f3\fs24 Table 5 - Mean Height}" ;

/* Imbed the TOC mark */
ods rtf text= "^S={outputwidth=100% just=1} {\tc\f3\fs0\cf8 Table 5 - Mean Height}";

/* Create the table */
proc means data = sashelp.class;
    var Height;
run;

/* Print the custom footnotes */
ods rtf text=
    "^S={outputwidth=100% just=1} {\f3\fs24 †This is custom footnote for Table 5}";

quit;

ods rtf close;
```