Chapter 3

Editing and Debugging SAS Programs

Topics

- SAS Program Editor and Enhanced Editor
- Write, run and save a SAS program
- Enhance the readability of your SAS programs
- Interpret error messages in the SAS log
- Correct errors
- Resolve common SAS programming problems
- Including comments in SAS programs

Two Program Editors in SAS

- **Program Editor**:
  - The original editor for SAS Display Manager and still the only one available when using Display Manager on non-Windows systems
  - The program window title starts with "Program Editor"
  - Includes line commands
  - Code disappears after submission, but you can recall the code with "Recall Last Submit" under the Run menu
- **Enhanced Editor**:
  - More commonly used in the Windows system. The program window title starts with "Editor"
  - Has better coloration, e.g., a color for defined keywords
  - Has some advanced editing functionalities, e.g., short-cuts
  - Code does not disappear after submission

Writing a SAS Program in an Editor Window

SAS statements can be written in almost any format, but there are several common practices that SAS programmers employ to improve readability:

- Begin DATA and PROC steps in column one
- Indent statements within a step
- Begin RUN statements in column one
- Include a RUN statement after every DATA step or PROC step

Writing a SAS Program in an Editor Window: Example

```
LIBNAME MPS "c:\stsci5010\examples";
DATA MPS.ex3_1;
  INPUT id sex $ age income rating1 rating2 rating3;
DATALINES;
1  F  36 18  7 5 2
18  M  50 14  5 6 3
33  F  48  6  7 2 7
49  M  24 14  7 5 7
65  F  52  9  4 7 7
;
PROC PRINT DATA=MPS.ex3_1;
RUN;
```

Writing a SAS program in the Program Editor Window: Show Line Numbers

```
00001  LIBNAME MPS "c:\stsci5010\examples";
00002  DATA MPS.ex3_1;
00003    INPUT id sex $ age income rating1 rating2 rating3 ;
00004    DATALINES;
00005  1  F  36 18  7 5 2
00006  18  M  50 14  5 6 3
00007  33  F  48  6  7 2 7
00008  49  M  24 14  7 5 7
00009  65  F  52  9  4 7 7
00010  ;
00011  PROC PRINT DATA=MPS.ex3_1;
00012  RUN;
```

- Type **NUMS** (or just **NUM**)in the command box
- Select Tools→ Options→ Program Editor → Editing → Display line numbers

Text Editor Line Commands

Enter the commands in the line number area to delete, insert, move, and repeat text.

Command	Action
Cn	copies n lines (where n = a number up to 9999) from the current line
Dn	deletes n lines from the current line
In	inserts n blank lines from the current line
Mn	moves n lines
Rn	repeats current line n times
A	after (used with C, I, and M)
B	before (used with C, I, and M)

Text Editor Line Commands: Examples

Command	Action
00001 i3002 00003	inserts 3 lines after line 00002
0ib01 00002 00003	inserts 1 line before line 00001
0ib41 00002 00003	inserts 4 lines before line 00001
000c2 00002 0a003	copies 2 lines (00001 and 00002) after line 00003
00001 0d302 00003	deletes 3 lines (00002, 00003, and 00004)
00b01 00002 00m03	moves 1 line (00003) before line 00001

