PharmaSUG 2012 - Paper DG04

iRobot: Listing Creator

David Gray, PPD, Austin, Texas
Zhuo Chen, PPD, Austin, Texas
Suneela Gogineni, PPD, Austin, Texas

ABSTRACT

This paper introduces a method to automate the creation of a set of SAS® listing programs, each generating a listing based on input specifications. A MS Word macro inputs the listing specifications and outputs a MS Excel file containing the key information needed to generate the listing programs. A SAS® macro reads the MS Excel file and creates a set of SAS® programs, which then can be further customized.

INTRODUCTION

This listing creator is simple to use. Please see a snapshot below for folder structure:

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td></td>
<td>File Folder</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td>File Folder</td>
</tr>
<tr>
<td>Spec</td>
<td></td>
<td>File Folder</td>
</tr>
<tr>
<td>generate_report</td>
<td>1 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>ListingCreator</td>
<td>3 KB</td>
<td>SAS System Program</td>
</tr>
</tbody>
</table>

- Data folder: all raw SAS® data sets used to create listings
- Output folder: all listing outputs
- Spec folder: original listing specifications, it could be one spec, or could be as many as you need.
- Generate_report.sas: a macro to create listing output (which can be PDF, or MS Excel or any output format you need). Each listing program will automatically call this macro.
- ListingCreator.sas: a macro to create a set of SAS® programs, each program will generate one listing.

STEP 1: USE THE MS WORD MACRO TO CREATE SPEC.XLS

This MS Word macro will run through each listing specification file in the Spec folder. It first opens one specification file, then searches for the key word “Report Title:” for the title, searches for the key word “Program Name:” for the SAS® program name, and searches for the key word “Variable Names” for a list of variables in the output (and the order in the listing output). Then the macro saves this information into SPEC.XLS file in the Spec folder. After one specification has been completed, it moves to the next, repeating the same steps until all specifications has been searched and all information has been saved in SPEC.XLS.

A completed example specification is shown in Display 1:
### iRobot: Listing Creator, continued

*The version first placed into production should be Version 1*

<table>
<thead>
<tr>
<th>Version Number: *</th>
<th>0.01</th>
<th>Requested by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report Title:</td>
<td>Listing 8: List of All Adverse Events</td>
<td>Request Date:</td>
</tr>
<tr>
<td>Report Due Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report Name:</td>
<td>Listing 8: List of All Adverse Events</td>
<td>Lead Programmer:</td>
</tr>
<tr>
<td>Study Name:</td>
<td>ABCDEFG</td>
<td></td>
</tr>
<tr>
<td>Sponsor Name:</td>
<td>XYZ</td>
<td>Internal/External Delivery:</td>
</tr>
<tr>
<td>Program Name:</td>
<td>StudyAAA_06.sas</td>
<td></td>
</tr>
</tbody>
</table>

### Brief Overview of the Report’s Intent:
DM REVIEW LISTING FOR ADVERSE EVENTS

### Expected Output Format:
- [ ] XLS File
- [ ] PDF File
- [ ] RTF File
- [ ] CSV File
- [ ] Post Script for Printing

### Report Format Criteria (for Output Formats of Report Only)*:
**Report Header and Footer are modified ONLY if sponsor requests modifications: otherwise PPD standard below is pulled into report**

**Report Header:**
- Line 1 = Client: (Sponsor Name – left justified)
- Line 2 = Protocol: (Study Name – left justified)
- Line 3 = (Report Title - Center)

**Report Footer:**
- Line 1 = ((Program Path), (File Name), (Date / Time) - left justified)
- Line 2 = (SAS version used to create data listing) – left justified
- Line 2 = (PPD, Inc – centered)

### Data Requirements Section:

**NOTE:** Place the variables based on the order of display from left to right

<table>
<thead>
<tr>
<th>Order</th>
<th>Annotated DCM/Data Source</th>
<th>Variable Names</th>
<th>Special Column Headings For Special Fields or Custom Variables</th>
<th>Criteria or Calculation definition ~Complete for required variables only</th>
<th>Compare (X)</th>
<th>Count (X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AEV</td>
<td>INV</td>
<td>Country</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2.</td>
<td>AEV</td>
<td>PT</td>
<td>Patient No.</td>
<td>Report only first occurrence</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3.</td>
<td>AEV</td>
<td>REC1N</td>
<td>Event No.</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4.</td>
<td>AEV</td>
<td>AEVNAME1A</td>
<td>Adverse Event</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5.</td>
<td>AEV</td>
<td>AEVSEVER1C</td>
<td>Was Event Serious?</td>
<td>Decode Serious [{CRN11_}]</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6.</td>
<td>AEV</td>
<td>AEVESV1C</td>
<td>Severity</td>
<td>Decode Severity [{AEVS21_}]</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7.</td>
<td>AEV</td>
<td>AEVSMR1C</td>
<td>Relationship</td>
<td>Decode Relation [{AEVS11_}]</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8.</td>
<td>AEV</td>
<td>ACNTAK</td>
<td>Action Taken</td>
<td>Concatenate ACNTAK1N-ACNTAKAN (8 variables) when it is not blank, use &quot;&quot;,&quot; to separate them.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>9.</td>
<td>AEV</td>
<td>AEVSTT1O</td>
<td>Start Date</td>
<td>Output format DDMMYYYY</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>10.</td>
<td>AEV</td>
<td>AEVEN1D1O</td>
<td>Stop Date</td>
<td>Output format DDMMYYYY</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11.</td>
<td>AEV</td>
<td>AEVCTU1C</td>
<td>Continuing?</td>
<td>Decode Continuing [{CRN11_}]</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Display 1. Listing specification file.
iRobot: Listing Creator, continued

Display 2 below is a snapshot of the Spec folder after the macro has been run. It contains individual listing specifications and the SPEC.XLS created by the word macro.

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>spec</td>
<td>23 KB</td>
<td>Microsoft Excel Work...</td>
</tr>
<tr>
<td>StudyAAA_Listing 10 Concomitant Medications</td>
<td>80 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 11 Infections</td>
<td>97 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 12a Immunosuppressive Medications</td>
<td>74 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 12b Immunosuppressive Medications</td>
<td>75 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 12c Immunosuppressive Medications</td>
<td>61 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 13 Immunosuppressive Medications</td>
<td>90 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 14 Dosing Adverse Events_In...</td>
<td>107 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 15 Duplicate Data</td>
<td>60 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 16a Infections Coding Preference</td>
<td>111 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 16b Infections Coding Verbatim</td>
<td>116 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 16c Infections Uncoded Terms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>StudyAAA_Listing 17a Reason for Death Coding</td>
<td>97 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 17b Reason for Death Coding</td>
<td>97 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 17c Reason for Death Uncode...</td>
<td>61 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 18 ECG Recon DO8</td>
<td>71 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
<tr>
<td>StudyAAA_Listing 19 ECG Recon Date_Time</td>
<td>82 KB</td>
<td>Microsoft Word Doc...</td>
</tr>
</tbody>
</table>

Display 2. Spec folder.

Display 3 below is the snapshot of SPEC.XLS file created by the macro.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>title</td>
</tr>
<tr>
<td>2</td>
<td>Listing 5a: Adverse Event Sorted by Preferred *StudyAAA_05a.sas</td>
</tr>
<tr>
<td>3</td>
<td>Listing 5b: Adverse Event Sorted by Verbatim *StudyAAA_05b.sas</td>
</tr>
<tr>
<td>4</td>
<td>Listing 6: List of All Adverse Events *StudyAAA_06.sas</td>
</tr>
<tr>
<td>5</td>
<td>Listing 7: List of All Serious Adverse Events *StudyAAA_07.sas</td>
</tr>
<tr>
<td>6</td>
<td>Listing 8: Treatment &amp; Study Completion *StudyAAA_08.sas</td>
</tr>
<tr>
<td>7</td>
<td>Listing 9a: Concomitant Medications Sorted by StudyAAA_09a.sas</td>
</tr>
<tr>
<td>8</td>
<td>Listing 9b: Concomitant Medications Sorted by StudyAAA_09b.sas</td>
</tr>
<tr>
<td>9</td>
<td>Listing 9c: Concomitant Medications Uncoded *StudyAAA_09c.sas</td>
</tr>
<tr>
<td>10</td>
<td>Listing 10: List of All Concomitant Medications *StudyAAA_10.sas</td>
</tr>
<tr>
<td>11</td>
<td>Listing 11: Infections *StudyAAA_11.sas</td>
</tr>
<tr>
<td>12</td>
<td>Listing 12a: Immunosuppressive Medications *StudyAAA_12a.sas</td>
</tr>
<tr>
<td>13</td>
<td>Listing 12b: Immunosuppressive Medications *StudyAAA_12b.sas</td>
</tr>
<tr>
<td>14</td>
<td>Listing 12c: Immunosuppressive Medications *StudyAAA_12c.sas</td>
</tr>
</tbody>
</table>

Display 3. SPEC.XLS.