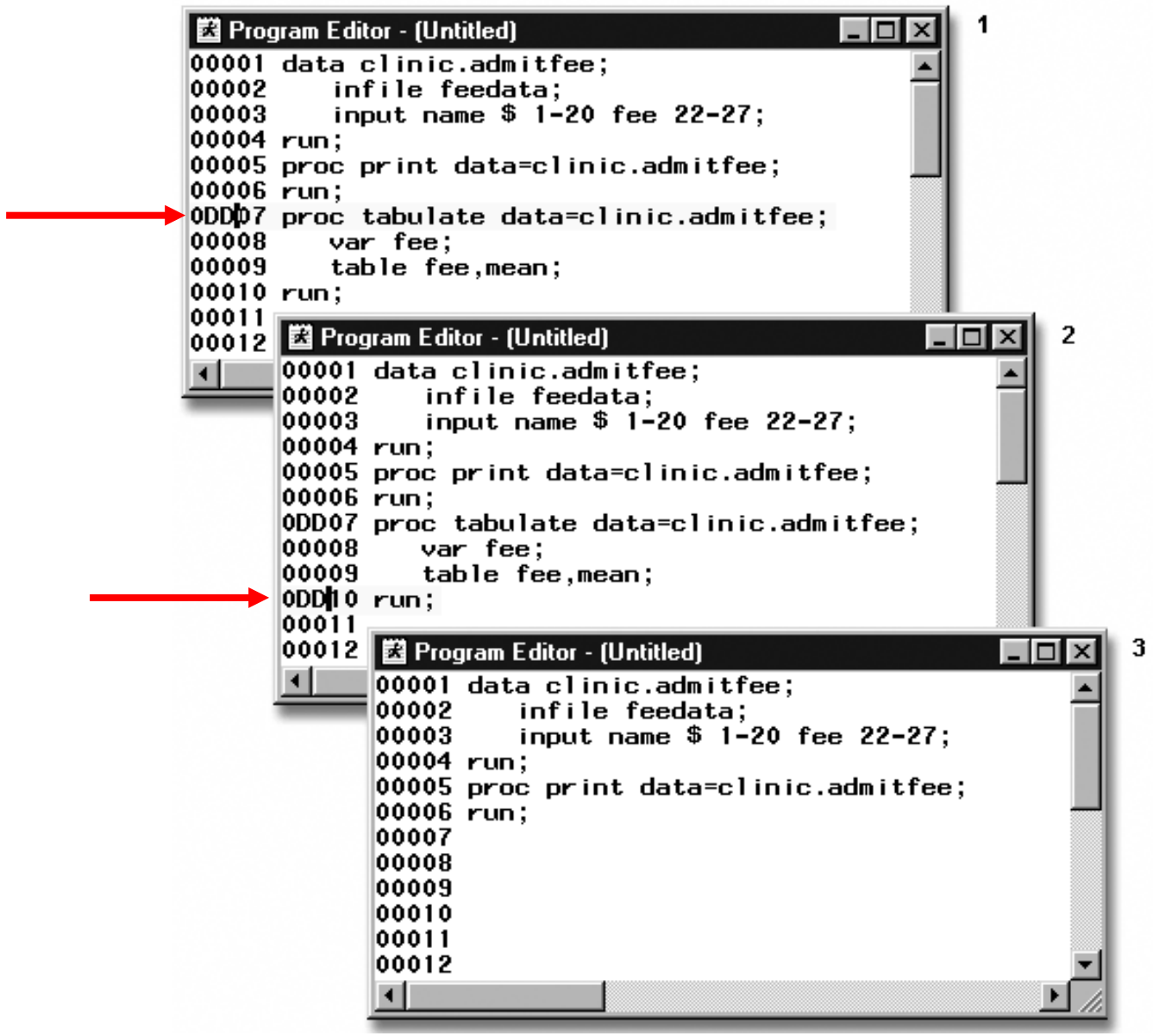
Block Text Editor Line Commands

Enter these commands in the line number area to delete, insert, move, and repeat multiple lines of text.

Command	Action
DD	deletes a block of lines
CC	copies a block of lines
MM	moves a block of lines
RR	repeats multiple lines
A	after (used with CC and MM commands)
B	before (used with CC and MM commands)

To use a block command, specify the command on the first line affected and on the final line affected, and then press Enter.

Block Text Editor Line Commands: Example



Block Text Editor Line Commands: Example

Program Editor - ex3_1

```
00001 LIBNAME MPS "c:\stsci5010\examples";
00002 DATA MPS.ex3_1;
00003     INPUT id sex $ age income rating1 rating2 rating3 ;
00004 DATALINES;
00005 1  F  36 18  7 5 2
00006 18  M  50 14  5 6 3
00007 33  F  48  6  7 2 7
00008 49  M  24 14  7 5 7
00009 65  F  52  9  4 7 7
00010 ;
00011 PROC PRINT DATA=MPS.ex3_1;
00012 RUN;
00013
00014
```

Program Editor - ex3_1

```
00001 LIBNAME MPS "c:\stsci5010\examples";
00002 DATA MPS.ex3_1;
00003     INPUT id sex $ age income rating1 rating2 rating3 ;
00004 DATALINES;
0cc05 1  F  36 18  7 5 2
00006 18  M  50 14  5 6 3
0cc07 33  F  48  6  7 2 7
00008 49  M  24 14  7 5 7
0a009 65  F  52  9  4 7 7
00010 ;
00011 PROC PRINT DATA=MPS.ex3_1;
00012 RUN;
00013
00014
```

Program Editor - ex3_1

```
00001 LIBNAME MPS "c:\stsci5010\examples";
00002 DATA MPS.ex3_1;
00003     INPUT id sex $ age income rating1 rating2 rating3 ;
00004 DATALINES;
00005 1  F  36 18  7 5 2
00006 18  M  50 14  5 6 3
00007 33  F  48  6  7 2 7
00008 49  M  24 14  7 5 7
00009 65  F  52  9  4 7 7
00010 1  F  36 18  7 5 2
00011 18  M  50 14  5 6 3
00012 33  F  48  6  7 2 7
00013 ;
00014 PROC PRINT DATA=MPS.ex3_1;
00015 RUN;
```