The macro can be easily modified if you need to use alternative search strings to extract the information for listing title, program name, and the list of variable names.

The source code for the word macro is on Appendix A of this paper.
STEP 2: USE LISTING CREATOR.SAS TO CREATE A SET OF SAS® LISTING PROGRAMS

This SAS® program contains two macros. The first macro, %create_one_program() will create one SAS® listing program each time it is called. Note you can customize the header section to fit your standard.

%MACRO create_one_program(title=, progname=, keepvar=);
   DATA _null_;
   FILE "&&progname..SAS";
   put "="/*******************************************************************/;
   put "* STUDY NAME: Study AAA ";
   put "* PROTOCOL: Protocol BBB ";
   put "* PROGRAM NAME: &&progname..SAS ";
   put "* SAS VERSION: 9.1.3 ";
   put "* AUTHOR: ";
   put "* DATE CREATED: ";
   put "* PURPOSE: &&title ";
   put "* INPUT FILES: ";
   put "* OUTPUT FILES: ";
   put "="/*******************************************************************/;
   put ";
   put '%' 'INCLUDE "generate_report.sas";'
   put ";
   put '%' "LET title = &&title ; ";
   put '%' "LET progname = &&progname ; ";
   put '%' "LET keepvar = &&keepvar; ";
   put ";
   put 'LIBNAME data ".\data";'
   put ";
   put 'DATA &&progname (KEEP=&&keepvar); '
   put "/* put your code here */ ";
   put "RUN; ";
   put ";
   put "/* add footnotes if need */ ";
   put 'FOOTNOTE3 j=1 "\path&&progname..SAS";'
   put '@generate_report(&title,&&progname,&&keepvar);'
run;
%MEND create_one_program;
The 2nd macro `%create_all_programs()` reads in the SPEC.XLS, then calls the first macro `%create_one_program()` one by one for each listing, passing the listing title, SAS® program name and variables to generate one corresponding SAS® program for each listing specification.

```sas
%Macro create_all_programs();
  %let specification=./spec/spec.xls;

  proc import datafile="&specification" out=spec;
    getnames=yes;
  run;

  data spec;
    set spec;
    temp = index(progname,".sas");
    if temp>0 then progname=substr(progname,1,temp-1);
  run;

  data _null_;
    set spec end=eof;
    call symput('title'||trim(left(_n_)), trim(left(title)));
    call symput('progname'||trim(left(_n_)), trim(left(progname)));
    call symput('keepvar'||trim(left(_n_)), trim(left(keepvar)));
    if eof then do;
      call symput('maxds', trim(left(_n_)));
    end;
  run;

  %let max = &maxds.;
  %local j;
  %do j=1 %to &max;
    %create_one_program(title=&title&j,
          progname=&progname&j,
          keepvar=&keepvar&j);
  %end;
%mend create_all_programs;
```
Display 4 below is a snapshot of the directory after execution of %create_all_programs.

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td></td>
<td>File Folder</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td>File Folder</td>
</tr>
<tr>
<td>Spec</td>
<td></td>
<td>File Folder</td>
</tr>
<tr>
<td>generate_report</td>
<td>1 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>ListingCreator</td>
<td>3 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>ListingCreator</td>
<td>11 KB</td>
<td>SAS Log</td>
</tr>
<tr>
<td>StudyAAA_05a</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_05b</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_06</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_07</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_08</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_09a</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_09b</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_09c</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_10</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_11</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_12a</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_12b</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
<tr>
<td>StudyAAA_12c</td>
<td>2 KB</td>
<td>SAS System Program</td>
</tr>
</tbody>
</table>

Display 4. Directory after execution of %create_all_programs.

STEP 3: MODIFY EACH LISTING PROGRAM THEN CREATE LISTING OUTPUT

Each SAS® listing program already has listing template and key information for that corresponding listing. Let's look at one example, StudyAAA_06.sas, which is generated automatically by this macro based on the specification for listing 06 in this StudyAAA.

As you can see below the SAS® program name, listing title and the variables have been populated in the SAS® listing programs. All you need are a few minor modifications to finalize each program. See the **bolded italicized** code below.

```sas
/****************************/
* STUDY NAME: Study AAA
* PROTOCOL: Protocol BBB
* PROGRAM NAME: StudyAAA_06.SAS
* SAS VERSION: 9.1.3
* AUTHOR:
* DATE CREATED:
* PURPOSE: Listing 6: List of All Adverse Events
* INPUT FILES:
* OUTPUT FILES:
/****************************/

%INCLUDE "generate_report.sas";
```
%LET title = Listing 6: List of All Adverse Events;
%LET programe = StudyAAA_06;
%LET KEEPVAR = INV PT REC1N AEVNA1A AEVSE1C AEVSEV1C AEVSMR1C ACNTAK AEVSTT10 AEVEND10 AEVCTU1C;
LIBNAME DATA ".\data";
DATA &programe (KEEP=&keepvar);
    /* put your code here */
RUN;

    /* add footnotes if needed */

FOOTNOTE3 j=1 "\path\&programe..SAS";
%generate_report(&title,&programe,&keepvar);

You can manipulate the bolded italicized code below so it can read in the proper raw data from Data folder or derive certain variables. You can also add footnotes if needed.

DATA &programe (KEEP=&keepvar);
    SET DATA.AEVAEV;
    LENGTH ACNTAK $10. ;
    ACNTAK = TRIM(LEFT(acntak1n))||TRIM(LEFT(acntak2n));
    LABEL ACNTAK = "Action Taken";
RUN;

FOOTNOTE1 j=1 "Note: Continuing at final exam 1=Yes, 0=No. ";

After execution, the listing will be output to the OUTPUT folder and will have the same name as the SAS® listing program, e.g. StudyAAA_06.RTF in this case. Please see Display 5.
## Study AAA
### Protocol BBB
### Listing & List of All Adverse Events

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Patient</th>
<th>Record number</th>
<th>Adverse Event</th>
<th>Seriousness</th>
<th>Severity</th>
<th>Relationship to study drug</th>
<th>Action Taken</th>
<th>Adverse event start (date)</th>
<th>Adverse event end (date)</th>
<th>Continuing at final exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUS</td>
<td>01000002</td>
<td>1.00</td>
<td>PULMONARY THROMBOSIS</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>20100623</td>
<td>20100623</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000002</td>
<td>2.00</td>
<td>LEFT LEG DEEP VEN TRBMS</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>20100623</td>
<td>20100623</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000002</td>
<td>3.00</td>
<td>EUTANCHEMIC HEART DISEASE</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>20100623</td>
<td>20100623</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>1.00</td>
<td>TRANSPLANT WOUND PAIN</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20100620</td>
<td>20100610</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>2.00</td>
<td>UROINARY URGENCY INTERMITTENT</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20100527</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>3.00</td>
<td>PARASTHESIA BILATERAL FEET</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20100521</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>4.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>5.00</td>
<td>DIARRHOEA</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20100810</td>
<td>20100812</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>6.00</td>
<td>ACNE OVER KIDNEY INTERMITTENT</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20100523</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>7.00</td>
<td>BILATERAL LIDS ODEMA</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20100506</td>
<td>20100524</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>8.00</td>
<td>BILATERAL INTERMITTENT</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>20100518</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS</td>
<td>01000003</td>
<td>9.00</td>
<td>ANXIETY</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>20101113</td>
<td></td>
<td></td>
<td>1</td>
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*Note: Continuing at final exam = Yes, 0 = No.*

Display 5. StudyAAA_06.RTF

### MACRO %GENERATE_REPORT()###

The source code of macro %generate_report() is below. Since this is such a simple macro, you can easily customize it to PDF or EXCEL etc. output format as desired.

```sas
%MACRO generate_report(title, programe, keepvar);
   OPTIONS MISSING="" NODATE ORIENTATION = landscape ;
   TITLE1 "Study AAA";
   TITLE2 "Protocol BBB";
   TITLE3 "&title";
   ODS RTF FILE="\output\&programe..rtf";
   PROC REPORT DATA=&programe HEADLINE HEADSKIP SPLIT='$' MISSING NOWORD;
      COLUMN &keepvar;
   RUN;
   ODS RTF CLOSE;
%MEND generate_report;
```
CONCLUSION

When you have a large number of listings to produce, utilizing a standardized specification format and the automation macros presented in this paper you will realize substantial time savings. The macros presented may be further customized to further automate the program generation and output format. Time is money, so let iRobot do the heavy lifting!

Appendix A: SOURCE CODE FOR THE WORD MACRO:

Note that this macro requires the SPEC.XLS file to be present and will replace the contents each time it is executed. In order to execute this macro the MS Excel 11.0 or 12.0 Object Library reference must be enabled.