Running a SAS program

```
LIBNAME MPS "c:\stsci5010\examples";
DATA MPS.ex3_1;
  INPUT id sex $ age income rating1 rating2 rating3 ;
  DATALINES;
1  F  36 18  7 5 2
18  M  50 14  5 6 3
33  F  48  6  7 2 7
49  M  24 14  7 5 7
65  F  52  9  4 7 7
;
PROC PRINT DATA=MPS.ex3_1;
RUN;
```

Submitting a SAS program

To submit a SAS program:

- With the Editor window active, select **Run -> Submit**.
- Clicking the **running person** in the toolbar just under the menu line.
- To submit only a portion of a program in the Editor window, highlight the portion you want to submit, right-click the highlighted area, and select **Submit Selection**, or click the **running person**, or select **Run -> Submit.**
- You can even run SAS code from clipboard, by selecting **Run -> Submit Clipboard.**

To interrupt a submitted program use the Ctrl and Break keys or the exclamation in the toolbar

Save and Open a SAS Program

- To save a SAS program use the menu file>save as. You may save it to any location you prefer.
- To open a stored program in SAS by using
  - File shortcuts in the SAS Explorer window.
  - My favorite folders (View → My Favorite Folders).
  - The Open window (File → Open Program).
  - The INCLUDE command in the Command box/window (e.g., Include “C:\STSCI5010\Examples\Ex3_1.sas”.
  - Dragging and dropping it into the code editing window.
  - Navigate to the stored SAS file, right click it and select "Open with SAS 9.4" option.

View the LOG window

- Each time a step is executed, SAS generates a log of the processing activities and the results of the processing.
- The SAS log collects messages about the processing of SAS programs and any **errors** that may occur.
- Click the Log window to activate it.

Error Types

- **Syntax Errors** - occur when program statements do not conform to the rules of the SAS language.
- **Data Errors** - occur when some data values are not appropriate for the SAS statements that are specified in a program.

After you submit a program, SAS scans each step for syntax errors, then processes the step if no syntax errors are found. SAS then goes to the next step and repeats the process. Syntax errors, such as misspelled keywords, generally cause SAS to stop processing the step in which the error occurred.

Common Messages in SAS Log

- **Errors:** cannot be ignored. E.g., an error msg in log:

  37 PROC PRINr DATA=MPS.ex3_2;

  ERROR: Procedure PRINR not found.

  38 RUN;

- **Warnings:** Program can often run with warnings.

  WARNING: The Base Product with which PRINTS is associated will expire within 30 days.

- **Notes:** Provide information or can indicate a problem.

  NOTE: There were 6 observations read from the data set WORK.TIMES.

Common Syntax Errors

- The missing semicolon
- No run statement at the very end
- Misspelling the data file name
- Misspelling SAS keywords
- Unmatched quotes/comments
- Specifying an invalid option

Looking for Errors in a SAS program

```
libname MPS "c:\MPS';
data MPS.new;
     weight=135
     age=26,
run;
proc pRINt data=MPS.new;
```

Correcting Errors

- After the error(s) in your SAS program have been identified, return to your Editor Window and make the appropriate changes.
- Save your revised SAS program.
- Resubmit the revised program.
- After verifying in your Log Window that no errors are now present, proceed to look at the results in the Output Window if applicable.

Results and Output Window

- Once you have created output, the Results Window opens.
- The Results window covers the Explorer window. You can switch between the two windows using the tabs at the bottom of the window.
- Look at the Results window. The Results node at the top of the window contains a folder for the output of the procedures you ran. The folder is labeled with the procedure name and the title of the report.
- SAS will produce output in two possible formats:
  - an HTML document.
  - a listing (traditional SAS output).

Comments in SAS Programs

- Effective **commenting** is essential to document the purpose of the program, to explain segments of the program, or to describe the steps in a complex program or calculation.

- **SAS ignores text in the comments during processing** and turns this text **green** in your Editor Window by default (you can change this setting through the Enhanced Editor's Appearance).

Comments in SAS Programs

To create comments you can use two styles:

1. Start with "*" and end with ";" comment symbols. This method is good for a single line comment or an end-of-line comment.

```
proc print data= student;      * Prints the data;
run;
```

2. Start with "/*" and ends with "*/" comment symbols. This method is good for a single line comment, an end-of-line comment, or a block comment.

```
proc print data= students;     /* Prints the data*/
run;
```

Comments in SAS Programs

More examples:

```
*Making a simple data set called “new”;
 libname MPS “c:\MPS”;
 data MPS.new; /*creating a dataset named new*/
      weight=35; *weight is a numeric variable;
 run;

 /*
Print this “new” data set
to the output window
*/
 proc print data=MPS.new;
 run;
```