Sub ReadSpecs()
' MS Word Macro to read in the specification documents and output to SPEC.XLS
' Modify the directory path to the SPEC.XLS Document below
mydirectory = ".
ChangeFileOpenDirectory mydirectory

Dim CurrFile As String
Dim CurrTitle As String
Dim CurrPgmName As String
Dim CurrVar As String
Dim VarLst As String
Dim row As Integer
Dim col As Column
Dim rng As Range
Dim CurrDoc As Document
Dim XlApp As Excel.Application
Dim IdsSheet As Integer
Dim XlSheet As Excel.Worksheet
Dim OpenStatus As Boolean
Dim ws As Worksheet
Dim row_counter As Integer

' Open the excel workbook
Set XlApp = New Excel.Application
XlApp.Visible = False
Set xlbook = XlApp.Workbooks.Open(mydirectory & "$SPEC.xls")
Set XlSheet = xlbook.ActiveSheet
XlSheet.Cells.Clear
row_counter = 1
XlSheet.Cells(row_counter, 1) = "title"
XlSheet.Cells(row_counter, 2) = "progname"
XlSheet.Cells(row_counter, 3) = "keepvar"
row_counter = row_counter + 1
XlApp.ScreenUpdating = False

' Open each specification file
CurrFile = Dir(mydirectory & "\*.doc")
Do While CurrFile <> ""
    Documents.Open FileName:=CurrFile
    Documents.DoEnd

' Process each file
' Get the title
Selection.Find.ClearFormatting
With Selection.Find
    .Text = "Report Title"
    .Replacement.Text = ""
    .Forward = True
    .Wrap = wdFindContinue
    .Format = False
    .MatchCase = False
    .MatchWholeWord = False
    .MatchWildcards = False
    .MatchSoundsLike = False
    .MatchAllWordForms = False
End With
Selection.Find.Execute
Selection.MoveRight Unit:=wdCell
CurrTitle = Selection.Text

' Get the Program Name
Selection.Find.ClearFormatting
With Selection.Find
    .Text = "Program Name"
    .Replacement.Text = ""
    .Forward = True
    .Wrap = wdFindContinue
    .Format = False
    .MatchCase = False
    .MatchWholeWord = False
    .MatchWildcards = False
    .MatchSoundsLike = False
.MatchAllWordForms = False
End With
Selection.Find.Execute
Selection.MoveRight Unit:=wdCell
CurrPgmName = Selection.Text

' Get the variable list
Selection.Find.ClearFormatting
With Selection.Find
.Text = "Variable Names"
.Replacement.Text = ""
.Forward = True
.Wrap = wdFindContinue
.Format = False
.MatchCase = False
.MatchWholeWord = False
.MatchWildcards = False
.MatchSoundsLike = False
.MatchAllWordForms = False
End With
Selection.Find.Execute

' set col to the column with the variable names are located

VarLst = ""
' Store the variables in VarLst separated by a comma

For row = 2 To Selection.Tables(1).Rows.Count

' Strip the last char (cell marker) and add to the list and the CRLF
CurrVar = Left(CurrVar, Len(CurrVar) - 1)
CurrVar = LTrimCRLF(CurrVar)

If row = 2 Then
VarLst = CurrVar
Else
VarLst = VarLst & "," & CurrVar
End If
Next
' update the SPEC.XLS file
    XLSheet.Cells(row_counter, 1) = CurrTitle
    XLSheet.Cells(row_counter, 2) = CurrPgmName
    XLSheet.Cells(row_counter, 3) = VarLst
    row_counter = row_counter + 1

' Close the specification file
    ActiveDocument.Close

' Call the Dir command to get the next filename
    CurrFile = Dir
    Loop

' Close the SPEC.XLS file
    XLApp.ActiveWorkbook.Save
    XLApp.ActiveWorkbook.Close

End Sub

Function LTrimCRLF(s As String) As String
    Dim index As Integer, start As Integer, strlen As Integer
    Dim c As String
    strlen = Len(s)
    index = 1
    start = -1
    Do While (index <= strlen) And (start = -1)
        c = Mid(s, index, 1)
        If (c = vbCr) Or (c = vbLf) Then
            index = index + 1
        Else
            start = index
        End If
        Loop
    If start = -1 Then
        LTrimCRLF = ""
    Else
        LTrimCRLF = Mid(s, start)
    End If

End Function
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CONTACT INFORMATION
Your comments and questions are valued and encouraged. Contact the authors at:

   David Gray, Zhuo Chen, Suneela Gogineni
   PPD
   7551 Metro Center Drive, Suite 300
   Austin, TX 78744
   E-mail: david.gray@ppdi.com, zhuo.chen@ppdi.com, Suneela.Gogineni@ppdi.com

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